

PROMOTING INNOVATION THROUGH PUBLIC PROCUREMENT: A
SYSTEMS OF INNOVATION APPROACH

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SYSTEMS OF INNOVATION APPROACH**

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ABSTRACT

PROMOTING INNOVATION THROUGH PUBLIC PROCUREMENT: A SYSTEMS OF INNOVATION APPROACH

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This study serves a dual purpose. Firstly, it seeks to offer new empirical evidence on the impact of public procurement on firms' innovation performance, delving into the comparative effects of various demand and supply-side factors and exploring country-level differences. Secondly, the thesis aims to analyze the mediator role of absorptive capacity in the link between innovation and procurement.

The study initially employs the Heckman two-step estimation technique and Community Innovation Survey data to empirically examine the dependence of firms' innovation performance on public procurement. An interaction term is introduced to the model to assess the mediator role of absorptive capacity. The results indicate a high potential for public procurement to enhance firms' innovation performance. However, an unexpected finding emerges: the mediator role of absorptive capacity is deemed insignificant in the estimated model.

Subsequently, the case study method is employed to explore how the mediator role of absorptive capacity manifests in the association between public procurement and innovation. Two procurement cases from Turkey are analyzed through by collecting

data through open sources and semi-structured interviews. The findings suggest that the absorptive capacity of both the buyer and the supplier holds varying importance and priority at different phases of the Public Procurement of Innovation (PPI) process. The procurer's absorptive capacity is emphasized, especially in the pre-procurement phase, while the supplier's absorptive capacity becomes more critical during tendering and post-award phases.

Finally, this research develops policy recommendations rooted in the Systems of Innovation approach, which prioritizes mutual relations, collaborations, and information exchange.

Keywords: Public procurement for innovation, innovation performance, mediator role, absorptive capacity, systems of innovation

ÖZ

KAMU ALIMLARI YOLUYLA İNOVASYONUN TEŞVİK EDİLMESİ: İNOVASYON SİSTEMLERİ YAKLAŞIMI

CAN, Mustafa

Doktora, Bilim ve Teknoloji Politikası Çalışmaları Bölümü

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Bu çalışma ikili bir amaca hizmet etmektedir. Birinci amaç, kamu alımlarının firmaların inovasyon performansı üzerindeki etkisine ilişkin yeni ampirik kanıtlar sağlamayı amaçlamaktadır. Tezde farklı talep ve arz yönlü faktörlerin karşılaştırmalı etkileri ve ülke düzeyindeki farklılıklar tartışılacaktır. İkinci olarak, bu tez yenilik ve kamu alımları arasındaki bağlantıda özümseme kapasitesinin arabulucu rolünü analiz etmeyi amaçlamaktadır.

Araştırma sorularına cevap bulmak için nicel ve nitel araştırma yöntemlerinden yararlanılmıştır. Firmaların yenilik performansının kamu alımlarına bağımlılığına ilişkin ampirik kanıtlar bulmak için başlangıçta Heckman İki-Aşamalı tahmin tekniği ve Topluluk Yenilik Anketi verilerinden yararlanılmıştır. Özümseme kapasitesinin arabulucu rolünü test etmek için modele bir etkileşim terimi dahil edilmiştir. Bulgular, kamu alımlarının firmaların inovasyon performansını artırma konusunda yüksek bir potansiyele sahip olduğunu göstermiştir. Tahmin edilen modelde beklenmeyen bir sonuç ise özümseme kapasitesinin arabulucu rolüne dair istatistiksel olarak anlamlı bir bulgu elde edilememiş olmasıdır.

Daha sonra, kamu alımları ile yenilik arasındaki ilişkide özümseme kapasitesinin arabulucu rolünün nasıl ortaya çıktığını arařtırmak için örnek olay incelemesi yöntemi kullanılmıřtır. Türkiye'den iki kamu alımı vakası, açık kaynaklar ve yarı-yapılandırılmıř görüřmeler yoluyla veri toplanarak analiz edilmiřtir. Bulgular dođrultusunda, alıcı kamu kuruluřu ve tedarikçinin özümseme kapasitesinin YAKA sürecinin farklı ařamalarında deđiřen önem ve önceliđe sahip olduđu sonucuna varılmıřtır. Özellikle ihale öncesi ařamada alıcı kamu kuruluřunun özümseme kapasitesi ön plana çıkarken, ihale süreci ve ihale sonrası ařamalarda tedarikçinin özümseme kapasitesi daha kritik hale geldiđi görülmüřtür.

Son olarak bulgular ıřıđında, karřılıklı etkileřime, iř birliklerine ve bilgi alıřveriřine yüksek öncelik veren Yenilik Sistemleri yaklařımına dayalı politika önerileri geliřtirilmektedir.

Anahtar Kelimeler: Yenilik amaçlı kamu alımları, yenilik performansı, arabulucu rol, özümseme kapasitesi, yenilik sistemleri.

This dissertation is dedicated to my beloved son, Ediz Ege CAN.

I hope that this work, completed under very difficult conditions, serves as an inspiration, fostering your determination to engage in endeavors that contribute to the betterment of our country and humanity. I have full confidence that you will go on to achieve remarkable accomplishments.

I love you to the moon and back, my dear son...

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LIST OF ABBREVIATIONS

CIS	: Community Innovation Survey
EC	: European Commission
EU	: The European Union
EUROSTAT	: Statistical Office of the European Union
GPL	: Government Procurement Law
ICLEI	: International Council for Local Environmental Initiatives
IEP	: Innovation-Enhancing Procurement
IRP	: Innovation-Related Procurement
MEAT	: Most Economically Advantageous Tender
METU	: Middle East Technical University
NIS	: National Innovation System
NPM	: New Public Management
OECD	: Organization for Economic Co-operation and Development
PhD	: Doctor of Philosophy
PCP	: Pre-Commercial Procurement
PIP	: Public Innovation Procurement
PPI	: Public Procurement for Innovation
PPL	: Public Procurement Law
PPS	: Public Procurement System
PTP	: Public Technology Procurement
R&D	: Research and Development
SI	: Systems of Innovation
TUIK	: Turkish statistical institute
WB	: The World Bank

CHAPTER 1

INTRODUCTION

1.1. Gap in the Literature and the Aim of the Thesis

The 21st century has witnessed the increasing attention to innovation activities as an important driver of competitiveness and growth (Antonelli & Carlsson, 1994; Freeman et al., 1982; Lundvall, 1992). Policymakers face the crucial task of discerning which instruments hold greater potential to catalyze innovation and to what extent specific means warrant concentrated attention as tools for innovation policy. Against this backdrop, public procurement, a substantial component of overall demand for goods and services, has garnered increasing recognition as an effective instrument for advancing the objectives of innovation policy (Edler, 2010; Uyarra & Flanagan, 2010). Edler and Georghiou (2007) proposed that public procurement plays a critical role in demand-oriented innovation policy, underscoring the need for heightened consideration of public demand to reinforce existing innovation measures.

Multiple reports from the European Commission underscore the significant potential of public procurement in fostering innovations, highlighting that approximately 16 percent of the European Union's GDP can be attributed to this avenue (Aho et al., 2006; Nyiri et al., 2007; Tsipouri et al., 2010). According to OECD (2016), public procurement has an enormous financial volume with 29 percent of total government expenditures and 12 percent of gross domestic product (GDP) on average across OECD countries. This substantial share of public demand within the overall economy has led to an increased emphasis on leveraging public procurement as a strategic tool as an innovation policy tool in recent years. Many authors mostly argue that countries should take advantage of public procurement as an important pillar of innovation policy (Edquist et al., 2000; Rolfstam, 2009; Uyarra & Flanagan, 2010).

Amid the growing attention to the role of public procurement in driving innovation, extensive research has delved into case studies to examine how public procurement serves as a catalyst for innovation (Edler et al., 2015; Edler & Yeow, 2016; Charles Edquist & Zabala-iturriagagoitia, 2012; Rolfstam, 2009; Tsipouri et al., 2010; Uyarra et al., 2020; Zelenbabic, 2015). However, quantitative analyses exploring this relationship are relatively scarce, with a limited number of studies able to conduct such analyses (Aschhoff & Sofka, 2009; Saastamoinen et al., 2018). Notably, existing studies are often confined to data from a single country and involve a restricted set of variables, thus failing to provide comprehensive quantitative evidence regarding the potential impact of public procurement on firms' innovation success. This thesis seeks to address this gap by conducting a comparative analysis of the innovation effects of public procurement alongside other determinants, utilizing data derived from a substantial sample of Community Innovation Survey (CIS) data.

On the other hand, in addition to the increasing emphasis on the analysis of the direct impact of innovation determinants on the innovation performance of firms, there is also an increasing interest in exploring the mediating role of a third variable, particularly the absorptive capacity, within these bilateral relations (Aliasghar et al., 2019; Aljanabi, 2018; Escribano et al., 2009; Noor & Aljanabi, 2016; Wu et al., 2010). Nevertheless, the existing literature provides limited scientific insight into the mediator role of the absorptive capacity in the relationship between innovation and procurement. The primary objective of this thesis is to analyze how absorptive capacity mediates the link between innovation and procurement.

A crucial aspect often overlooked in most existing policy studies is the perception of Public Procurement for Innovation (PPI) procedures as a linear and sequential activity. Consequently, prevailing policy instruments recommended for PPI activities typically adopt a market failure approach, primarily concentrating on R&D subsidies. This tendency has led to a deficiency in the PPI literature and policy studies, as they lack policy tools that consider the fundamental building blocks of innovation activities, such as feedback loops, networks, and interactions. To bridge this gap, a key objective of this thesis is to formulate policy recommendations grounded in the

Systems of Innovation (SI) approach, which prioritizes interrelations, collaborations, and knowledge exchange.

In summary, this dissertation has three primary objectives. Firstly, it seeks to evaluate new empirical evidence on the effect of public procurement on innovation performance of firms. This involves a comparative analysis of various demand and supply-side factors, taking into account potential country-level differences. Secondly, this study aims to analyze case studies in order to elucidate the mediator role of absorptive capacity in the relationship between innovation and procurement. Lastly, the research endeavors to contribute to the development of innovation policies by employing SI approach, with the overarching goal of fostering and enhancing the implementation of PPI initiatives.

1.2. Research Questions and Hypotheses

Within the framework of the arguments presented above, the central question guiding this dissertation is: "To what extent does public procurement influence product innovation?" Complementary to this overarching inquiry, the study aims to address specific sub-questions:

- *How robust is the impact of public procurement on product innovation compared to other innovation determinants?*
- *Does the observed effect vary based on the EU membership status of the entities under examination?*

I argue that public procurement, as an important part of demand, has a significant potential for fostering innovation compared to other determinants. In addition, this impact is likely to be more pronounced in EU member states.

Another crucial research question explored in this thesis pertains to the potential mediator role of absorptive capacity in the relationship between innovation and procurement, and the mechanisms through which this mediating effect manifests. The hypothesis that will be tested in the third chapter posits that absorptive capacity

is an important mediator in the relationship between innovation and procurement. In other words, it suggests that firms and public agencies with a higher level of absorptive capacity are more likely to achieve successful innovation outcomes through public procurement.

Finally, this dissertation aims to explore whether the SI approach may be an effective policy framework in designing innovative public procurement policies. I posit that the SI approach is an effective framework for designing innovation policies with the aim of supporting and fostering PPI activities. The new evidence substantiating this claim may serve as a rationale for the development of novel innovation policies which incorporate SI approach into the implementation of innovation procurement. Exploring and activating the potential of the SI approach for PPI activities holds the promise of cultivating more successful innovations through public demand.

1.3. Research Design

The thesis employed both quantitative and qualitative research methods to address the research questions. Initially, econometric methods, specifically the Heckman two-step estimation technique, were applied using data from the Community Innovation Survey to uncover empirical evidence regarding the impact of public procurement on the innovation performance of firms. In the model, an interaction term was incorporated to test the hypothesis regarding the potential mediator role of absorptive capacity.

Following the quantitative analysis, a case study method was employed to delve into the mechanisms through which the mediator role of absorptive capacity unfolds in the relationship between public procurement and innovation. The study focused specifically on two PPI cases in Turkey. Data was collected from open sources and semi-structured interviews.

In the seventh chapter, the dissertation initiated a discussion on identifying the most appropriate theory of innovation policy to serve as a framework for designing policies that facilitate and promote PPI activities. In contrast to prevalent

interpretations in existing literature that often depict the PPI process as a linear model of innovation activity, it was claimed that an innovation procurement process includes interdependencies and interactions among various agents, organizations and institutions within innovation systems. Building on this premise, the policy development process unfolded in three stages, guided by the System of Innovation (SI) approach. Initially, two primary objectives were established. Subsequently, the dissertation identified innovation system challenges contributing to low innovation performance in relation to PPI activities, drawing on both existing literature and our empirical findings. Finally, comprehensive policy recommendations were formulated at macro (system/national), meso (organizational/industrial), and micro (individual/skill) levels to address these challenges and enhance innovation outcomes.

1.4. Main Contribution and Originality

This dissertation aims to contribute to the literature in three ways. First, it seeks to advance our understanding of the innovation impact of public procurement in comparison with other determinants of innovation, including both demand pull and technology push factors. Distinguishing itself from previous studies, this research utilizes a substantial sample from Eurostat's CIS data. Through this extensive analysis, the aim is to offer authentic empirical evidence regarding the potential of public procurement for driving innovation and to discern the extent to which public procurement warrants emphasis as a strategic tool in innovation policy.

Second, this study introduces an innovative approach by exploring the mediator impact of absorptive capacity on the innovation effect of public procurement. Diverging from previous studies that focuses on the single impact of explanatory variables on product innovation, both quantitative and qualitative research methods are used. This dual methodology allows for an in-depth analysis of how the effect of public procurement on product innovation is contingent upon absorptive capacity. Such an examination helps elucidate whether the influence of public procurement on product innovation is more pronounced for procurers and suppliers with higher absorptive capacity.

Lastly, this thesis is expected to enrich the existing literature by formulating policies for innovation procurement implementations utilizing the SI approach. To our knowledge, this study is one of the few studies developing PPI policies through the SI approach. This approach gives high priority to the nonlinearities and feedback loops by incorporating institutions and collaborations into the process. The envisioned outcome is the creation of a framework that furnishes guiding policy tools for public authorities and innovative firms, thereby facilitating more productive and effective PPI implementations.

1.5. Organization of the Thesis

The dissertation is structured into eight chapters. The first section is dedicated to the introduction, setting the stage for the research. The second section delves into the definitions and procedures associated with public procurement, offering insights into public procurement legislation and regulatory institutions within the EU and select European countries.

Chapter three begins by laying out a brief overview of the public procurement innovation concept and the theoretical background of the relationship between public procurement and innovation. Following that, the focus shifts to policy studies pertaining to PPI activities.

The fourth section of the dissertation starts with a discussion on the concept of absorptive capacity, followed by an exploration of the underlying reasons why absorptive capacity holds significance in the relationship between the public and innovation. Then, research questions and hypotheses are presented.

Following this, the chapter five addresses methodological aspects and data considerations. This part initially dwells on why to use Heckman two-step sample selection model and how to collect and analyze the data. Subsequently, the methodology employed for the qualitative research is detailed, providing justifications for the chosen approach. The rationale behind opting for the case study method, as well as the process of data collection and analysis, is elaborated upon.

Section six unveils the findings. Firstly, the findings obtained with the quantitative analysis method are presented. Subsequently, the section then presents two case studies from Turkey, with a comprehensive discussion of the findings derived from the cross-case analysis. The chapter concludes by interpreting the results and engaging in a discussion of their implications.

The seventh section of this dissertation focuses on policy implications. Beginning with an exploration of the reasons why the SI approach is deemed necessary and important in policy development, two specific objectives are outlined, aiming to enhance innovation performance in PPI activities. Subsequently, innovation system problems contributing to low innovation performance in PPI activities are identified based on a review of the literature and empirical findings. The section concludes with the development of policy recommendations designed to address these issues at macro (system/national), meso (organizational/industrial), and micro (individual/skill) levels.

Finally, the conclusion gives a brief summary of the dissertation and includes a discussion of the limitations and future research areas.

CHAPTER 2

PUBLIC PROCUREMENT: CONCEPT AND REGULATION

2.1. Definition and the scale of public procurement

In a world characterized by rising competition, rapid change, and increasing uncertainty, the rising expectations of citizens for high quality and cost-effective governance force governments to use public funds more effectively (Dahlby, 2008; Tanzi & Schuknecht, 2000). The ineffective management of taxpayers' money has emerged as a cause for concern, fostering distrust in governments and contributing to a decline in the prosperity of citizens, as well as missed opportunities for development (Mohapatra & Giri, 2016). In response, public authorities are actively seeking more productive approaches and tools for government spending. In this context, one promising avenue to ensure greater value for taxpayers' money involves the more efficient and strategic implementation of public procurement activities (Snider & Rendon, 2008; Tanzi & Schuknecht, 2000).

Upon analyzing studies related to the definition of public procurement, it becomes evident that the generally accepted definition in the literature, including organizations such as the OECD and EU, is as follows:

Public procurement refers to the process by which public authorities, such as government departments or local authorities, purchase work, goods or services from companies.

The term 'public procurement' includes all steps of the process of acquiring goods, services and work, beginning with determining a need and ending with contract completion and delivery (Lloyd & McCue, 2004). Public procurement activities can occur at both regional and national levels, and the procedures governing these

processes are regulated by specific laws and regulations specifying how relevant decisions are to be made.

While some studies may interchangeably use the terms "purchasing" and "procurement," it's essential to note that these terms are not entirely synonymous. Purchasing represents just one phase within the broader procurement procedure. While purchasing only focuses on act of buying goods and services, procurement focuses on the overall value creation through identification of potential suppliers, preparation of tender documents and selection of the supplier that offers the best value for money (Lloyd & McCue, 2004).

A standard public procurement procedure typically involves six fundamental steps (Figure 2.1). The initial step involves identifying public needs and specifying their requirements.

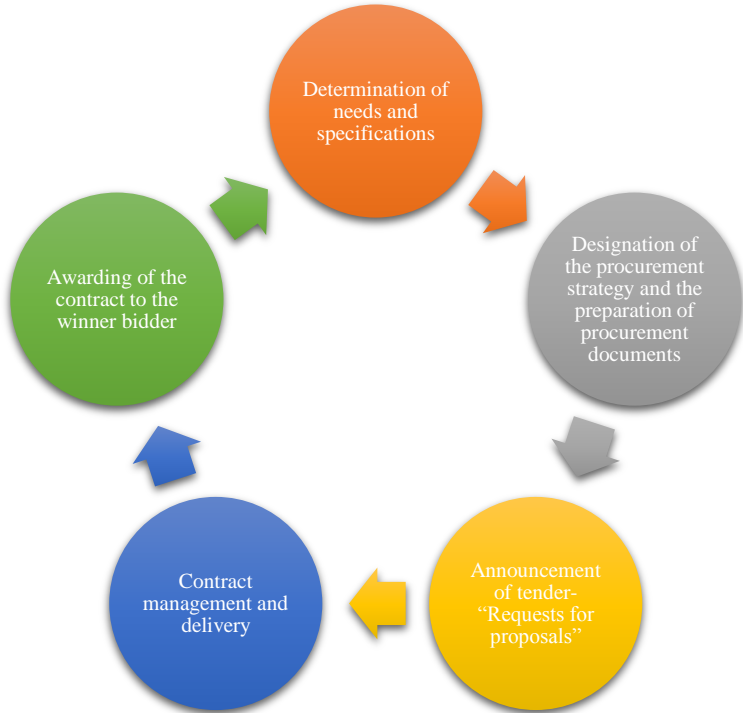


Figure 2. 1. A regular public procurement procedure
Source: Author's own work

At the second step, the procurement documents including the tendering and contracting issues are prepared by public authorities. The directing issues for these

documents are the procurement strategy, assessment criteria, and the contract type. Following the publication of notice for requesting proposals, economic operators submit their proposals to the bid evaluation committee of a public organization. After the evaluation of tenders as specified in the procurement documents, a contract is awarded between the selected firm and public agency.

The last step of the procurement process is accepting the goods, services, or works by an inspection as stated in the specification and procurement legislation. If the inspection result is affirmative, a regular public procurement process ends with the payment to the contractor.

Even if the size of government expenditure on public procurement mostly varies in the range 8-20% of GDP, governments in OECD countries averagely allocate %13 of their total expenditures for procurement activities (for detail see Table 2.1). Due to its significant share in government expenditures, OECD emphasize that public procurement has an important potential for fostering economic growth, improving social welfare, ensuring security and reducing environmental deterioration in the regions and countries (OECD, 2016). According to European Commission (EC), with an estimated 16 percent of the European Union’s GDP, public procurement has significant potential to attract EU innovations to the market, support lead customers, and provide competitiveness to innovative firms in the global markets (Tsipouri et al., 2010).

Table 2. 1. Public Procurement Data 2009-2020 (General government procurement as share of GDP)

Country	2009	2020
Australia	15.36	17.95
Austria	13.83	14.33
Belgium	14.23	15.06
Canada	14.71	14.47
Colombia	10.45	10.87
Costa Rica	6.56	7.09
Czech Republic	16.44	14.5
Denmark	14.48	13.94
Estonia	14.79	14.39
Finland	16.78	19.19
France	15.29	15.21
Germany	15.29	17.79

Table 2.1. (continued)

Greece	15.51	11.81
Hungary	13.86	16.67
Iceland	15.94	15.76
Ireland	12.05	8.27
Israel	14.51	16.37
Italy	12.17	11.56
Japan	15.3	17.67
Korea	13.68	14.57
Latvia	12.6	13.69
Lithuania	12.08	10.93
Luxembourg	11.46	12.47
Mexico	5.99	4.82
Netherlands	21.57	20.73
New Zealand	15.59	16.27
Norway	13.41	16.86
Poland	12.95	12.16
Portugal	12.65	9.85
Slovak Republic	15.16	12.23
Slovenia	14	12.56
Spain	13.88	11.59
Sweden	16.2	16.6
Switzerland	8.36	9.63
Turkey	12.36	10.8
United Kingdom	15.35	15.64
United States	11.77	10.19
OECD - Average	13.73	13.71
OECD - Total	13.28	13.02
Non-OECD Economies		
Brazil	16.01	15.99
Bulgaria	12.32	10.95
Croatia	15.28	16.51
Indonesia	..	6.63
Romania	12.44	11.19
South Africa	10.95	10.1
OECD EU member countries	14.71	14.76

Source: Derived from OECD database by author

2.2. Public Procurement Cycle

A public procurement cycle encompasses the entirety of financial transactions as defined by legal regulations and primarily conducted through written documents. While a fundamental principle is to ensure maximum competition in public procurement, there are three main types of procurement by means of participation: open, restricted and competitive procedure with negotiation.

Open tendering is a procedure that is publicly announced to inform all potential suppliers, allowing any interested local or foreign suppliers to submit bids. In the restricted method, only bidders invited by the public administration following a pre-

qualification evaluation are eligible to submit their bids. This method is commonly utilized in cases where the nature of the procurement requires expertise and/or advanced technology.

In competitive procedure with negotiation, tenderers, selected based on evaluation criteria, submit initial tenders. The public organization's tender commission engages in negotiations with each bidder to explore methods and solutions that best meet the administration's needs. Through these negotiations, technical details of the work and realization methods are clarified, and bidders capable of meeting these conditions are then invited to submit their final price offers. This method may be chosen in special cases related to defense and security, the need for a research and development process, or the unique nature and complexity of the work.

In addition to the three main procurement methods, legal legislations often include exceptions that allow countries to make direct purchases from state-owned enterprises without public announcement and competition. These exceptions are particularly relevant for addressing suddenly emerging needs related to security, public health, and natural disasters.

While there are differences among these procurement methods regarding the number of firms invited to the tender and the number of bidders, it is possible to classify the activities conducted in all procurement types under three stages, as outlined by the OECD (2009):

- Pre-tendering
- Tendering
- Post-tendering

2.2.1. Pre-tendering phase

The primary objective of this phase is the accurate determination of needs, considering not only quantity but also technical requirements, budget, delivery time, and location.

Initially, the public institution defines its requirements, taking into account technical specifications, approximate costs, delivery timelines, and other relevant factors. To ensure success in this stage, public personnel should gather extensive information, both internally and from the market. Following the definition of needs, the public organization prepares procurement documents. These documents encompass technical requirements, conditions for participation, the tender evaluation methodology, and criteria for contract award (OECD, 2009).

This stage heavily relies on the efforts and capabilities of the buyer public organization. Inadequate planning may lead to unnecessary expenditures, while vague and defective requirements can result in an unsuccessful procurement, acquiring unsatisfactory goods, services, or work. Given the intricacy of determining quantity and technical requirements, this mission requires meticulous execution by highly skilled public personnel.

2.2.2. Tendering phase

Procurer public organizations, with the goal of notifying potential suppliers about the tender, officially announce the tender following procedures outlined in the legislation. These announcements may be disseminated through various channels such as local or national newspapers, public procurement agency websites, and the organization's own websites.

These notices typically include concise information about the procurement, details about the location and time of the tender, and instructions on how interested parties can obtain the tender document. In the case of open tendering, the aim is to inform the maximum number of bidders, while in restricted methods, only bidders whose qualifications have been approved by the public administration are notified about the tender.

Following the announcement, a tender commission is formed, comprising an odd number of members that include technical and fiscal experts. Tender documents are provided to the commission officials well in advance of the bid submission deadline

for thorough preparation. Bidders prepare their proposals and submit them to the commission by the specified tender date. In recent years, the use of e-procurement websites, provided by many countries, has allowed bidders to submit their proposals through online systems.

Subsequently, the commission convenes on the predetermined date to evaluate the proposals based on award criteria established by the public authority. Two main types of bid evaluation methods are utilized: the lowest cost and the most economically advantageous tender (MEAT). In the lowest cost method, the sole criterion for contract award is the price. In contrast, the MEAT method may consider additional factors beyond price, such as quality, life-cycle cost, and environmental or social considerations. The primary goal of the MEAT method is to identify the tender that offers the best value for money (OECD, 2016).

Upon evaluating the bids, the commission compiles an evaluation report signed by all members, which is then submitted, along with all necessary documents, for approval by the contracting authority. If the commission's evaluation is approved, a contract is signed with the winning bidder, and the results are communicated to all bidders.

The efficiency of this stage is closely tied to the efforts and capabilities of potential suppliers rather than the public. Bidders must comprehend the requirements thoroughly, analyze costs accurately, and present the most cost-efficient and satisfactory solution to win the tender. On the public side, defining a transparent proposal evaluation process is essential for ensuring the efficient use of public resources.

2.2.3. Post-tendering phase

The post-tendering phase generally encompasses activities related to contract management, delivery, and payment. This stage necessitates the clear delineation of expectations, roles, and responsibilities by both the public sector and the supplier for effective contract management (OECD, 2009).

During contract management, parties should adhere to fundamental principles such as fairness, timeliness, and communication. While the primary duty of the public agency is to safeguard the public interest, successful contract administration requires fair treatment, considering the rights of the supplier. Unfair practices or solicitations not outlined in the contract may discourage qualified suppliers from participating, potentially reducing competition. Timeliness is another critical factor in contract management, as the timely completion of contractual obligations by the supplier is vital for avoiding disruptions in tasks for the public administration. Both parties must ensure that contract requirements are fulfilled promptly to prevent delays. Effective communication and information exchange between parties, especially in projects involving technical complexity or research and development, contribute significantly to successful contract management within legal limits (Georghiou et al., 2014).

In the final stage of the post-tendering phase and the procurement process, the goods are delivered and inspected by the public authority. The procurer examines whether the final product conforms to the contract signed between the parties. The main risk in this step is the delivery of goods or services that do not meet or fall below contractual requirements. As such deliveries would lead to under-fulfillment of public needs and inefficient use of public resources, the public authority is required to conduct an impartial inspection to ensure conformity with the requirements specified in the tender documents. Public procurement regulations generally allow for the delivery and acceptance of goods or services with technical specifications above contractual requirements, provided it does not incur additional costs to the public authority.

2.3. Principles of public procurement

Public procurement regulations must be built upon fundamental principles to achieve a competitive, open, and well-regulated procurement market. In this study, four main principles are highlighted:

- Transparency
- Non-discrimination and objectivity

- Competitiveness
- Accountability

2.3.1. Transparency

Transparency is one of the most crucial principles in Public Procurement directives and regulations. The principle of transparency is designed to enhance control over the decision-making process by providing information about actions related to tendering and contract awarding. It serves as an effective tool against corruption and ensures the rule of law (OECD, 2016).

Activities to ensure and enhance transparency are relevant to various stages of the procurement procedure. However, the primary steps to provide transparency are taken during the tender announcement stage. Tender notices should be announced as early as possible in newspapers and on the government's procurement website, containing all necessary information regarding the tender. The results of the tender, including the name of the winning bidder, date, and the procurement method used, should be published on the government's procurement website. As a practice to maximize transparency, it is generally accepted as good practice to inform bidders about the results of their bids and the reasons for their success or failure (Georghiou et al., 2014).

While the open tendering method, where all potential suppliers are informed about the tender, contributes to enhancing transparency, restricted tendering methods may be preferred by public organizations in cases allowed by procurement directives. However, the use of restricted or limited tendering does not necessarily imply a less transparent procedure. Even in tenders where announcements and invitations include a limited number of bidders, measures should be taken to ensure transparency and prevent corruption (OECD, 2009).

Parties involved should also pay attention to avoiding any behavior that might compromise transparency during negotiations. The contracting authority may conduct negotiations with candidates in both open and competitive procedures with

negotiation methods to clarify some technical and fiscal conditions of the procurement. Although negotiations contribute significantly to the procurement process, they have the potential to impede transparency if legal and ethical values are violated. Therefore, negotiations should be conducted within a predefined context and within the framework clearly defined by regulations (OECD, 2009).

2.3.2. Non-discrimination and objectivity

For the effective utilization of public resources in public procurement, it is essential to encourage all potential suppliers to participate in the tender without discrimination, and the evaluation of bidders' bids should be conducted impartially. This fundamental principle in procurement activities is known as non-discrimination and objectivity.

This principle necessitates the establishment of clear standards and objective conditions throughout the entire procurement cycle. When determining the technical requirements of the need, efforts should be made to create a technical document free from discriminatory features that could exclude qualified suppliers from the tender. Technical requirements should focus on the functional performance to be achieved rather than specifying how it should be done (OECD, 2009). Similarly, the tender announcement should be disseminated in a manner that informs all potential suppliers, avoiding practices that selectively target specific groups.

The evaluation of tenderers should be grounded in clear and objective criteria (OECD, 2009). The non-discrimination and objectivity principle require the public authority to predefine the procedure for evaluating bids. While this doesn't mean disclosing all details of the evaluation criteria and weights, it instills confidence in candidates that the public authority will conduct a fair and impartial assessment (Bovis, 2012).

This principle becomes even more critical in restricted procedures. In tenders where public authorities invite a specific number of bidders without public announcements, it is paramount to apply impartial principles in selecting bidders to submit bids.

Procurement practices that favor specific segments and groups over objective criteria for efficient use of public resources may lead to corruption, resource wastage, and violations of the non-discrimination and objectivity principle.

In summary, public organizations should uphold non-discriminatory and objective practices at all stages of procurement, especially in the selection of candidates and the awarding of contracts, irrespective of the tendering method or the purchased product. In cases of insufficient human resources or technically complex purchases, obtaining consultancy support from experts may be necessary to maintain non-discrimination and objectivity.

2.3.3. Competitiveness

The ultimate aim of public procurement systems and regulations is to maximize the efficiency of public spending and ensure the best value for citizens' taxes (Georghiou et al., 2014). A key tool in achieving this objective is the creation of procurement environments that foster maximum participation and robust competition.

Increased competition in procurement activities leads to cost reduction, improved quality, and stimulates innovation. Initially manifesting as price competitiveness, competition eventually fosters competitive advantages in related industries, such as research and development, innovation, and customer care (Bovis, 2012).

Consequently, the performance of national firms, which might have been previously given preferential treatment for various reasons, improves due to the influence of competition, potentially resulting in further development in the national industry. In non-competitive procurement environments, economic incentives diminish, and dominant local players may prioritize cost reduction, hindering the desired performance in prices and quality within national industries (Bovis, 2012). However, it is essential to strike a balance and avoid creating a procurement environment that overwhelms local firms with the competitiveness of international companies. Encouraging and supporting domestic production and players to a certain extent without impeding competition, such as incorporating a percentage advantage for

domestic production and domestic players in a most economically advantageous tender (MEAT) bid evaluation method, can serve this purpose.

Another practice that may foster anti-competitive environments is the preference for competitive dialogue or restricted methods over open tenders. If the bidders are not chosen based on objective criteria, these methods, which involve only bidders deemed suitable by the public administration, can result in inadequate competition in terms of price and quality. Procuring agencies should refrain from discriminatory practices that give undue advantages to certain bidders.

However, contracting authorities face challenges regarding price competitiveness in open tenders, particularly when contractors submit 'abnormally low bids.' Such situations pose risks not only to the quality of the products to be delivered but also to the delivery process. While procurement rules provide guidance for the automatic disqualification of abnormally low offers, evaluating low offers that are not abnormal can be challenging for many contracting authorities (Bovis, 2012). These instances underscore the importance of applying the MEAT method in procurements where non-price factors are significant.

2.3.4. Accountability

One of the key distinctions between public procurement and private sector procurement personnel lies in the intense accountability that public procurement officers must adhere to at all stages.

Accountability, defined as the responsibility of officials for their actions and decisions in procurement and the resulting outcomes, involves the auditing of public procurement personnel by auditors and taxpayers. Unlike procurement units in the private sector, which primarily focus on cost reduction and efficiency for profitability, public sector procurement personnel are primarily concerned with legal compliance due to their accountability to taxpayers and auditors (Chapman & Glatz, 2009).

While the majority of public personnel fulfill their duties within the framework of legislation, there may be instances where some misuse public resources inefficiently,

leading to public harm and corruption for personal gains. To prevent and monitor such practices, government agencies need to establish auditing procedures designed to oversee overall procurement activities while ensuring accountability and transparency (Chapman & Glatz, 2009). These audits primarily aim to examine the compliance of past activities with legislation, and their indirect effect on public procurement personnel is the awareness that procurement activities using public resources will be subject to future audits. Such awareness promotes accountable practices by increasing the tendency of public personnel to comply with public procurement laws and regulations.

Undesirable practices that undermine accountability can be encountered at every stage of the procurement process. For instance, including requirements in technical specifications and tender documents that provide advantages to specific individuals or groups is a faulty practice. Contracting authorities must eliminate potential discrimination criteria that distort competition and transparency, opting for methods that use taxpayers' resources effectively (Bovis, 2012).

The principle of accountability also has the potential to create an excessive risk perception among some public personnel. To avoid administrative and legal problems during audits, personnel may apply legislation with minimal initiative. For instance, this potential impact may be evident in assessing award criteria. There are two basic methods that contracting authorities use for the award of public contracts: (a) the most economically advantageous tender (MEAT) and (b) the lowest price. The lowest price method awards the contract to the bid with the lowest price without considering other qualitative factors. In contrast, the MEAT evaluation method can consider various criteria such as cost-effectiveness, environmental characteristics, running costs, after-sales service, technical assistance, and delivery time. Public procurement experts often prefer the lowest price method due to its simplicity and prevalence.

However, there is a push to expand the MEAT method, which considers factors beyond price, in the public sector to use public resources more efficiently (Bovis, 2012). Since determining the criteria and weights for the MEAT method requires a

comprehensive study, it may lead to hesitations within the scope of accountability for public personnel. In such cases, internal and external audit mechanisms can play a key role in resolving these issues by taking on guiding roles in addition to their audit duties.

2.4. The legal framework of public procurement: Country Cases

2.4.1. Public procurement regulation in the EU

The primary objective of EU procurement regulations, within the context of EU policies, is to establish a common market for public procurement among its members, ensuring the free movement of goods, services, and works within the EU. The ultimate goal is the efficient utilization of Member States' public resources by fostering maximum competition. These regulations stipulate that public procurement activities should be driven by the pursuit of the best combination of quality and effectiveness for the goods or services being acquired (Graells, 2015). The competitive environment aims to eliminate barriers to intra-community competition resulting from preferential procurement practices favoring national production and firms.

In addition to fostering competition, EU public procurement directives incorporate multiple principles such as transparency, accountability, non-discrimination, and objectivity. The overarching goal is to optimize public procurement, enhancing the performance in the delivery of public services by the state and its entities, with due consideration given to principles like accountability, the prevention of corruption, and avoiding political manipulation (Bovis, 2012).

The current legal framework for EU public procurement is based on the Directives published in 2014. To date, five distinct reform phases have been implemented (Arrowsmith, 2011).

- **Phase 1 - the 1970s:**

The foundation of directives governing tendering procedures was laid in the 1970s with Directive 71/305/EEC, focusing on rules for public works contracts. Following

this, in 1977, Directive 77/62/EEC was implemented, introducing similar regulations for public supply contracts.

- **Phase 2 – the late 1980s and early 1990s:**

Revisions to public procurement rules were made in the late 1980s and early 1990s, aligning with the broader objective of creating a single market in Europe.

- **Phase 3 – 1997:**

Legislative changes in 1997 were prompted by concerns about the EU and its Member States becoming parties to the new WTO Agreement on Government Procurement (GPA). Directives 97/52/EC and 98/4/EC were issued to address challenges arising from the GPA, where firms from non-EU countries could access the EU market on more favorable terms than EU firms.

- **Phase 4 – 2004:**

In the 1990s, a comprehensive reform period emerged, driven by a 1996 Green Paper by the European Commission titled "Public Procurement in the European Union: Exploring the Way Forward." The Green Paper aimed at providing a new legal framework rather than mere legislative changes.

The European Union Commission identified the need for new legislation based on two primary reasons. Firstly, there was a necessity to simplify the existing complex rules, and secondly, there was a need for increased flexibility to address new applications and adapt to market realities.

Following almost four years of legislative and consultative processes, two new directives were enacted:

- Directive 2004/18 (public sector contracts)
- Directive 2004/17 (utilities contracts)

The adoption of the 2004 legislative package marked a significant step, and subsequent to this, the EU introduced several additional initiatives to consolidate the

procurement regime. Some notable legislative studies in this context were Directive 2007/66/EC and Directive 2009/81/EC.

Phase 5 –2014:

In 2011, the European Commission submitted a Green Paper emphasizing the necessity for the modernization of the EU public procurement policy towards a more efficient European Procurement Market. The Commission's objective was to develop simpler and more effective legislation, surpassing the complexities of Directives 2004/17/EC and 2004/18/EC. This commitment aimed to align public procurement practices with the goals of the Europe 2020 strategy, emphasizing the optimal utilization of public funds and the establishment of a unified market within the EU.

To pursue this objective, the Commission, as outlined in the Single Market Act (2010), announced plans for extensive consultations, leading to legislative proposals by early 2012. These deliberations aimed to enhance and reshape European public procurement legislation, introducing flexibility in procurement processes and aligning public funds to support broader development policies.

As a culmination of these efforts, three directives were published in the Official Journal of the European Union on 28 March 2014:

- Directive 2014/24/EU (public works, supply and service contracts)
- Directive 2014/25/EU (procurement in the water, energy, transport and postal services sectors)
- Directive 2014/23/EU on the award of concession contracts

These directives officially took effect on 17 April 2014, 20 days after their publication. Member States were granted a 24-month period, until 18 April 2016, to transpose these directives into their national laws.

2.4.2. Public procurement regulation in Sweden

Public procurement in Sweden plays a substantial economic role, accounting for approximately SEK 800 billion annually, equivalent to 20 percent of the country's GDP (The National Agency for Public Procurement, 2023a).

Swedish public authorities prioritize efficiency, legal compliance, and fostering competition as key objectives in public procurement. Aligned with the broader goals of the European Union, Swedish procurement regulations emphasize the facilitation of free movement of goods and services, contributing to the realization of the internal market. Additionally, promoting innovative solutions and considering environmental and social aspects are integral aspects of the Swedish public procurement agenda (The Government of Sweden, 2023).

The legal framework for Swedish procurement largely aligns with EU directives, with contracts falling below the specified EU thresholds governed by national legislation. The four primary laws governing Swedish procurement are:

- The Public Procurement Act (LOU)
- The Act on Procurement in the Utilities Sector (LUF)
- The Act on Procurement of Concessions (LUK)
- The Defence and Security Procurement Act (LUFSS)

While public institutions in Sweden conduct procurements below the European Commission's determined threshold under national legislation, those exceeding these values are subject to EU directives. As of January 1, 2022, threshold values are as follows:

Table 2. 2. Threshold values in Sweden (in kroner (SEK))

Level of unit	Goods & services	Construction contracts	Social services and other special services
Government agencies	1,456,476	55,991,099	7,802,550
Other contracting authorities	2,236,731	55,991,099	7,802,550
The direct procurement limit from 2022-02-01	700,000	700,000	7,802,550

SOURCE: (The Government of Sweden, 2023)

In 2015, the Swedish government established the "National Public Procurement Agency" to offer comprehensive support and guidance to both public sector organizations and their suppliers concerning public procurement regulations. This organization is dedicated to addressing inquiries related to public sector contracts, strategic considerations, and specific issues, with the overarching goal of minimizing uncertainties. To ensure compliance and oversight, the auditing of public procurement activities is entrusted to the Swedish Competition Authority (The National Agency for Public Procurement, 2023b).

2.4.3. Public procurement regulation in Norway

In Norway, the overarching principles governing public procurement are established by the Public Procurement Law. To provide more granular guidelines for specific sectors, detailed regulations have been put in place, including:

- the Public Procurement Regulation
- the Utilities Regulation
- the Defence and Security Regulation
- the Regulation on Concessions Procurement

The public procurement framework in Norway extends its applicability to include compliance with EU Directives, specifically Directive 2014/23/EU (the Concessions Directive), Directive 2014/24/EU (the Public Procurement Directive), and Directive 2014/25/EU (the Utilities Directive). For procurements surpassing the financial thresholds outlined in these EU Directives, Norwegian authorities adhere to the regulations specified in EU public procurement legislation (Norwegian Agency for Public and Financial Management, 2023).

However, procurements below EU thresholds are carried out according to national regulations. The existing thresholds and the regulations are as follows:

- Procurements below NOK 100,000 are not subject to the procurement legislation.

- For procurements between NOK 100,000 and 1.4 million, the contracting authority must conduct a competitive procurement among at least three potential bidders without obligation to tender announcement.
- Purchases of NOK 1.4 million to NOK 2.2 million are subject to specific requirements and a national tender announcement is mandatory
- Procurements with a value above NOK 2.2 million, which is the EU threshold, are subject to the EU Procurement Directives

The EU thresholds typically undergo revision every two years, and Norwegian authorities duly update the thresholds in line with these changes. Within the framework of the legislation, four tender methods can be implemented: (i) open procedure, (ii) restricted procedure, (iii) negotiated procedure, and (iv) competitive dialogue. Procurements falling under EU Procurement legislation, exceeding EU thresholds, are exclusively awarded through an open or a restricted procedure. In Norway, the open method is often preferred in these cases, requiring bidders to submit bids based on the contracting authority's specifications, with limited flexibility for bid adjustments and price negotiations.

The negotiated procedure or competitive dialogue may be utilized only under specific conditions outlined in the European Directive, Art 26 (4) Dir 2014/24. Generally, these methods are applicable when obtaining an acceptable bid is challenging in an open or restricted contract, or when negotiation on design or innovative solutions is necessary.

In Norway, a Complaints Board for Public Procurement (“KOFA”) has been established to review public procurement complaints. Comprising ten members with a legal background, this board handles complaints as per the Regulation on the Complaints Board for Public Procurement from 2002. While KOFA's assessments are advisory, they offer a more cost-effective alternative to the courts. However, parties can also bring their claims regarding tenders to the Norwegian courts.

Central purchasing institutions and contracting authorities in Norway have access to an e-procurement system. As of 18 October 2018, procurer organizations are

obligated to use e-procurement, especially in public tenders exceeding NOK 1.4 million, unless the nature of the procurement makes it impossible to utilize electronic communication tools.

2.4.4. Public procurement regulation in Turkey

In Turkey, public procurements amounted to 733.189.311.000 TL (approximately 55 billion dollars) by 2022 (Public Procurement Authority, 2023). This amount corresponds to an average of 11.23 percent of the GDP and 32.92 percent of total general government expenditures in Turkey.

Table 2. 3. Public Procurement Data in Turkey 2009-2020

Year	General government procurement spending as a percentage of GDP	General government procurement spending as share of total general government expenditures
2009	12.36	32.76
2010	11.55	32.72
2011	10.41	31.24
2012	10.64	32.05
2013	11.17	34.26
2014	10.57	33.09
2015	10.82	34.1
2016	11.4	33.67
2017	12	35.32
2018	12.11	34.92
2019	10.9	30.76
2020	10.8	30.1
Average	11.23	32.92

Source: Derived from OECD database by author

The Public Procurement Law (PPL) No. 4734, which is currently in force in Turkey, was adopted on January 4, 2002, with the repeal of the Law No. 2886 on Government Procurement Law (GPL). This radical change in the public procurement system is an outcome of the neoliberal good governance reforms carried out with the participation of international organizations such as the International Monetary Fund, the World Bank and the European Union after the economic crisis in 2001 in Turkey (Ayhan & Üstüner, 2015).

Turkey's EU membership negotiations played an important role in this reform. Studies carried out by EU experts within the scope of Turkey's EU membership indicated that Law No. 2886 was not in line with EU legislation and was insufficient to provide principles such as competition and transparency (Graells, 2015).

In addition, in the evaluations made by the World Bank regarding Turkey's procurement system in 1997 and 2001, it was stated that the GPL contained provisions that did not comply with the requirements of a modern public procurement system, such as efficiency, equal treatment, and transparency. As a result of legislative studies, the Public Procurement Law No. 4734, regulating the procurement activities of the public, came into force as of January 1, 2003. However, Law No. 2886 was not completely repealed, and it was decided to continue to be used in the execution of tenders related to the sale and lease of public goods and services (Çelik, 2023).

In the PPL, numerous enhancements were implemented to bolster transparency, competitiveness, and efficiency in the utilization of public resources, aligning the public procurement process with market principles (Ayhan & Üstüner, 2015).

One noteworthy improvement in the PPL is the mandatory announcement requirement for tenders. The closed-envelope auction methods, which were organized without prior announcement in the Government Procurement Law (GPL), have been replaced by open and restricted procedures that involve public announcements (Public Procurement Law No. 4734, 2002). This regulatory change represents a crucial revision aimed at enabling all potential suppliers in the market to participate in public tenders, fostering maximum competition, and mitigating the risk of corruption.

A substantial revision was undertaken concerning the competition and bidding process. Under GPL No. 2886, the 'appropriate value' determined by the administration served as the reference point before the tender, and bidders competed by reducing their prices relative to this value. However, transparency and competition in tenders were compromised as the 'appropriate value' was determined

based on outdated prices without considering current market conditions. In contrast, the PPL mandates that the contracting authority calculates the estimated cost through market research without disclosing this information. All bidders, informed about the tender through announcements, then compete by submitting the most suitable bids (Public Procurement Law No. 4734, 2002).

The free movement of goods was a key focus in the membership negotiations between the European Union and Turkey. In response, the Law No. 4734 introduced regulations allowing foreign bidders to be invited and participate in public contracts in Turkey (Public Procurement Law No. 4734, 2002). Unlike the GPL, where participation in the tender process primarily favored national tenderers and was largely closed to foreign entities, the PPL No. 4734 included provisions obliging procurements above a certain limit to be open to foreign tenderers (Public Procurement Law No. 4734, 2002).

Another contribution brought by the PPL is the establishment of Public Procurement Agency to ensure national and international coordination regarding public procurement and to examine and finalize complaints regarding tenders (Public Procurement Law No.4734, 2002). The Public Procurement Authority is positioned as an independent regulatory agency in order to regulate public procurement activities in line with the principles of governance (Ayhan & Üstüner, 2015). The composition of the Public Procurement Board, the decision-making body within the authority, is stipulated to include ten members with proven qualifications and experience in national or international tender legislation. To ensure transparency and independence, it is mandated that board members are elected from individuals without affiliations, including past or current political party memberships or assignments. The board provides statistical information on tenders, including those conducted by exception and through direct procurement, through biannual reports published every six months (Public Procurement Law No.4734, 2002).

Under Law No. 4734, public administrations are required to follow one of three procedures for the procurement of goods, services, and works: open, restricted, or negotiated procedure. Additionally, there is a direct supply method, beyond these

three tender procedures, where needs below a specified limit are fulfilled by individuals appointed by the administration official through market price research.

The regulations governing tender procedures within the framework of Public Procurement Law No. 4734 have been designed to align with international standards. Notably, direct procurement has been restructured as a separate category under Article 22, and subparagraphs (a), (b), (c), and (d) of Article 21 outline the negotiated procedure for situations where administrations must negotiate technical conditions and prices to meet their needs.

The open tender procedure is the primary method recommended for administrations. This procedure necessitates the preparation of an approximate cost and the issuance of a tender announcement. For administrations to opt for the other two tender procedures, the subject of the tender must meet the conditions outlined in Law No. 4734, and these reasons must be explicitly stated in the tender approval document (Public Procurement Law No.4734, 2002).

The restricted tender procedure is employed when the open tender procedure is not feasible due to the nature of the procurement, requiring specialized knowledge and/or advanced technology. In this method, only bidders deemed adequate through a pre-qualification evaluation conducted by the administration can submit bids. The evaluation is based on criteria outlined in the pre-qualification document and announcement, and candidates failing to meet the specified minimum requirements are deemed inadequate. If the number of eligible bidders is less than five or falls below three, the contracting authority has the option to cancel the bid (Public Procurement Law No.4734, 2002).

On the other hand, the negotiated procedure is utilized under circumstances outlined in Article 21 of Law No. 4734. This method involves a two-stage bidding process where the administration engages in discussions with bidders regarding the technical details, implementation methods, and pricing in specific cases. The conditions for applying the negotiated procedure, as defined in Article 21, include:

- a) No tenders are submitted in open or restricted procedures.

- b) Immediate tender procedures are unavoidable due to unexpected and unforeseen events like natural disasters, epidemics, risks to life or property, or events beyond the contracting authority's foresight.
- c) Immediate tender procedures are unavoidable due to specific events related to defense and security.
- d) The procurement involves a research and development process, not subject to mass production.
- e) Due to the specific and complex characteristics of the works, goods, or services to be procured, it is impossible to clearly define the technical and financial aspects.
- f) Product, goods, material, and services procurements by contracting authorities with estimated costs of up to 1.439.543 TL.

In tenders falling under subparagraphs (a), (d), and (e), qualified bidders, assessed based on criteria outlined in the tender document, initially submit bids excluding pricing. The tender commission then negotiates with each bidder on technical details and implementation methods that best meet the administration's needs. After technical negotiations clarify the conditions, bidders capable of meeting these conditions are asked to submit final price offers based on the technical specifications, concluding the tender (Public Procurement Law No.4734, 2002).

In cases outlined in subparagraphs (b), (c), and (f), it is not mandatory to make an announcement. In instances where no announcement is issued, at least three bidders are invited to submit their qualification documents and price offers collectively.

The direct procurement method is a flexible approach outlined in Article 22 of Law No. 4734, allowing needs to be fulfilled without the necessity of public announcements, guarantees, the establishment of a formal tender commission, or adherence to the qualification conditions specified in Article 10 of the Law. However, the discretion granted to administrations under this method is not boundless; it must align with the principles delineated in Article 5 of the Law and be executed in accordance with the overarching objective of serving public interest. The specific instances in which the direct procurement method can be applied, as stipulated in Article 22 of Law No. 4734, include:

- a) When the needs can be met from only one natural or legal person.
- b) If only one single natural or legal person has exclusive rights regarding the need.
- c) Procurement of goods and services necessarily supplied from the initial supplier/service provider to ensure compatibility and standardization, based on principal contracts not exceeding a three-year period.
- d) Procurements not exceeding the annual threshold for the needs of contracting authorities.
- e) Purchase or lease of immovable property for the needs of contracting authorities, accommodation, trips, and subsistence.
- f) Procurement of medicine, vaccination, serum, antiserum, blood, and blood products that are not economically storable due to their nature and are necessary for use within a defined time interval or in urgent situations, and of consumables whose application can be decided during practice, and that are specific to patients, such as orthoses, prostheses, and consumable materials for tests and analyses.
- g) Procurements of legal services from advocates, whether of Turkish or foreign nationality, or from advocacy partnerships, are carried out to represent and defend the contracting authorities covered by the law. These services specifically pertain to legal representation in lawsuits related to disputes intended to be settled through international arbitration.
- h) Service procurements from Turkish or foreign nationality advocates pursuant to Articles 22 and 36 of Law No: 4353, dated 08.01.1943, and service procurements in order to register the intellectual and industrial properties by national and international institutions.
- i) Procurements of services by the Turkish Labor Authority are conducted concerning its responsibilities outlined in subparagraphs (b) and (c) of the third article of Law No: 4904, dated 25.06.2003. Additionally, these services encompass the duties specified in the seventh subparagraph of article 48 of the Unemployment Insurance Law, numbered 4904, dated 25.08.1999.
- j) In situations where there is a determination to renew elections before the conclusion of the regular term, to conduct off-year elections, or to organize a referendum on constitutional changes, procurements are made for watermarked voting paper, watermarked voting envelope paper, and printing services. These procurement activities are carried out by the Supreme Election Board. Additionally,

in the case of local elections, the printing services for voting paper are procured by the chairmanships of Provincial Election Boards.

In addition to specifying the type of tender, it is crucial to determine the method for identifying the most economically advantageous offer before initiating the procurement process. Two fundamental approaches exist for determining the most economically advantageous tender. The first method relies solely on the price factor, where the bid with the lowest price is considered the most economically advantageous and is awarded the contract. In the second method, the determination considers non-price factors, encompassing elements such as operating and maintenance costs, cost-effectiveness, efficiency, quality, technical merit, and price. If non-price factors are to be incorporated into the assessment, these factors must be clearly outlined in the tender documents, expressed either as monetary values or relative weights (Public Procurement Law No. 4734, 2002).

The inclusion of non-price factors in the evaluation, as permitted by Law No. 4734, aligns with the previous EU Public Procurement Directive 2004/18/EU, predating the latest one, 2014/24/EU (Çelik, 2023). However, the 2014/24/EU Public Procurement directive, developed to address evolving needs, introduced a life cycle costing approach in EU countries. This approach, encompassing innovative procurement policies, emphasizes sustainability alongside price considerations. The absence of these practices in Law No. 4734 indicates a misalignment of Turkish public procurement legislation with EU standards.

Furthermore, Law No. 4734 includes a provision allowing the provision of a price advantage in favor of domestic bidders in tenders where the approximate cost exceeds the annual threshold, and both domestic and foreign bidders participate. According to Article 63 of Law No. 4734, contracting authorities can specify in the tender document that a price advantage of up to 15% may be granted to domestic bidders in the procurement of goods and services.

In tenders involving both domestic and foreign bidders, irrespective of the approximate cost, a price advantage of up to 15% will be provided for bidders

offering domestic goods. However, it is noteworthy that within the context of Turkey's harmonization efforts with the European Union *acquis*, the EU has expressed reservations against providing advantages to domestic companies and products under the law governing the free movement of goods.

Despite the significant revisions introduced in PPL to enhance transparency, competitiveness, and efficiency, there are areas within the Turkish public procurement system that still require improvement. Ayhan and Üstüner (2015) underscore the importance of bolstering the regulatory function and autonomy of the public procurement institution, revisiting provisions favoring domestic bidders, and minimizing exemptions from tender legislation. These areas demand focused attention from Turkish public authorities to align with European Union procurement standards and uphold principles of good governance (Ayhan & Üstüner, 2015).

2.5. Chapter Summary

The effective implementation of cost-effective public procurement relies on a well-established Public Procurement System (PPS)¹, shaped by nation-specific laws, regulations, directives, norms, and values. OECD (2016) underscores that an efficient PPS serves as the fundamental cornerstone for a well-functioning government, prompting numerous countries to reform their systems and extract maximum benefits from public procurement activities. As views and expectations regarding the state's role in economic activities undergo significant changes, authors have increasingly challenged the Neoclassical Economic Theory's market failure rationale for government intervention. Instead, there is a growing consensus in favor of adopting the system failure approach of Evolutionary Economic Theory in economic and innovation policy analyses (Bleda & Del Río, 2013; Freeman, 1987; Georgiou et al., 2014; Nelson, 1993; Tanzi & Schuknecht, 2000).

¹ PPS across nations exhibit diverse dimensions, predominantly regulated by national and local procurement laws. Despite these variations, the core objectives of all PPSs align closely: to ensure transparency and foster competition, taking into account economic and cost-efficiency considerations. The underlying expectation is that a transparent environment will promote competition, and healthy competition, in turn, will contribute to cost-efficiency by reducing expenses, enhancing quality, and catalyzing innovations (Bovis, 2012; Graells, 2015).

In recent years, the concept of the Entrepreneurial State (Mazzucato, 2013) has gained prominence, advocating for the adoption of more entrepreneurial approaches by the state, moving beyond the traditional market failure rationale. This evolving approach in public and innovation policy, coupled with the imperative of efficiently utilizing public resources, has led to increased interest in leveraging public procurement as a tool for innovation policy alongside its primary mission of satisfying government needs. Policymakers and academicians have increasingly focused on the innovation potential of public demand over the last decades.

European experts, for example, argue that public procurement should be utilized to stimulate demand for innovative goods, improve public services, and contribute to creating an innovative Europe (Aho et al., 2006). Edler & Georghiou (2007) posit that public procurement plays a crucial role in demand-oriented innovation policy, urging a concentration on public demand to support existing innovation measures. The OECD also encourages governments to adapt their procurement systems to align with the goals and rationales of innovation procurement activities (OECD, 2016). Given this heightened interest and emphasis on the innovation potential of public demand, this thesis seeks to enhance our understanding of the innovation impact of public procurement in the subsequent chapters.

CHAPTER 3

THE PUBLIC PROCUREMENT AND INNOVATION

3.1. Introduction

In recent decades, there has been a surging interest in unveiling the potential of public procurement as a robust innovation policy tool. Numerous policy reports, academic papers, and books have explored the idea of utilizing public procurement to drive innovation. Therefore, the primary objective of this chapter is to enhance our comprehension of the connection between public procurement and the innovation performance of firms.

The structure of this chapter unfolds as follows. Initially, the chapter delves into the foundational elements and theoretical frameworks elucidating the nexus between public procurement and innovation. Following that, the focus shifts to policy studies pertaining to PPI activities. The chapter ends with empirical literature and research hypothesis.

3.2. Theoretical Background

3.2.1. Public procurement as an innovation activator

Over the past decade, a burgeoning body of literature has underscored the substantial potential of public procurement as a catalyst for innovation within the realm of innovation policy. Advocating that demand-side innovation policies have historically been overlooked, these studies posit that public procurement, constituting a significant portion of local demand, holds considerable economic and technological potential to stimulate innovation activities among firms (Dalpé, 1994; Jakob Edler, 2010; Jakob Edler & Georghiou, 2007; Jakob Edler & Yeow, 2016; C. Edquist et al.,

2000; Charles Edquist et al., 2015; Charles Edquist & Zabala-iturriagoitia, 2012; Georghiou et al., 2014; Geroski, 1990; Hommen & Rolfstam, 2008; Mazzucato, 2020; Rolfstam, 2009; Uyarra & Flanagan, 2010)

While the roots of this argument trace back to the 1980s (Mowery et al., 1979; Pavitt & Walker, 1976; Rothwell & Zegveld, 1981, 1984), academicians and policymakers have shown an *increasing interest* in the subject, especially in the last two decades. Initially, the debate revolved around the concept of “public technology procurement (PTP)” (C. Edquist et al., 2000; Palmberg, 2000).

A widely accepted definition for PTP has been presented by Edquist et al. (2000): *“PTP occurs when a public agency places an order for a product or system which does not exist at the time, but which could (probably) be developed within a reasonable period.”* Unlike standard public procurement, which aims to acquire ready-made or off-the-shelf products, PTP involves additional R&D and innovation work leading to a novel product or system to meet the public agency's demand.

This type of procurement may result in products or systems that are novel to the world (developmental) and/or new to the country (adaptive) (Edquist et al., 2000). However, in subsequent years, the terminology has shifted slightly, with more recent studies favoring the term “innovation” over “technology” in the definition of the procedure. Some authors use the notion “public procurement for innovation,” while others prefer “innovation procurement” instead of PTP.

Despite the transition from the concept of “technology” to “innovation”, most authors continued to use the same definition² for defining the public procurement for innovation (henceforth PPI) procedure. The procurement in which the procured innovative product is used by the procuring public organization itself is termed direct PPI, while other innovation procurement cases organized by an agency on behalf of end-user public institutions are referred to as catalytic PPI (C. Edquist, 2009)

² *“PPI occurs when a public agency places an order for a product or system which does not exist at the time, but which could (probably) be developed within a reasonable period.”*

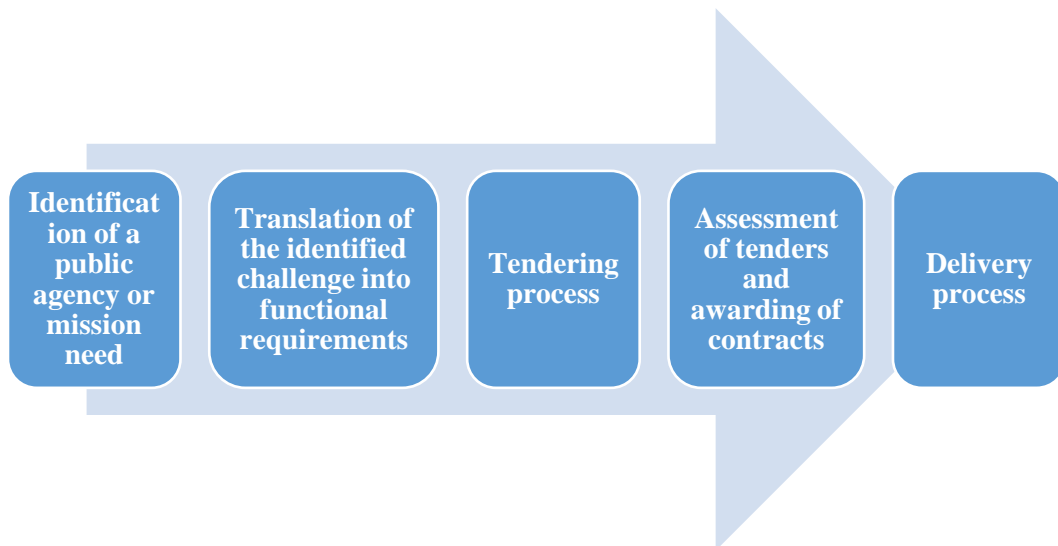


Figure 3. 1. Public Procurement for Innovation Process

Source: Adapted from Edquist & Zabala-iturriagoitia (2012)

However, recent literature reviews have brought forth critiques of the existing definition. Uyarra and Flanagan (2010) argue that the current definition disproportionately prioritizes innovation over the primary objective of public procurement—meeting the needs of public organizations. They contend that PPI activities should primarily focus on procuring the necessities of the public sector and improving government services, with the secondary goal of stimulating innovation-friendly procurement. Edquist and Zabala-iturriagoitia (2012) present a more comprehensive 5-stage activity-based definition of the PPI procedure, as illustrated in Figure 3.1. They emphasize that the primary goal of PPI is to address the needs of public authorities and alleviate societal challenges, going beyond a sole focus on fostering innovation. While many PPI studies highlight the policy's aim to promote innovation while meeting the demands of a public agency, it is evident that the widely used definition falls short of adequately capturing this nuanced content.

The widely adopted definition of innovation in PPI, as articulated by Edquist (2009), focuses on "a product or system that does not yet exist," categorizing it into "adaptive (new to the country)" and "developmental (new to the world)." However, this definition has faced criticism for its exclusion of certain types of innovation. Uyarra and Flanagan (2010) contend that it overlooks incremental, process, and marketing innovations. Similarly, Bjørnaas and Schmidt-Horix (2013) emphasize the

need to broaden the definition, asserting that innovation in PPI should not be confined to product novelty alone but should also encompass innovations within the firm. Therefore, there is a compelling case for revising the prevailing definition to embrace all types of innovation. Such a revision is crucial for fostering a more comprehensive perspective in PPI activities, allowing for a more inclusive understanding of innovation.

Recognizing the limitations of the current definition, there is a compelling need for a more expansive and inclusive description of PPI. Addressing these gaps, Bjørnaas and Schmidt-Horix (2013) propose a revised definition, stating that PPI is "a purchase by a public organization of goods and/or services with the explicit intent or implicit consequence of inducing innovation, whether of the procured product itself or of the underlying processes." Offering a distinct perspective from the public organization's side, Edler and Yeow (2016) define PPI as "the purchase of a solution that is novel to the buying organization to serve an organizational need." Additionally, Edquist (2017) introduces three categories of procurement types conducive to innovative solutions: Public Innovation Procurement (PIP), encompassing direct and catalytic innovation procurement resulting in an innovative product; Innovation-Enhancing Procurement (IEP), covering both PPI and "functional regular procurement" that is open to innovation offers; and Innovation-Related Procurement (IRP), which includes IEP and Pre-Commercial Procurement (PCP), involving the acquisition of an expected R&D result by a public agency.

This thesis places a central emphasis on PPI activities, asserting that existing definitions fall short of encompassing the diverse types and levels of innovations that can emerge through public procurement. In response to this critique, this study proposes a novel and more comprehensive definition for PPI:

a procurement that meets public agency's needs with an innovative solution

This expanded definition explicitly incorporates various forms of innovation, including but not limited to product innovation, encompassing process, organizational, and marketing innovations across all levels.

The integration of public procurement as a strategic innovation policy tool is substantiated by compelling justifications and outcomes, as elucidated by Edler and Georghiou (2007). This approach is underpinned by three primary rationales:

First, public procurement significantly influences the location decisions of Multinational Enterprises (MNEs), acting as a pivotal component of "local" demand. This, in turn, fosters a desire to generate innovations within a given location.

Second, innovation procurement serves as a mechanism to remedy both market failures, primarily arising from information asymmetries, and system failures marked by inadequate interaction. This is achieved by effectively translating needs into dynamic markets for innovative products. Procurement entities often grapple with a lack of comprehensive awareness regarding the specifics of desired products and the potential offerings available in the market. Conversely, suppliers frequently lack clarity on the exact requirements of customers, both present and future. The resulting uncertainties elevate risks and predispose economic environments to failures. In this context, the pivotal role of public tenders lies in their openness to proposals for innovative solutions, emerging as a critical mitigator of market and system failures. This occurs through the reduction of information inequality and the facilitation of heightened interaction among stakeholders. By bridging these gaps, innovation procurement becomes a cornerstone in fostering a more resilient and effective economic environment.

Third, the procurement of innovative goods and services stands as a catalyst for improving the quality, effectiveness, and efficiency of public services. Innovatively developed products and services play a pivotal role in resolving challenges and deficiencies within public organizations. Cabral et al. (2006) underscore the significant share of public demand in the overall market demand, emphasizing how public procurement can drive innovation by stimulating R&D investment, facilitating the dissemination of R&D results, steering the direction of innovation, mitigating costs and risks hindering innovation, and shaping the focus of R&D activities. Beyond economic considerations, McCrudden (2004) advocates for the integration of social and environmental issues into public procurement, positioning innovation procurement as a mechanism to address societal and environmental problems.

Edquist (2009) highlights the ample opportunities to transform routine procurements into innovation-driven ones to enhance user satisfaction and alleviate certain social challenges. Consequently, Edquist and Zabala-iturriagoitia (2012) assert that innovation procurement activities should be integral components of innovation policies aimed at tackling global challenges. In this context, this study contends that the establishment of procurement activities geared towards acquiring innovative solutions becomes increasingly imperative for governments, as the resolution of many challenges necessitates the adoption of cutting-edge techniques and equipment that may not currently exist in the market.

In another groundbreaking study, Mazzucato (2013), renowned for her emphasis on the entrepreneurial role of states in the economy, assigns a unique and invaluable role to the use of public procurement as an innovation policy tool. Contrary to prevailing perspectives, she deems it inadequate for the state to construct innovation policies solely based on market failures, which typically revolve around supporting basic research, tax regulation, and funding infrastructure projects. Instead, drawing on the foundations of Schumpeterian and Keynesian theories, she advocates for government interventions in innovation systems that adopt entrepreneurial approaches to foster the creation of new markets. Furthermore, she underscores the significance of mission-oriented public policies, providing a framework and incentive for innovation activities within both the private sector and EU-level authorities. A critical aspect is ensuring that these missions not only drive economic growth but also enhance societal welfare (Mazzucato, 2018). As with any policy, the success of the mission-oriented approach hinges on the tools employed. Amid a suite of mission-oriented policies and tools, Mazzucato (2020) places significant emphasis on public procurement as a means to fulfill missions. She proposes that states adopting mission-oriented policies for more inclusive and sustainable economic growth should prioritize adapting their procurement activities to spur innovation (Mazzucato, 2020). The pivotal role of public procurement in the concept of the "entrepreneurial state," resonating prominently in the literature, mandates a reform of procurement regulations and processes. This transformation aims to execute determined missions more efficiently, achieving innovative solutions in a shorter timeframe.

On the other hand, the utilization of public procurement as an innovation policy tool aligns seamlessly with discussions in public administration literature, particularly concerning the imperative for innovation within the framework of New Public Management (NPM) (Pollitt & Bouckaert, 2011). Edler and Yeow (2016) underscore that fostering innovation to enhance the productivity of public services has perennially been integral to the modernization policies of public agencies. Within this paradigm, innovation emerges as a crucial instrument for rendering public services more effective and responsive to citizen expectations. In navigating the intricate landscape of a technology-intensive era, the public sector is compelled to embrace innovation as a strategic imperative to address economic, social, and environmental challenges (Appelt & Galindo-Rueda, 2016; Jakob Edler & Yeow, 2016; OECD, 2017). Governments are increasingly recognizing the transformative potential of innovative products and services in elevating public services and optimizing the utilization of public funds (OECD, 2011a). The relentless march of technological change, intensified global competition, and economic challenges further necessitate that governments actively consider and cultivate innovation within their public procurement activities (Malgarini et al., 2007). Consequently, numerous countries, alongside the OECD, are engaged in substantial efforts to reform procurement systems. These endeavors are geared toward orchestrating innovation procurement activities, not merely as an economic strategy but as a mechanism to achieve broader social objectives (Graells, 2015; OECD, 2011b).

3.2.2. Related Innovation Policy Studies in EU

The issue under discussion has garnered significant attention in academic circles, prominently featured in policy studies conducted by the OECD and the EC. Over the past decade, a plethora of papers, inquiries, expert group reports, and policy documents have been meticulously compiled and published (Appelt & Galindo-Rueda, 2016; EC, 2005; Nyiri et al., 2007; OECD, 2016; Semple, 2014; Sylvest, 2008). Policy-makers, through these documents, have underscored the pivotal role of public procurement as a demand-driven catalyst for innovation to bolster national innovation capacity. While the use of public procurement for enhancing competitiveness and fostering growth has been integral to the industrial policies of

Member States throughout the history of European economic integration (Bovis, 2012), the dialogue on innovation procurement at the EU level was officially initiated with the European Commission's Research Investment Action Plan (2003). This groundbreaking report, aimed at elevating research and development (R&D) expenditure to 3% of GDP, marked the inception of concerted attention to innovation procurement activities at the EU level. The momentum further accelerated with the "Kok Report," which highlighted the potential of public procurement to establish lead markets for research and innovation-intensive products, provided procurement procedures were strategically aligned to target innovation (Kok, 2004). Following suit, the European Council, in the mid-term review of the Lisbon strategy, urged Member States to overhaul public procurement approaches, emphasizing its pivotal role as an innovation policy tool (European Council, 2005). Additionally, the Aho Group Report (Aho et al., 2006) emphasized the imperative to formulate policies that harness innovation through public procurement, with experts recommending its use to enhance the quality of public services (Aho et al., 2006).

In September 2006, the Commission presented a strategic innovation policy paper, a culmination of the analysis of rules and best practices. This document specifically underscored the pivotal role of PPI in establishing lead markets, particularly in sectors where the state serves as the largest aggregate buyer (EC, 2006). A complementary initiative coordinated by the EU Commission in the spring of 2007 involved the publication of a handbook on PPI, derived from an exhaustive study on public procurement practices across Europe (EC, 2007).

Another expert group in the EU studied the risks that public procurers encounter during the innovative procurement processes. Twelve case studies have been conducted by an expert group, and five types of risk were defined: technological risks, organizational and societal risks, market risks, financial risks, turbulence risks. The resulting report provides valuable recommendations for procurement personnel to effectively navigate and mitigate these risks (Tsipouri et al., 2010). The culmination of academic and policy-oriented studies significantly raised awareness among decision-making authorities, leading to substantial revisions in EU public procurement legislation. To actively promote and facilitate innovation procurement

activities within public institutions at the European level, three new directives—2014/23/EU, 2014/24/EU, and 2014/25/EU—were published by the European Parliament and the Council. The primary objective behind these revisions was to endorse the inclusion of innovative and competitive proposals in the public procurement process while upholding the fundamental principles of public procurement.

As a more recent step, PPI has been evaluated as one of the leading innovation policies, and substantial financial support was allocated to the joint PPI projects in the biggest EU Research and Innovation program “Horizon 2020”. A series of PPI projects, which were jointly initiated by a group of public institutions from European countries, have been funded through this program. Hence, numerous innovative solutions have emerged, addressing public needs more effectively and contributing to overall economic development (for the projects see the web page: <https://ec.europa.eu/programmes/horizon2020>)

In summary, European experts advocate utilizing public procurement to stimulate demand for innovative goods while simultaneously enhancing the quality of public services. Given that public procurement accounts for an estimated 16 percent of the European Union's GDP, it represents a substantial market for innovative products and services, offering significant potential to foster an innovative Europe (J. Becker et al., 2019). Recognizing this, EU institutions and bodies have actively encouraged member states to establish frameworks and share case studies to disseminate best practices in PPI.

In this context, various European countries have undertaken initiatives to promote and disseminate the implementation of PPI. The Austrian government, for instance, published the "Austrian Action Plan on Public Procurement Promoting Innovation PPPI" in 2012, delineating strategies for leveraging procurement to drive innovation. In Finland, the government organized the "Action Plan for Demand and User-Driven Innovation" in 2010, highlighting innovation procurement as an effective tool. Netherlands policymakers devised the action plan "Innovatiegericht Inkopen" to promote the use of PPI, Pre-Commercial Procurement (PCP), Small Business

Innovation Research (SBIR), and other innovation procurement instruments. Denmark introduced a "Strategy for Intelligent Public Procurement" in 2013, and Belgian public authorities implemented a regional-level plan, the "Action Plan on Procurement of Innovation," in 2008. In 2014, the German federal government established KOINNO, a competence center dedicated to PPI activities. Sweden appointed two agencies, The National Agency for Public Procurement and Sweden's innovation agency VINNOVA, to coordinate and finance PPI activities as part of the National Public Procurement Strategy (2016).

Regarding U.S. government PPI policies, technology procurement and innovation-driven procurement have been key strategies employed for numerous years. While the PPI concept has not garnered as much attention in U.S. literature as it has in Europe, the U.S. government's strategic public procurement activities, with a focus on social, economic, and environmental objectives, have resulted in several successful PPI examples (Weiss, 2014). Significant technological breakthroughs in internet technologies, GPS, aerospace, and semiconductors have been instigated by demand from the federal government (Mazzucato, 2020; Weiss, 2014).

A noteworthy initiative in the realm of innovation-led public procurement by the U.S. government is the Small Business Innovation Research Program (SBIR).

Enacted in the early 1980s to enhance U.S. competitiveness by fostering innovative high-tech SMEs, the SBIR program mandates that federal agencies with R&D expenditures exceeding \$100 million allocate a specific percentage (approximately 3.2%) of their R&D budgets to address public needs through innovative SMEs. Following a three-step procedure, the innovative products developed to meet public needs are intended for adoption and use in the commercial market. Well-known companies like Apple Computer, Intel, Chiron, and Compaq have received early-stage funding through the SBIR program (Audretsch, 2003; Mazzucato, 2020).

Studies by Audretsch (2003) and Cooper (2003) analyzing the performance of the SBIR program highlight the strong support and encouragement for academic entrepreneurship in U.S. universities facilitated by funding from the SBIR.

3.2.3. Related Innovation Policy Studies in Turkey

PPI has gained notable interest in Turkey in recent years. Initial deliberations on using public demand as a technology policy tool centered around the concept of "procurement based on R&D." The seminal linkage between public procurement and innovation appeared in the "National Science, Technology and Innovation Strategy 2011-16" document, published in 2010. This report aimed to "enhance the public procurement system to include R&D and innovation components." Furthermore, the 23rd meeting of "The Supreme Council for Science and Technology" emphasized the inadequacy of existing legal regulations for promoting innovation in public procurement. Consequently, an expert group was formed to identify legislative needs for stimulating R&D and innovation, proposing four revisions at the conclusion of their study (TÜBİTAK, 2012).

In response, national public procurement laws underwent legislative adjustments. The comprehensive treatment of using public procurement as an innovation and public policy tool was enshrined in Turkey's 10th Development Plan (2014-2018). A key action plan within this development initiative was the "Developing Technology through Public Procurement and Domestic Production Program." This program primarily aimed to regulate public procurement to foster innovation, technology transfer, innovative entrepreneurship, and foreign direct investment. Various actions and strategies were devised under this program, and a significant provision was incorporated into national public procurement law to facilitate innovation procurement practices in Turkey.

Despite these positive strides, legislative amendments, and heightened awareness in public policy, widespread adoption of PPI practices across all public institutions and sectors has not materialized to the desired extent. While the defense industry has seen the development of highly successful innovative products in response to public organizations' needs, existing policies may fall short in creating an innovative environment for all public procurement activities in Turkey. Consequently, there is a pressing need for more robust innovation policies to fully harness the innovation potential inherent in public demand within Turkey.

3.3. Empirical Literature and Research Hypothesis

In summary, while there is a wealth of policy initiatives and case studies discussed earlier, a limited number of papers have undertaken quantitative analyses of the innovation impact of public procurement.

Notably, Aschhoff and Sofka (2009) conducted a comparative analysis of the impact of public procurement and three other forms of public support³ on innovation using data from the Mannheim Innovation Panel-2003 survey. Employing a latent class Tobit regression model on a sample of 1149 innovative German enterprises spanning both manufacturing and service sectors, their study revealed a heterogeneous relationship between public procurement and firms' innovation success.⁴ Public procurement emerged as an effective innovation policy instrument, particularly for small firms that were cognizant of its potential. Furthermore, their findings suggested that the impacts of each innovation policy tool might depend on firm characteristics. The study has certain limitations. Firstly, it exclusively compares the innovative effects of only four public supports, each with distinct objectives and time horizons. Secondly, the dataset is confined to German firms, prompting a recommendation for future research to conduct multi-country comparative studies for more comprehensive insights into the relationship between public procurement and innovation.

Guerzoni and Raiteri (2015) conducted a comprehensive study across 27 EU member states, Norway, and Switzerland, exploring the impact of various factors, including innovative public procurement, R&D subsidies, and tax credits, on private R&D investment. Drawing on data from the Innobarometer's "Strategic Trends in Innovation 2006–2008," their research yielded insightful findings. Notably, they discovered that innovative public procurement exhibited a more substantial influence on private R&D expenditure when compared to R&D grants. While the primary focus of Guerzoni and Raiteri's work did not center explicitly on the impact of public

³ regulation, domestic university, public R&D subsidy.

⁴ Innovation success (dependent variable) is measured as the share of sales with new-to-the-market products.

procurement on innovation, their discovery of a positive association between innovative public procurement and increased private R&D investment provides valuable support for the broader relationship between innovation and public procurement. This evidence underscores the pivotal role of PPI in shaping demand-side innovation policies.

In a comprehensive examination of the interplay between networks and innovation performance among Finnish SMEs, Saastamoinen et al. (2018) explored the mediator effect of demand emanating from public or private sector customers. Notably, their research revealed a noteworthy insight—SMEs are better positioned to enhance innovation by fostering collaborations with fellow firms as opposed to engaging with public or private R&D agencies when developing new products for the public sector. The study suggests that, despite challenges in the public tendering process, certain SMEs exhibit the capability to generate innovative solutions for the demands of the public sector. However, a limitation in their interpretation lies in their emphasis on the mediator role of PPI between networks and innovation performance. In contrast, our thesis focuses on a more direct examination of the impact of public procurement on innovation performance, aiming to uncover the magnitude and direction of this association, rather than relegating PPI to a secondary role.

In light of the limitations observed in the aforementioned constrained set of quantitative studies, it is evident that the existing quantitative literature fails to furnish ample evidence regarding the potential impact of public procurement on firms' innovation performance. Moreover, these studies predominantly rely on data from individual countries, thereby restricting the generalizability of their findings. Consequently, the primary objective of our study is to address these gaps by expanding our comprehension of the influence of public procurement on firms' innovation performance and examining how this relationship is moderated by absorptive capacity. To achieve this, this study undertakes a quantitative analysis utilizing a dataset sourced from the community innovation survey conducted in selected European countries. Aligned with the trends identified in prior research, we posit the hypothesis that public procurement exerts a positive influence on the product innovation performance of firms. Furthermore, this study anticipates that

absorptive capacity plays a pivotal role in enhancing the positive impact of public procurement on innovation.

CHAPTER 4

THE ROLE OF ABSORPTIVE CAPACITY IN THE RELATION BETWEEN PUBLIC PROCUREMENT AND INNOVATION

4.1. Introduction

In recent years, innovation procurement and absorptive capacity are two leading topics of interest in innovation literature. Although extensive research has been carried out on the impact of absorptive capacity and public procurement on innovation process (Cohen & Levinthal, 1990; Zahra & George, 2002; Anderson & Tushman, 1990; Helfat, 1997; Kim & Kogut, 1996; Tsai, 2001; Lane et al., 2006; Chen, Lin, & Chang, 2009; Fosfuri & Tribó, 2008; Tseng, Chang Pai, & Hung, 2011), as far as we know, no single study has attempted to investigate the mediator role of the absorptive capacity in the relationship between public procurement and innovation. Based on the assertion that the absorptive capacity of procurer and supplier have a mediator role in the relationship between innovation and procurement, this chapter explores the theoretical background of this mediation.

4.2. Conceptual background and hypotheses

4.2.1. Absorptive capacity and innovation

In the evolving landscape of the new economy, characterized by the growing significance of knowledge and innovation (Dasgupta & David, 1994; Gibbons et al., 1994; Grant, 1996; Ancori et al., 2000), the absorption of external knowledge has garnered considerable attention in innovation studies over the past few decades. As a pioneering study, Cohen and Levinthal (1990) emphasized the critical role of the firm's ability to effectively exploit external knowledge, and they proposed the term of absorptive capacity for the firm's ability to recognize, assimilate, and use external knowledge for its commercial ends (1990, p. 128).

In subsequent years, some studies have offered revisions for this three-dimensional absorptive capacity model of Cohen and Levinthal (1990). For example, Zahra and George (2002) proposed four dimensions (acquire, assimilate, transform, and exploit) instead of three-dimensions. Murovec and Prodan (2009) contributed by categorizing absorptive capacity into market and scientific information, delineating concepts such as science-push absorptive capacity and demand-pull absorptive capacity. In another study, Schweisfurth and Raasch (2009) brought attention to the need absorptive capacity⁵ which was an under-researched face of absorptive. They stated that need knowledge⁶ and solution knowledge are two complementary and crucial parts of a firm's absorptive capacity; however, many authors, first and foremost Cohen and Levinthal (1990), concentrated only on solution knowledge by offering to measure the absorptive capacity through in-house R&D efforts. These studies mostly ignored the importance of need knowledge and need absorptive capacity. However, it is clear that need absorptive capacity has a critical role in effectively determining customer needs that require innovative solutions (Schweisfurth & Raasch, 2009).

On the other hand, several studies have empirically investigated the impact of absorptive capacity on firm's innovation performance and they strongly confirmed the positive association between these two critical concepts (Anderson & Tushman, 1990; Helfat, 1997; Kim & Kogut, 1996; Tsai, 2001; Lane et al., 2006; Chen, Lin, & Chang, 2009; Fosfuri & Tribó, 2008; Tseng, Chang Pai, & Hung, 2011). Besides this direct role of absorptive capacity, some studies have drawn attention to the mediator role of absorptive capacity in innovation activities. In their study, Wu et al. (2010) analyzed the mediation effect of absorptive capacity on the association between technology management capability and new product development performance with a sample of 151 Chinese enterprises. Their findings confirmed the mediating impact of absorptive capacity. Aljanabi (2018) has explored the mediating role of absorptive capacity in the relation between entrepreneurial orientation and technological innovation capabilities, and he found significant results about the mediator role of

⁵ According to Schweisfurth and Raasch (2009), absorptive capacity for need knowledge is “a firm's ability to identify, assimilate, and exploit knowledge about customer needs from the environment”.

⁶ Need knowledge refers to “knowledge about a customer's hierarchy of needs” (Homburg et al., 2009, p.64).

absorptive capacity. In another study, Aliasghar et al. (2019) also investigated whether absorptive capacity mediates the association between process innovation and external knowledge. He gathered evidence about the mediator role of potential absorptive capacity, using a sample including 171 Iranian auto component suppliers. However, to our knowledge, no study has been dedicated to understanding the mediator role of absorptive capacity in the relationship between public procurement and innovation. This thesis explores how absorptive capacity mediates the association between public procurement and innovation. The following section focuses on the underlying rationales of this argument.

4.2.2. Why does absorptive capacity matter in the relation between PP and innovation?

As meticulously discussed earlier, the burgeoning interest in absorptive capacity extends beyond its direct influence on innovation to encompass its pivotal role as a mediator. This thesis advances the proposition that absorptive capacity plays a crucial mediating role in the intricate relationship between public procurement and innovation. Given that innovation procurement involves aligning the unmet needs of public organizations with market solutions, this section delves into the mediating impact of absorptive capacity. Building upon the framework introduced by Schweisfurth and Raasch (2018), this exploration emphasizes the dual dimensions of absorptive capacity: need absorptive capacity and solution absorptive capacity.

In the framework articulated by Schweisfurth and Raasch (2018), the innovation procedure is delineated as the amalgamation of insights into unmet customer needs and the assimilation of solution knowledge sourced externally. From this perspective, the PPI process can be construed as the convergence of knowledge pertaining to the unfulfilled requirements of a public agency with the technological solution knowledge originated by a supplier. In a PPI, description of the need is made by a public agency, and the innovative solution is produced by a supplier in the market (Edler & Georghiou, 2007; C. Edquist et al., 2000). The innovation impact of public procurement mostly occurs with innovation procurement activities in which a public agency aims to purchase an innovative product from an innovator in the market.

The literature on the PPI concept has enormously discussed the factors acting as drivers and barriers to encouraging innovation in public procurement activities (Edquist et al., 2000; Edler et al., 2005; Rolfstam et al., 2009; Rolfstam, 2013; Georghiou et al., 2014; OECD, 2016). Among these factors, those justifying the significance of the mediator role of absorptive capacity in innovation and procurement association are discussed below under three headings. Subsequently, three case studies from three European countries are discussed in order to examine how these propositions occur in real-life context.

4.2.2.1. Public buyer's ability to define innovation requirements considering market capabilities

In a PPI, it is vital to prepare the technical specification document in a way that demands and/or encourages innovation. Ineffectively and too narrowly prepared specifications might act as a strong barrier to the generation of innovative products (Georghiou et al., 2014). However, the need knowledge that is possessed by public organization is mostly uncertain, tacit and embedded not only in public personnel but also in organizational routines, practices and norms (EC, 2005; Schweisfurth & Raasch, 2018; Wu et al., 2010). In order to codify and specify this need knowledge effectively, public organizations may need to conduct internal R&D activities, market analysis and feasibility studies in this pre-tendering phase of PPI (Charles Edquist & Zabala-iturriagagoitia, 2012). Organizations having high level of absorptive capacity would be more successful on translating this tacit knowledge into codified knowledge (Foray, 2004; Simon, 1999; Brynjolfsson & Hitt, 2000; Zahra & George, 2002).

Moreover, in the research conducted by OECD, incompetence of public procurer personnel and lack of knowledge about the market's innovation potentials were reported by countries as the leading obstacles in innovation procurement activities. The study emphasizes that identifying an innovative need entails public procurement staff with high-level understanding of technical specifications and market capabilities (OECD, 2016). Public procurers with higher absorptive capacity would detect and understand the external solution knowledge in the market more quickly and

effectively than those who lack this capability (Schweisfurth & Raasch, 2018). Thus, the absorptive capacity of employees, primarily shaped by the existing technological knowledge gleaned from internal R&D endeavors (Cohen & Levinthal, 1990), emerges as a pivotal factor for enabling public organizations to effectively orchestrate PPI initiatives that yield innovative solutions aligned with public demands.

Thus, as highlighted in the study conducted by Edler et al. (2005), the evidence suggests that procuring agencies often struggle to independently identify and grasp the current and future market capabilities comprehensively. Yet, formulating needs specifications necessitates an understanding of potential suppliers' capabilities; otherwise, the disparity between criteria and market capabilities becomes too vast. In such scenarios, the feasibility of innovation generation may be hindered (Edler et al., 2005). Therefore, procuring agencies must possess the ability to acquire knowledge about the innovation's feasibility from the market in the project's early stages and should incorporate this external knowledge into tender documents to enhance the likelihood of successful innovation procurement. Given these arguments, it is proposed that the absorptive capacity (both need and solution) of a public organization is likely to act as a robust moderator in the relationship between public procurement and innovation.

4.2.2.2. Supplier's capability to understand the need and deliver a satisfactory innovation

According to studies on PPI activities (Edler & Gee, 2013; Uyarra et al., 2014), an impediment to the PPI process is suppliers' inadequate understanding of the requirements. Insufficient appreciation and comprehension of public needs' characteristics by suppliers can result in defective manufacturing and PPI failure. Therefore, external knowledge about procurers' needs must be effectively acquired and utilized by potential suppliers in innovation procurement, particularly since PPI aims to acquire an innovative product with non-standard features compared to a standard product with common and mostly well-known specifications (Edler et al., 2005). A supplier that efficiently employs, assimilates, and exploits need knowledge

can develop a satisfactory solution for the unsatisfied needs of public organizations (Georghiou et al., 2014; Ancori et al., 2000). In contrast, a supplier with lower need absorptive capacity may underestimate need knowledge and struggle to produce innovative products with the requested features.

On the other hand, market's innovation capacity and expertise in technology generation are crucial enabling factors for PPI activities (EC, 2010; van Seggelen, 2016). If potential suppliers in the market lack the necessary ability to generate the requested innovation, PPI may fail. Given that this innovation capacity is heavily reliant on absorptive capacity, a firm with high absorptive capacity possesses a more extensive technological knowledge domain, making it easier to translate customer needs into a new innovative product (Cohen & Levinthal, 1990; Tsai, 2009).

Therefore, the development of an innovative solution by a supplier in an innovation procurement requires a high solution absorptive capacity. Previous and current internal R&D efforts, learning experiences, knowledge base, and problem-solving ability of workers constitute the absorptive capacity of a firm (Cohen & Levinthal, 1990; Stock et al., 2001; Camisón & Forés, 2010). Firms that enhance their solution absorptive capacity in response to the potential innovation needs of public organizations are more motivated and likely to develop quick and effective solutions to the public procurer's innovation call. Higher absorptive capacity enables firms to have easier access to external knowledge about public organizations' innovation needs, facilitating the effective integration of this knowledge into internal processes. Additionally, such firms have the opportunity to plan R&D activities in line with information about potential future innovation procurement. These benefits collectively contribute to firms more easily submitting a satisfying innovative solution to the procurer, enhancing the feasibility and strength of the innovation impact of public procurement.

4.2.2.3. Interaction and collaboration between procurer and supplier

The innovation literature places significant emphasis on the interactive nature of innovation, highlighting the essential role of collaboration and interaction among

various actors in the innovation process (W. Becker & Dietz, 2004; Miotti & Sachwald, 2003; Nieto & Santamaría, 2007; Ozman, 2009; K.-H. Tsai, 2009; Zeng et al., 2010). Networking with customers is a key collaborative method within this context, providing valuable information about customer needs, potential markets, and solution alternatives while also mitigating product design risks (von Hippel et al., 1999; Souder et al., 1997; Li and Calantone, 1998; Atuahene-Gima et al., 2005).

Hence, research on PPI underscores the essentiality of interaction and knowledge exchange between procurers and suppliers, particularly during the initial phases of the procurement process (OGC, 2004). Effective communication and coordination with suppliers during the pre-tendering phase transform market knowledge to the procurer, contributing to the preparation of tender documents and requirements that minimize barriers and enhance incentives for innovation (Uyarra, 2010). Moreover, the early exchange of knowledge between demander and supplier allows for a more accurate assessment and allocation of risks and benefits in an innovation procurement (OECD, 2016). In a survey of 800 suppliers from the UK public sector, Uyarra et al. (2014) found that "early interaction with the procuring organization" ranked second among the 17 important factors driving innovation in public procurement activities. Consequently, the generation of innovative solutions meeting the public organization's needs requires collaboration and interaction between the supplier and the public organization (Edquist & Zabala-Iturriagoitia, 2012; Edler & Yeow, 2016). Analyzing six innovation procurement cases, Edquist and Zabala-Iturriagoitia (2012) revealed that collaboration between procurers and potential suppliers is most critical and beneficial, particularly in the early stages of the process. However, optimal cognitive distance between parties is necessary to maximize the benefits of the network, as argued by Lane and Lubatkin (1998), who proposed that significant interorganizational learning requires partners with sufficient knowledge similarity for effective communication and adequate knowledge diversity for interactive learning.

Therefore, achieving interactive learning through collaboration between suppliers and customers necessitates a satisfactory level of absorptive capacity for each party involved (Mowery et al., 1996; Kim, 1998; Lane & Lubatkin, 1998; Lane et al.,

2001). Suppliers with high absorptive capacity are more likely to establish effective collaborations with procurer agencies, enabling them to identify and leverage knowledge about innovation needs more effectively. Similarly, public procurement agencies need a sufficient degree of absorptive capacity to derive maximum benefits from collaboration and interaction during the PPI process (Tsai, 2009; Edquist & Zabala-Iturriagagoitia, 2012; Uyerra, 2014). Consequently, this study posits that firms and public organizations with a higher level of absorptive capacity are more inclined to establish a stronger association, thereby increasing the innovation impact of public procurement.

The rationales and necessities discussed above provide a basis for asserting the theoretical framework illustrated in Figure 4.1. This study posits that the need and solution absorptive capacity of both procurers and suppliers play a mediating role in the association between public procurement and innovation. Consequently, the following hypotheses are formulated:

H1: Public agency's ability to acquire and use external need and solution knowledge moderates the association between public procurement and innovation.

H2: The supplier's ability to define and exploit the external need and solution knowledge moderates the relationship between public procurement and innovation.

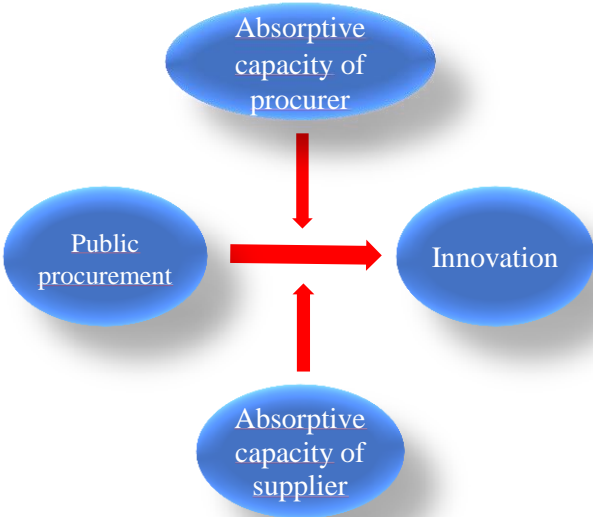


Figure 4. 1. Theoretical Framework

Source: Author's own work

Given the pivotal role of absorptive capacity in the innovation and public procurement processes, this study posits that firms and public agencies with a higher degree of absorptive capacity can extract greater benefits from the innovation impact of public procurement. The following chapter endeavors to test these hypotheses through quantitative research methods.

4.2.3. Three PPI examples from European countries

In this section, three PPI applications from three European countries are examined in the context of the two propositions outlined in this study.

4.2.3.1. Case Apron-Sweden

This case study pertains to the procurement of disposable bio-based aprons by a public agency in Sweden. The Skåne Regional Council, responsible for public healthcare, transportation, and regional development, aimed to become a fossil-free region by 2020, as outlined in its Environmental Programme (2017-2020).

Following a climate impact analysis revealing the healthcare sector's substantial carbon dioxide (CO₂) emissions (40%), largely attributed to disposable products, the public authority opted to shift from a standard procurement approach to an innovation procurement method. This change aimed to acquire more environmentally-friendly protective disposable aprons (Agency for Renewable Resources, 2017).

Several years before the case of the apron, three country councils had collaboratively initiated an innovation procurement for bio-based plastic aprons. However, this procurement did not reach a successful conclusion due to the unpreparedness and inadequacy of the market and suppliers to provide innovative solutions. Following the setback of this initial attempt, the Case Apron was launched a few years later, and the Environmental Management Board was appointed to oversee the innovation procurement process. Besides acquiring an innovative product, one of the objectives was to enhance the region's knowledge and capability in utilizing the PPI process for other procurements (ICLEI European Secretariat, 2017).

Through an analysis of the products available in the market and feedback from suppliers, the public agency determined that the aprons should contain a minimum of 70% renewable material. Open dialogue meetings were conducted to inform and engage suppliers while also gathering their feedback. This phase not only enhanced the procurer's absorptive capacity regarding potential solutions and suppliers in the market but also deepened their understanding of the technical requirements that were reasonable to demand (ICLEI European Secretariat, 2017).

Furthermore, procurer public organization organized training to support suppliers in developing their prior knowledge in preparing public tenders. Besides, a seminar was held to bring bio-based product developer suppliers together to generate knowledge exchange among them. One critical benefit of all these efforts made by the public agency was increasing suppliers' absorptive capacity, both need and solution knowledge, through training and collaboration.

Following the pre-tendering phase, the tender notice was published on June 25, 2015. The initial stage involved a qualification round, with four companies submitting appropriate bids. These companies were then invited to participate in the negotiation round, during which they received support from the public agency through feedback on technical specifications, the negotiated procedure, award criteria, and other relevant aspects. In the negotiation phase, each supplier was allocated 10-15 minutes to introduce their solution, covering topics such as climate impact, design, the share of renewable material, delivery time, price, award criteria, and financial contributions. This knowledge-sharing process led to significant enhancements in the bids submitted (ICLEI European Secretariat, 2017).

After the negotiations, suppliers submitted bids, and these were evaluated based on criteria determined through the 'most economically advantageous' tender approach. The public organization had allocated a grant for the winning company, up to €50,000, with the exact amount to be determined based on the outcome of the results. The contract was awarded on May 11, 2016. The winning bid not only increased the proportion of renewable material from 84% to 91% but also decreased the price by 25%. Furthermore, the quality of the aprons was improved, and raw materials were sourced locally instead of being imported.

To summarize, this case provides valuable evidence supporting the mediator role of absorptive capacity in the innovation impact of procurement. In the pre-tendering stage, the public agency organized seminars, meetings, and training sessions to develop both its need and solution knowledge, simultaneously enhancing the need knowledge of potential suppliers in the market. Consequently, the public agency adeptly assimilated, transformed, and exploited this acquired knowledge throughout the pre-tendering and tendering procedures. In the tendering and post-award phase, the supplier, boasting a high level of need and solution absorptive capacity, effectively leveraged the assimilated knowledge. As a result, they successfully navigated negotiations and won the tender by developing the most satisfactory innovative product.

4.2.3.2. Case Ecm-Norway

This case study revolves around the procurement of electrical construction machinery by a public agency in Norway (EC, 2016). The utilization of public procurement as a strategic tool for fostering sustainable production and construction aligns with the agenda outlined in the Public Procurement Strategy of The City of Oslo. This strategy emphasizes the need for innovative and cost-efficient public procurement. Building upon this, a municipal enterprise in Oslo, Omsorgsbygg Oslo KF, adopted the goal of developing environmentally friendly, innovative, and energy-efficient buildings in the city. This objective also harmonizes with Oslo's broader target of achieving zero fossil fuel use and reducing climate gas emissions by 95% by 2030 (City of Oslo, 2016).

In June 2016, Omsorgsbygg issued tender documents for the construction of four new kindergartens, stipulating that contractors must operate construction sites entirely free of fossil fuel emissions, achieved, for instance, through the use of electrical construction machinery. The deadline for submitting offers was set for September 2016, and the construction work was scheduled to take place in 2017. The overwhelmingly positive responses received from potential suppliers and contractors prompted the City Government to establish fossil-free construction sites as a mandatory requirement in all public procurement activities in Oslo from 2017 onward (City of Oslo, 2016).

Consequently, following an analysis of challenges and market dynamics, the public agency identified that prior public procurement procedures had predominantly prioritized price considerations and were geared toward procuring ready-made products from the market rather than eliciting new solutions. Recognizing the imperative for innovative solutions, especially to achieve emission-free construction sites, the agency sought to shift its procurement approach accordingly (City of Oslo, 2016).

Based on further analysis of construction sites, the public agency decided to concentrate on three leading causes of emissions stemming from construction sites: emissions from heating and drying construction sites, emissions from construction machinery, and emissions from transportation. The public agency set up a cooperation agreement with a consultancy organization to gather further information about the challenges and the possible solutions in the market. This consultancy organization was a non-profit organization that concentrated on sustainable environmental solutions to tackle the challenges of climate change (EC, 2016).

To facilitate collaboration between procurers and potential suppliers, a dialogue conference was organized, offering valuable feedback on existing market solutions and potential innovations. An interesting revelation from the event was the prevalence of conventional solutions in the market, despite the existence of more advantageous alternatives. Utilizing insights gained from market interactions, the public agency revised tender documents and technical specifications. The award criteria were adjusted to consider both price and quality, with quality carrying a 60% weighting. Following the public call for tenders, multiple bids were received, resulting in four contracts being awarded after a thorough assessment. The contractors encountered no difficulties in delivering fossil-free construction sites, showcasing the success of the innovative procurement process. Given the substantial achievements, the public agency opted to implement a "fossil-free" strategy in subsequent procurement activities (EC, 2016).

This case provides promising evidence supporting the mediator role of absorptive capacity in the relationship between procurement and innovation. In the pre-

tendering stage, the public agency actively sought to enhance its prior knowledge regarding potential solutions and market capabilities. Additionally, the agency enlisted the support of a consultancy organization to gather more information about market challenges, capacities, and potential solutions. Feedback from suppliers was actively solicited through a dialogue conference. The effective utilization of this collective knowledge informed revisions to the procurement procedures, emphasizing more environmentally friendly solutions. The successful fulfillment of the innovation requirement by contractors was a positive outcome resulting from the procurer's efforts to enhance the need knowledge of suppliers and consider their solution knowledge during tender preparation. This achievement highlights the effective combination of both need and solution absorptive capacity at the contractor level.

4.2.3.3. Case Cloud- European Consortium- Switzerland

In order to procure an innovative “hybrid science cloud platform” for the European research community, ten public research organizations from seven European countries - CERN, CNRS, DESY, EMBL, ESRF, IFAE, INFN, KIT, STFC, and SurfSARA- collectively launched an innovation procurement in January 2016, named Helix Nebula Science Cloud (HNSciCloud). The objective of this initiative was to generate high-performance hybrid cloud technologies for big data transmission among the Europe’s leading public research organizations (ICLEI, 2019)

Large-scale European research projects have necessitated a platform for universally sharing, storing, and analyzing vast amounts of data due to the international structure of scientific collaborations. This platform needed to be easily accessible by all end-users globally and must adhere to the conditions of Reliability, Availability, and Security (RAS) (ICLEI, 2019). This requirement led to the formulation of the "Strategic Plan for a Scientific Cloud Computing Infrastructure for Europe," a joint initiative by CERN and ESA in 2011. The development of a secure and globally recognized European Cloud Computing Infrastructure has been established as a strategic goal within this plan (CERN and ESA, 2011).

In this context, 10 of Europe's leading public research organizations (CERN, CNRS, DESY, EMBL-EBI, ESRF, IFAE, INFN, KIT, STFC, SURFSara) launched a joint Pre-Commercial Procurement (PCP) in 2016, led by CERN, called Helix Nebula Science Cloud (HNSciCloud). The procurement was co-funded by the European Union's H2020 Framework Programme and aimed to achieve cost-effective services and online storage connected via high-speed networks, providing a platform capable of handling large-scale scientific workloads (ICLEI, 2019).

During the Pre-Procurement phase, an analysis was conducted to assess end-user needs, current market capabilities, and relevant standards, forming a guide for the subsequent processes. CERN took the initiative to organize an open market consultation activity after issuing the prior information notice (PIN) in January 2016. Over 70 cloud suppliers participated in this activity, where they were informed about the end-users' needs, and the buying group gathered valuable information about the market capabilities. This interactive process laid the groundwork for the preparation of the tender documents (EC, 2016).

The tender was launched in July 2016, and submission was requested from all potential suppliers until September 2016. Most Economically Advantageous Tender (MEAT) method was adopted, and three categories of criteria have been determined: technical, non-technical criteria, and price. Participation in the tender was relatively high with 30 multinational companies, SMEs and public research organizations from 13 countries. The process of selecting the winning supplier involved a three-stage bid evaluation. In the first phase, only four bids were deemed satisfactory for producing a design. Moving on to the second phase, three tenderers were preferred to develop prototypes. Finally, a decision was made to develop a hybrid cloud service, with two suppliers collaborating jointly with the buying group (EC, 2018).

At the end of the product development process, the suppliers successfully produced and delivered the hybrid cloud service platforms to the buying groups. This innovation procurement activity is known as the Helix Nebula Science Cloud (HNSciCloud), and the platform is still actively used by end-users from various academic disciplines.

This case also provides valuable insights into the mediator role of absorptive capacity in the relationship between procurement and innovation. Firstly, the procurer group demonstrated a high level of knowledge about their needs and recognized that the challenge must be addressed with an innovative solution. Additionally, the buying group enhanced their solution knowledge base through an open market consultation activity and a survey of market players. This knowledge was effectively transformed and utilized by the procurer in the tender documents. Such a comprehensive definition and use of need and solution knowledge by the procurer consortium initiated the implementation of an innovation procurement process.

In the tender preparation phase, the consortium's open market consultation activity facilitated suppliers' access to knowledge about needs and priorities. The effective combination of this need knowledge with suppliers' solution knowledge played a critical role, particularly in the tendering and product development phases. The MEAT method, which considers both technical and non-technical dimensions alongside price in the initial bid evaluation by the public sector, made it crucial for suppliers to successfully acquire and utilize need and solution knowledge in this procurement. Consequently, the contract was awarded to the tenderer who presented the most effective combination of the requirements outlined in the tender documents. In summary, the absorptive capacity of both the procurer and the supplier played a mediating role in the relationship between public procurement and innovation.

CHAPTER 5

DATA AND METHODOLOGY

Quantitative and qualitative research methods were used to find answers to our research questions. At first, Heckman two-step estimation technique and community innovation survey data were used for finding empirical evidence related to dependence of innovation performance of firms on public procurement. An interaction term was also included in the model to test our hypothesis related to the mediator role of the absorptive capacity.

Subsequently, case study method was preferred for exploring how the mediator role of the absorptive capacity occurs in the association between public procurement and innovation.

5.1. Quantitative Data and Analysis Method

5.1.1. Data and variables

5.1.1.1. Data sources

The dataset utilized in this thesis originates from the Community Innovation Survey (CIS) conducted by Eurostat. The CIS is a biennial survey administered by both EU and selected non-EU countries over a three-year cycle, focusing on collecting information about the innovation activities of enterprises. Its primary objective is to provide policymakers with insights into the innovation landscape of firms.

While CIS surveys have faced criticism for potentially reflecting subjective assessments and posing challenges related to non-responsiveness and response accuracy (Criscuolo et al., 2005), they remain the foremost surveys for gathering

comprehensive and detailed information about the innovation activities of companies. In choosing the CIS for this thesis, this study considered its unique feature of containing data on innovation procurement activities across multiple countries within the same time frame. Moreover, the survey's richness of data on various factors influencing the innovation performance of firms enables us to incorporate a diverse set of variables into our estimation models. Therefore, this study specifically leverages the data from the CIS 2014, which encompasses innovation statistics for the three-year period from 2012 to 2014.

5.1.2. Variables

5.1.2.1. Dependent Variables

Despite the ongoing debate in the literature regarding the measurement of innovation, previous studies have commonly employed four distinct variables to gauge the innovation output of firms. While some researchers have utilized metrics such as the "number of patents" (Crépon & Duguet, 1997; Nagaoka et al., 2010) or a binary indicator of "product innovation presence" (Bhattacharya & Bloch, 2004; Cucculelli, 2018), others concentrating on innovation performance have predominantly employed "innovation sales per employee" (Frenz & Ietto-Gillies, 2009; Tsai, 2001) and "the share of innovative sales in total sales" (Ebersberger et al., 2012; Garcia & Mohnen, 2010; Hashi & Stojčić, 2013; Mairesse & Pierre, 2001; Saastamoinen et al., 2018). Each metric has its strengths and limitations.

This study advocates using "the share of new-to-market product innovation in total sales" as the innovation performance variable. This measure offers a more comprehensive evaluation of a firm's innovation performance, capturing the commercial success of its innovations. Unlike "innovation sales per employee," which may primarily reflect the innovation performance of workers rather than the overall firm, the chosen variable provides a more inclusive perspective.

Consequently, given that the Heckman two-step model employs probit and OLS regression methods for estimation, two distinct dependent variables were selected for

each equation. In the selection equation, the dependent variable is a binary (0,1) indicator indicating whether the firm has engaged in innovation over the previous three years. In the outcome equation, the dependent variable is the innovation performance measured by "the share of new-to-market product innovation in total sales," with the natural logarithmic transformation applied to address skewness.

5.1.2.2. Explanatory Variables

The central explanatory variable in our analysis is PPI, represented as a binary variable that assumes the value of 1 if an enterprise has undertaken any innovation activities within a procurement contract to supply goods or services to a public sector organization. In the CIS 2012-2014, companies are initially queried about their involvement in any public procurement activities during this period. Subsequently, they are asked whether a public procurement involving a request for innovation has been conducted. Given the focus of this thesis on assessing the innovation impact of public procurement, it is important to note that this study considers public procurement for innovation, rather than standard public procurement, as having a higher potential to enhance the innovation performance of firms.

5.1.2.3. Moderator Variable

In our model, absorptive capacity serves as the moderator variable. The existing literature overwhelmingly supports the notion of a positive impact of absorptive capacity on the innovation process (Cohen & Levinthal, 1990; Lane et al., 2006). In addition to its direct role, some authors have emphasized the mediator role of absorptive capacity in innovation activities (Aljanabi, 2018; Tsai, 2009; Wu et al., 2010). This study delves into the mediating role of absorptive capacity in the association between public procurement and innovation. Our hypothesis posits that firms and public organizations with higher absorptive capacity are more likely to achieve a more robust innovation impact from public procurement. To assess this, an absorptive capacity variable is introduced into the model, quantified by the logarithmic transformations of the ratio of internal R&D expenditure to the total sales of the firm (Belderbos et al., 2004; Cohen & Levinthal, 1990; Nieto & Santamaría, 2007; Schoenmakers & Duysters, 2006; Tsai, 2001).

5.1.2.4. Control variables

Given the influence of both firm-specific and environmental factors on innovation activities, a set of control variables has been incorporated into both the selection and outcome equations. These control variables include size, exporter status, public financial support, collaboration, employee education level (included only in the selection equation), industry and country-specific dummy variables.

The firm's size, measured by the logarithm of sales, is included as a control variable. Previous studies suggest that larger companies possess greater resources and incentives for innovation compared to SMEs (Bhattacharya & Bloch, 2004; Nieto & Santamaría, 2007).

The other control variable is the exporter property which takes the value of 1 if the firm is an exporter to any country at any volume. Some researchers (Galende & Manuel De La Fuente, 2003; Nieto & Santamaría, 2007; Romijn & Albaladejo, 2002) suggest that exporter companies tend to develop innovative products with higher performance in order to prevail in the competition. In addition, reviewing the literature regarding relationship between collaboration and innovation (W. Becker & Dietz, 2004; Miotti & Sachwald, 2003; Nieto & Santamaría, 2007; Ozman, 2009; K.-H. Tsai, 2009), it is possible to assert that a firm which collaborates with any kind of institution or organization shows a higher propensity to innovate, but the sign and power of this effect may change due to kind of innovation and network. Therefore, our model contains a control variable that indicates whether firms collaborate or not.

Dummy variables for industry and country were introduced to account for their respective effects. Specifically, five sector dummies were created to capture industry-related nuances⁷. Additionally, a country dummy variable was generated to indicate EU membership status. This variable holds significance as EU countries are anticipated to exhibit higher levels of innovation compared to non-members.

⁷ Sectors with fewer than 100 observations were consolidated and transformed into a unified sector dummy. Four sectors, each having observations exceeding 100, retained their individual representation. Consequently, the model incorporated a total of five sectors, as illustrated in Table 3.7.

Finally, the inclusion of the ratio of employees with tertiary education to the total number of employees in the selection equation serves as the instrumental variable. Adhering to one of the prerequisites for effective estimation in the Heckman two-step method, this variable is distinct from those included in the outcome equation. This choice aligns with the assertion in the literature that *the education level ratio among a firm's human resources* primarily influences innovation probability rather than innovation performance (Jones, 2001; Rothwell & Dodgson, 1991; K.-H. Tsai, 2009). This assumption is further supported by the correlation coefficients presented in Table 3.8. While the correlation coefficient between "innovator" and "human resources" is positive and significant, it is deemed insignificant for innovation performance.

5.1.3. Data Matching and Cleansing

Details of the variables are outlined in Table 5.1, and Table 5.2 presents summary statistics for the public procurement and innovation procurement data acquired from the 2012-2014 CIS. Notably, an average of 21.7 percent of the surveyed firms across 24 countries participated in public procurement. However, only 2.5 percent of enterprises engaged in a procurement contract that explicitly required innovation.

To procure a comprehensive dataset spanning multiple countries, the CIS 2014 microdata was requested from Eurostat, involving a meticulously structured sequence of steps⁸. Following this process, the microdata for 14 European countries, which permit data dissemination to researchers as scientific-use files, were successfully obtained from Eurostat. Subsequently, the CIS 2014 microdata for these 14 European countries was meticulously matched with the microdata provided by the Turkish Statistical Institute (Turkstat) for Turkey. While the initial dataset contained a substantial number of observations, a significant portion was excluded during the data matching process. This exclusion primarily resulted from the low response rates of firms regarding their participation in public procurement. Furthermore, the dataset underwent a thorough cleaning process to eliminate outliers and address missing

⁸ For detailed information on the application procedure for accessing to Eurostat microdata, see the web page: <https://ec.europa.eu/eurostat/web/microdata>

values. After these meticulous procedures, a final dataset consisting of 2,269 observations from 11 countries was achieved. The subsequent section presents descriptive statistics for this refined dataset, providing valuable insights into the characteristics of the firms included in the study.

Table 5. 1. Description of Variables

Variable	Description
Dependent Variable	
Innovator (yes/no)	It takes the value of 1 if a firm has introduced new or significantly improved products (goods or services) during the last three years, otherwise 0.
Innovation performance	Log of the share of total turnover in 2014 stemming from new or significantly improved products between 2012 and 2014 that were new in firm's market.
Independent Variable	
Public procurement for innovation (PPI)	It takes the value of 1 if an enterprise undertook any innovation activities as part of a procurement contract to provide goods or services to a public sector organization.
Control Variables	
Absorptive capacity	R&D intensity which is measured by internal R&D expenditure /total sales. (Consistent with Cohen and Levinthal (1990))
Cooperation	It takes value of 1 if a firm co-operated on any of its innovation activities with other enterprises or institutions during the last three years, otherwise 0.
Incentive	It takes value of 1 if a firm received any public financial support for innovation activities from the government during the last three years, otherwise 0.
Export	It takes value of 1 if an enterprise sold goods and/or services other European Union and/or all other countries during the three years 2010 to 2012.
Size	Enterprise's total turnover for 2010 and 2012 (log transformation of national currency units).
Human resources	the percentage of employees with tertiary education in the total number of employees (7 different intervals, increasing from 0 to 100)

Table 5. 2. Enterprises with procurement contracts for the public sector, 2012-2014

S.Nu.	Country	Total Enterprises (TE)	EPC (number)	EPC (% of TE)	INNO-REQUIRED (% of TE)	INNO-REQUIRED (number)
1	Belgium	14.262	3.537	24,8	2,0	285
2	Bulgaria	14.302	1.230	8,6	0,3	43
3	Germany	134.683	25.051	18,6	1,6	2.155
4	Estonia	3.488	879	25,2	2,0	70
5	Greece	14.970	3.982	26,6	1,8	269
6	France	70.894	21.339	30,1	2,9	2.056
7	Croatia	6.944	1.250	18,0	1,8	125
8	Italy	116.826	18.108	15,5	1,7	1.986
9	N.Cyprus	1.589	475	29,9	1,4	22
10	Lithuania	7.303	2.118	29,0	1,9	139
11	Hungary	15.148	2.560	16,9	14,1	2.136
12	Malta	780	191	24,5	3,0	23
13	Netherlands	25.183	3.853	15,3	1,8	453
14	Austria	16.441	5.590	34,0	2,5	411
15	Poland	54.124	4.817	8,9	0,3	162
16	Portugal	17.612	2.589	14,7	1,6	282
17	Romania	28.657	1.920	6,7	:	:
18	Slovenia	4.210	901	21,4	1,8	76
19	Slovakia	6.767	1.827	27,0	2,9	196
20	Finland	8.583	2.652	30,9	2,4	206
21	Sweden	17.940	4.772	26,6	:	:
22	Norway	8.959	2.177	24,3	2,2	197
23	Serbia	7.797	2.152	27,6	2,0	156
24	Turkey	80.841	11.722	14,5	3,6	2.910
	Total	579.226	125.692	21,7	2,5	14.481

Source: EuroStat, Innovation Survey, 2012-2014

Abbreviations:

EPC: Enterprises with procurement contract for domestic and/or foreign public sector

INNO-REQUIRED: Enterprises with procurement contract for domestic and/or foreign public sector for which innovation was required as part of the contract (Percentage of total enterprises)

5.1.4. Descriptive statistics

Table 5.3. provides an overview of the summary statistics for our refined dataset, comprising 2,269 observations from 11 countries. Of these, 1,201 firms are situated in 9 European Union countries, while 1,068 firms are from two European countries (Turkey and Norway) that are not EU members, as outlined in Table 5.4.

From the statistics presented in Table 5.3, it is evident that the proportion of innovator firms is relatively high, accounting for 78.62 percent of the sample. The average share of turnover attributed to new-to-the-market innovative products is 19.49%, with a standard error of approximately 23.16%. Given that the highest value for this variable is 100%, a logarithmic transformation was applied to mitigate skewness and enhance the suitability of the variable for analysis.

Table 5. 3. Summary statistics (Number of observations is 1797 with 1312 uncensored observations)

Variable	Obs	Mean	Std. Dev.	Min		Max	
				Value	Percent %	Value	Percent %
Dependent Variables							
Innovation performance	1312	19.49848	23.16669	0	-	100	-
Innovator (yes/no)	2269	0.7862494	0.4100431	0	21.38	1	78.62
Explanatory Variable							
PPI	2269	0.2062583	0.4047073	0	79.37	1	20.63
Control Variables							
Absorptive capacity	2269	5.33082	13.27012	0	-	100	-
Cooperation	2269	0.4535037	0.4979431	0	52.80	1	47.20
Incentive	2269	0.4720141	0.4993262	0	54.65	1	45.35
Export	2269	0.2159542	0.4115733	0	78.40	1	21.60
Size	2269	15.99923	1.954369	9.510562	-	22.60874	-
Human resources	2269	4.059498	1.657244	0	-	7	-

Examining the independent variables, it is noteworthy that 20.63 percent of the sample has engaged in innovation activities within the context of a procurement

contract. The distribution of enterprises involved in innovation procurement is further detailed by country and sector in the Appendix B in Table B-2 and Table B-3.

Table 5. 4. Distribution of Observations by Country

Country	Freq.	Percent	EU member
Bulgaria	109	4.8	√
Estonia	8	0.35	√
Greece	72	3.17	√
Croatia	97	4.28	√
Hungary	62	2.73	√
Latvia	23	1.01	√
Norway	781	34.42	x
Portugal	782	34.46	√
Romania	6	0.26	√
Slovakia	42	1.85	√
Turkey	287	12.65	x
Total	2,269	100	

Delving into the summary statistics of the control variables provides additional insights into the characteristics of the sample. Notably, 47.20 percent of the companies in the sample have established collaborations in innovation activities. On the export front, the percentage of companies engaging in export activities is relatively low, standing at 20 percent. Moreover, 45.35 percent of firms have received public financial support for innovation activities from government agencies.

Table B-4 in the Appendix B illustrates the sectoral diversity of firms. To maintain model robustness, sectors with fewer than 100 observations were grouped under the umbrella category of "others." Consequently, the companies in the dataset operate within five distinct sectors. Manufacturing dominates with a share of 32.88 percent, followed by the ICT sector at 21.73 percent.

Table B-1 in the Appendix B provides a comprehensive overview of the correlation coefficients among the variables. Notably, PPI and absorptive capacity exhibit positive and significant correlations with both innovation outputs. However, the correlation between PPI and innovation is somewhat weaker than anticipated, standing just above 0.10. On the other hand, firm size demonstrates a negative and

significant association with innovation activity. Given the absence of a unanimous consensus in the literature on the relationship between size and innovation, this correlation coefficient suggests a potential negative direction in their association.

Examining the correlation coefficients for the other control variables (incentive, export, and cooperation), a general positive correlation with innovation propensity is observed. However, these variables exhibit correlations with innovation performance that are not statistically significant. Importantly, there is no indication of severe correlation between independent variables, mitigating concerns of multicollinearity. Consequently, it can be concluded that the coefficients are not at a level that would adversely impact the integrity of our Heckman two-step estimation model.

5.1.5. Methodology: Heckman Two-Step Sample Selection Model

As mentioned, one objective of this study is to examine the impact of innovation procurement on the innovation performance of firms.

To measure innovation performance, this study utilizes the percentage of sales derived from innovative products that were new to the market, considering it as a continuous variable observed exclusively for innovative firms. To analyze the relationship between this dependent variable (innovation performance) and a set of independent variables, a regression model is constructed.

Ordinary least-squares (OLS) regression, a widely employed statistical technique in social science studies, is typically efficient for estimating such models. However, a potential issue arises due to one classical assumption of OLS—that the sample is randomly drawn from the target population. As our dependent variable is observed only for innovative firms, employing OLS regression may introduce a sample selection bias problem, resulting in biased and inefficient estimates (Heckman, 1976, 1979; Verbeek, 2004; Wooldridge, 2012).

To address this concern, this study adopts the Heckman two-step estimator, a widely used Type II Tobit model. The Heckman two-step estimation procedure proves effective in mitigating sample selection bias problems in models where the dependent variable is selectively observed, as is the case in our study (Heckman,

1979). This approach aligns with prior innovation studies that have acknowledged and addressed similar challenges in innovation surveys (Frenz & Ietto-Gillies, 2009; Mansury & Love, 2008; Sapprasert & Clausen, 2012; Tavassoli, 2015; Zang, 2018).

The Heckman model involves two distinct stages (Heckman, 1976, 1979; Verbeek, 2004; Wooldridge, 2012): the selection equation and the outcome equation. Initially, the selection equation is formulated, as depicted in Eq. (1), and it is estimated using a binary choice model through probit analysis. In our specific selection equation model, the dependent variable y_{1i} signifies whether a firm i engages in innovation, as outlined in Eq. (2). Since y_{1i} is not directly observable in practical terms, we estimate a latent variable, denoted as y_{1i}^* , by utilizing a set of explanatory and control variables. The vector of explanatory variables is represented by X_{1i} , while Z_{1i} signifies the vector of control variables, and u_{1i} denotes the error term in the model.

$$y_{1i}^* = X_{1i}\beta_1 + Z_{1i}\gamma_1 + u_{1i} \quad (1)$$

$$y_{1i} = \begin{cases} 1 & \text{if } y_{1i}^* > 0 \\ 0 & \text{if } y_{1i}^* \leq 0 \end{cases} \quad (2)$$

The purpose of this step is to calculate the correction factor known as the "Inverse Mills Ratio (IMR)," which will be utilized in the second step of the Heckman two-step estimation procedure. An essential criterion for achieving robust estimation in this method is to incorporate at least one independent variable in the selection equation that is not included in the outcome equation.

In the second stage of the Heckman two-step estimation, the outcome equation is formulated, as expressed in Eq. (3). In our specific outcome equation, product innovation performance, denoted as y_{2i} , is estimated through an Ordinary Least Squares (OLS) regression model. The model incorporates X_{2i} as the vector of explanatory variables and Z_{2i} as the vector of control variables. Distinct from the selection equation, the outcome equation introduces an additional explanatory variable referred to as the correction term λ , commonly known as the inverse Mills ratio. This correction term, derived from the selection equation, is included in the

outcome equation to mitigate the impact of sample selection bias. The equation also features u_{2i} as the error term in the model.

$$y_{2i}^* = X_{2i}\beta_2 + Z_{2i}\gamma_2 + \lambda + u_{2i} \quad (3)$$

$$y_{2i} = \begin{cases} y_{2i}^* & \text{if } y_{1i} = 1 \\ 0 & \text{if } y_{1i} = 0 \end{cases} \quad (4)$$

In summary, the Heckman two-step estimation process begins with the estimation of the selection model using probit regression, aiming to discern the influence of independent variables on product innovation. Following this, the final model is constructed and estimated using the OLS method, with the dependent variable being "Product Innovation Performance" — represented by the percentage of sales from new or significantly improved products introduced that were new to the market in total sales of the firm. To address potential selection bias arising from the non-random sample, the correction term λ , also known as the inverse Mills ratio, is incorporated into the outcome equation.

5.2. Qualitative data collection and analysis method

The second purpose of this study is gaining insights into the question: "How does absorptive capacity moderate the relationship between public procurement and innovation?" The case study method was chosen for investigating this question. This section of the thesis first introduced the case study research method, followed by a discussion on the reasons for selecting this approach. It then covered case selection, data collection, and analysis strategies.

5.2.1. Definition and rationale for the case study method

Case study research has become a prevalent method in social research, particularly when there is a need to comprehensively explore the dynamics of a phenomenon within its natural context. Unlike methods that strive for generalizable truths, case study analysis is focused on achieving a profound understanding of the intricacies of how and why a specific event, instance, or interaction unfolds (Eisenhardt, 1989; Yin, 2014).

Yin (2002) defines case study as “*a contemporary phenomenon within its real-life context, especially when the boundaries between a phenomenon and context are not clear and the researcher has little control over the phenomenon and context*”. Yin (2014) suggests employing the case study method when the researcher is focused on answering "how" or "why" questions related to the phenomenon of interest. His framework for case study research comprises five essential steps: defining the study's questions, formulating propositions if applicable, determining the unit(s) of analysis, establishing the logic that connects the data to the propositions, and defining criteria for interpreting the findings. Ensuring coherence and consistency across each stage is crucial for a well-designed case study research (Yin, 2014).

The case study method can be employed not only for in-depth exploration but also for testing and developing hypotheses, similar to the approach often used in grounded theory research (Yin, 2014; Glaser & Strauss, 1967). The widespread use of this method has extended beyond its traditional domains, with increasing interest and application in various scientific disciplines in recent years.

Therefore, the case study research method is employed in this section of the thesis to gain a comprehensive understanding of how absorptive capacity moderates the relationship between public procurement and innovation. This choice is grounded in three primary rationales. Firstly, despite the use of "rdintensity" in the previous section as a representation of an enterprise's absorptive capacity, there is no universally agreed-upon method in the literature for accurately measuring absorptive capacity with numerical data. As absorptive capacity is a mental concept observable in real-life events, rather than being easily quantified with a single quantitative measure, a qualitative inquiry method is deemed more suitable to unveil the embedded knowledge inherent in the actions and processes.

Secondly, one of the primary objectives of this thesis is to scrutinize the mediator effect of absorptive capacity—specifically, to identify the stages and strength at which this effect manifests. However, existing literature predominantly relies on quantitative data and methods for mediating effect studies, leaving a gap in understanding the detailed steps and mechanisms through which the mediating impact unfolds. Recognizing that a purely quantitative approach might not yield

sufficient detail and understanding necessary for policy development, a case study analysis is deemed essential to uncover the specific stages and mechanisms through which absorptive capacity mediates the relationship between public procurement and innovation.

Thirdly, the literature has predominantly focused on firm-level absorptive capacity, largely overlooking the absorptive capacity of public organizations. While the absorptive capacity of a company is often quantified using metrics like R&D expenditure to sales ratio, determining the absorptive capacity of a public agency remains less defined. However, given the pivotal role of public organizations as demanders in the procurement process, there is a crucial need to understand and measure their absorptive capacity. Consequently, the case study research method is deemed the most appropriate approach to investigate the mediating effect of public absorptive capacity in the relationship between public procurement and innovation.

Our research design is constructed following the model suggested by Yin (2009: p.57). The flowchart in Figure 5.1. demonstrates the steps of our research process. The preceding chapter delved into the conceptual background and established hypotheses. Subsequently, case selection, data collection, and data analysis principles are detailed in the following sections.

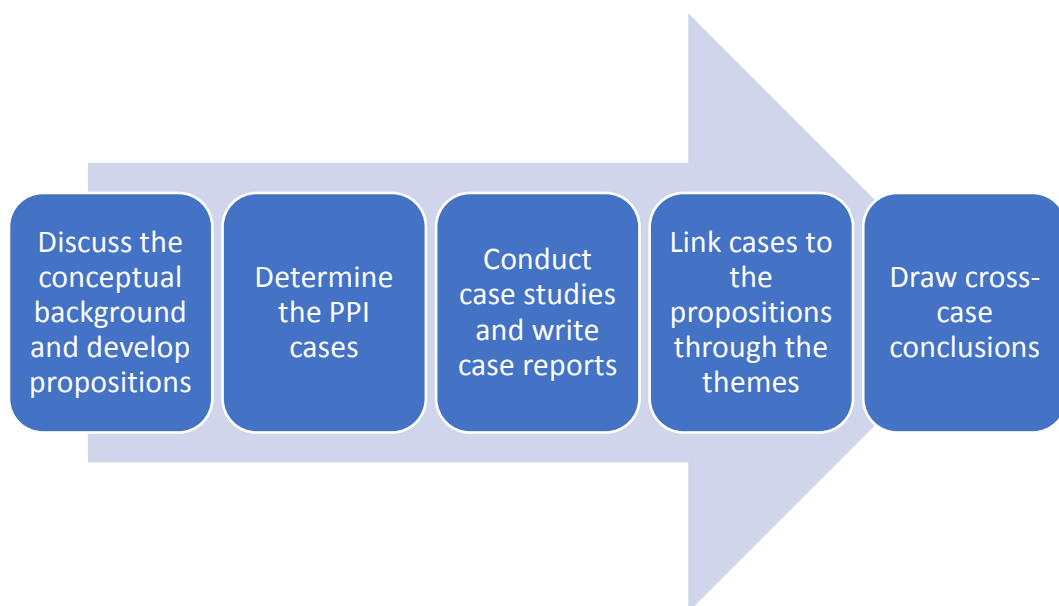


Figure 5. 1. Research Design

5.2.2. Case Selection

As a general principle, the selection of cases depends on the objective of the study and the research question. Case/cases ought to be chosen to acquire the most comprehensive and sufficient information explaining the research question (Yin, 2009).

Case study research may involve either a single case or multiple cases. Multiple case studies allow for the repeated exploration of research questions, producing more robust results through diverse empirical evidence (Eisenhardt & Graebner, 2007). On the other hand, single case studies offer a more in-depth investigation, providing a thorough understanding of the phenomena under consideration (Dyer & Wilkins, 1991). Eisenhardt (1991) suggests that the number of cases should be determined by the extent to which additional cases contribute new information to the study.

Yin (2009) underscores the necessity of a thorough and thoughtful examination of the advantages and disadvantages associated with the adoption of a multiple case study approach. Baxter and Jack (2008) posit that engaging in a multiple case study may demand considerable resources and time, potentially outweighing the informational benefits it yields. Dyer and Wilkins (1991) contend that the application of multiple case studies does not universally guarantee more profound theoretical insights when compared to a single case study. Consequently, researchers must judiciously weigh whether a single or multiple case study strategy aligns best with the aim of attaining a comprehensive understanding of the phenomenon under investigation.

Aligned with the purpose and exploratory nature of our study, a thorough investigation was conducted into potential cases that could offer valuable insights into the mediating role of absorptive capacity in the relationship between public procurement and innovation. In navigating through numerous alternatives during the case selection process, this study opted for an information-oriented sampling technique, as recommended by Flyvbjerg (2006). This approach involves selecting cases based on the anticipated coverage of information. The rationale behind this technique lies in the belief that, while an average case chosen through random

sampling may yield typical data, an extreme case with a wealth of information surpassing the average can potentially offer more profound insights. By focusing on information-intensive cases, this study aims to uncover comprehensive findings that may significantly contribute to our understanding of the studied phenomenon.

In the course of our extensive exploration of potential candidates, two cases emerged as noteworthy selections. These cases as outlined in Table 5.5, specifically pertaining to PPI, were chosen from procurement initiatives carried out in the city of Ankara. This selection was deliberate, considering that the central procurer organizations of public institutions in Turkey are predominantly situated in the capital city. These two cases were singled out from various alternatives due to their exceptional information richness aligning closely with the focus of our study. They offer valuable insights into the intricate dynamics of how the absorptive capacity of both suppliers and procurers mediates the impact of public procurement on innovation.

Table 5. 5. Selected Cases

Case	Innovative product	Sector	City
Case ROV	Remotely operated underwater vehicle	Robotics and Electronics	Ankara
Case SEG	Mono PERC type photovoltaic cells	Renewable Energy	Ankara

5.2.3. Data Collection

The gathering of evidence in a case study can take various forms, and Yin (2009) outlines six primary methods for data collection: documentation, archival records, interviews, direct observations, participant observation, and physical artifacts. Each of these methods comes with its own set of advantages and disadvantages. As a general guideline, Yin (2009) suggests that the quality of a study can be enhanced by employing a complementary and integrated approach, utilizing multiple methods concurrently.

Our research employed two distinct methods for data collection: document analysis and semi-structured interviews. Preliminary information about the cases was gathered through a comprehensive review of open-source documents, including

tender calls, policy papers, and reports. Following this, semi-structured interviews were conducted with personnel from both supplier and procurer organizations who played direct roles in the public procurement process. The limited number of interviews conducted was due to the constraint of a finite pool of personnel possessing pertinent information about the procurement procedures within the institution and company. Nevertheless, meticulous attention was given to selecting interviewees with a thorough understanding of the entire process.

Prior to the interviews, a prelude was established through two pre-interview sessions with selected experts to refine and validate the open-ended questions. Subsequently, the interview protocol was shared with the participants, setting the stage for approximately one-hour-long meetings. These sessions were meticulously recorded and later transcribed in their entirety. The interview transcriptions were then compiled by the author and emailed to the participants for their review, allowing for their input in terms of approval, corrections, and additional insights. The interview guideline employed in this study is available in Appendix C for reference.

5.2.3. Data Analysis

Analyzing and interpreting the collected data is a pivotal phase in case study research. According to Yin (2009), a comprehensive case study analysis should encompass steps such as examining, categorizing, tabulating, testing, or recombining evidence. In our research, our data analysis procedure was structured in alignment with Yin's (2009) recommendations and have harmonized it with the methodology outlined by Miles and Huberman (1994), incorporating the "Codes and Coding" technique proposed by Atkinson (2002). The overarching goal during our data analysis process was to establish effective links between the gathered data, the research questions, and the proposed hypotheses. Figure 5.2. demonstrates the steps of our data analysis procedure.



Figure 5. 2. Data Analysis Process

Source: Author's own work

The presentation and interpretation of findings unfolded in two distinct steps. Initially, the PPI cases were elucidated and discussed in a narrative manner, centering around the fundamental concepts of absorptive capacity theory. This narrative approach aimed to encapsulate the mediating role of absorptive capacity in the relationship between public procurement and innovation. The focus during this phase was to articulate the specific type of absorptive capacity that exhibited greater prominence at various stages of the procurement process.

Subsequently, a cross-case comparison was carried out to match and aggregate similar and different findings from the cases. To ensure construct validity, a thorough cross-case analysis was executed, explicitly presenting the findings related to each proposition, in accordance with the guidelines outlined by Ketokivi and Choi (2014). To achieve this, themes were established to group and analyze the case findings pertaining to the propositions. These themes were developed by taking into account the mediating role of absorptive capacity between public procurement and innovation, as evidenced in three PPI examples from European countries presented in section 4. This method facilitated the comparison of evidence regarding the initial propositions and the subsequent refinement of a set of final propositions based on the emergent findings, as recommended by Atkinson (2002). Consistent with the approach advocated by Eisenhardt and Graebner (2007), the presentation of evidence was predominantly structured using tables and figures to enhance the reliability and clarity of the results.

Absorptive capacity conceptualization (Cohen & Levinthal, 1990) and PPI concept were the basic theoretical frameworks during this analysis. Among different propositions for absorptive capacity dimensions, decomposition offered by Schweisfurth and Raasch (2009) was embraced for the collection and interpretation of the evidence: the need and solution absorptive capacity. This preference was influenced by the distinctive structure of the innovation procurement process, characterized by the alignment of unmet needs within public organizations with available solutions in the market.

Following the case study analysis process, policy recommendations were constructed for the benefit of all stakeholders. Implications derived through the findings were not

universal or statistical generalizations; instead, they were contextual (Yin, 1994; Ragin, 1987).

CHAPTER 6

RESULTS

6.1. Quantitative analysis results

6.1.1. Estimation results for the impact of public procurement on innovation performance

To assess the hypotheses formulated in the preceding section, Heckman two-step estimation was conducted on three distinct samples. Initially, the model was estimated for the entire dataset, encompassing firms from 11 countries. Subsequently, the sample was stratified into two subsamples based on the criterion of EU membership: firms from EU and non-EU countries.

Tables 6.1 and 6.2 present the results obtained through the Heckman two-step estimation. Notably, the coefficient of the Mill's ratio is statistically insignificant across all samples, suggesting the absence of sample selection bias and indicating independence between the two equations.

The key finding is that PPI exhibits a highly significant and positive association (0.309, $p < 0.01$) with the innovation performance of firms. This implies that firms engaging in innovation procurement are more likely to achieve a higher share of total turnover from new or significantly improved products that are novel in the firm's market. Upon further analysis, when the sample is bifurcated, the results reveal that the positive impact of PPI is more pronounced in the sample of EU member countries (0.527, $p < 0.01$) compared to the entire dataset. However, the innovation impact of public procurement is deemed insignificant for firms in Non-EU countries.

The estimation concerning innovation probability reveals that firms engaging in PPI are significantly more inclined to introduce product innovation (0.443, $p < 0.01$).

Notably, the magnitude of this impact is found to be lesser for firms in non-EU countries (0.436, $p < 0.01$) compared to the other two samples. Taken together, all these findings strongly support our hypothesis asserting that PPI activities have a great potential to stimulate innovation performance of firms, and this impact might be more potent for firms in EU member countries thanks to the regulations and policies developed throughout the EU.

In an attempt to test our hypothesis regarding the intermediary role of absorptive capacity in the relationship between public procurement and innovation, a mediator variable was introduced into the model. However, based on the estimation results presented in Table 3.10, this study did not find significant evidence supporting this proposition. This unexpected result could be attributed to two potential reasons. First, the use of a single measurement (R&D intensity measured by internal R&D expenditure/sales) might have been insufficient to comprehensively capture the complex construct of absorptive capacity. Secondly, the reliance solely on a quantitative research method might have limited the exploration of the nuanced mediator effect. In light of these considerations, it is recommended that future studies on this topic adopt a more comprehensive approach, incorporating representative variables and employing diverse research methods to unravel the intricate dynamics of the researched mediator effect.

To ensure a comprehensive and well-specified model, control variables were included in our estimation. While these variables are not the primary focus of the study, their results provide valuable insights into the determinants of innovation performance. The findings suggest that revenues from innovative products tend to increase with the absorptive capacity of an enterprise, measured by R&D intensity. Additionally, size has a significant negative coefficient, implying that smaller firms are more likely to generate larger shares of market novelties. Exporting also seems to positively influence the percentage of new-to-market product innovation in total sales, though this effect becomes insignificant in the non-EU sample. These observations align with established propositions in the innovation literature. Contrary to expectations, innovation performance does not appear to differ significantly for units that establish cooperation and/or receive public financial support in innovation activities.

To further understand the determinants of innovation performance, the analysis considered industrial and country effects. The results indicate that the industry to which a firm belongs has a relative impact on innovation performance. Notably, firms in the Information and Communication Technology (ICT) sector exhibit a higher likelihood of having larger shares of new-to-market innovation revenues in total sales compared to firms in the manufacturing and other sectors. This finding suggests that the ICT sector is more innovation-intensive relative to other industries.

In addition to industrial effects, a country dummy variable representing EU membership was included. Results suggest that non-EU countries are more likely to have larger shares of market novelties in total sales. This result aligns with the longstanding debate about European countries facing challenges in translating scientific knowledge into commercial products, commonly referred to as the "European Paradox" (EC, 1995). This outcome serves as additional evidence contributing to the ongoing discussion surrounding the innovation landscape in European countries.

In conclusion, the empirical findings robustly support our hypothesis regarding the strong association between public procurement and innovation. PPI emerges as a crucial innovation driver, significantly enhancing the innovation performance of firms. The positive impact of PPI is particularly pronounced in EU member countries, underscoring the influence of regulatory and policy frameworks established at the supranational level.

Table 6. 1. Heckman Two-step Estimation Results-1

VARIABLES	All countries (11)		EU Countries (9)		NON-EU Countries (2)	
	Innovation Performance	Innovator	Innovation Performance	Innovator	Innovation Performance	Innovator
PPI	0.309*** (0.101)	0.443*** (0.0996)	0.527*** (0.138)	0.467*** (0.148)	0.109 (0.145)	0.436*** (0.140)
Absorptive capacity	1.154*** (0.291)	1.171*** (0.401)	0.702* (0.422)	0.502 (0.520)	1.357*** (0.432)	2.095*** (0.672)
Cooperation	0.0831 (0.119)	0.576*** (0.0768)	0.167 (0.175)	0.654*** (0.116)	-0.106 (0.158)	0.486*** (0.107)
Incentive	-0.0157 (0.0847)	0.182** (0.0791)	-0.208* (0.108)	0.0694 (0.113)	0.134 (0.137)	0.277** (0.113)
Export	0.201** (0.0979)	0.312*** (0.101)	0.470*** (0.132)	0.271* (0.144)	-0.0802 (0.141)	0.293* (0.150)
Size	-0.151*** (0.0202)	-0.00648 (0.0209)	-0.172*** (0.0283)	0.00808 (0.0304)	-0.112*** (0.0294)	-0.0193 (0.0301)
Human resources		0.121*** (0.0268)		0.127*** (0.0338)		0.111** (0.0456)
EU Membership	-0.178** (0.0753)	0.00329 (0.0765)				
lambda		0.384 (0.379)		0.493 (0.454)		-0.233 (0.637)
Constant	4.311*** (0.424)	-0.116 (0.343)	4.453*** (0.566)	-0.327 (0.450)	3.934*** (0.586)	0.111 (0.517)
Observations	1,797	1,797	912	912	885	885

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 6. 2. Heckman Two-step Estimation Results-2

VARIABLES	All countries (11)		EU Countries (9)		NON-EU Countries (2)	
	Innovation Performance	Innovator	Innovation Performance	Innovator	Innovation Performance	Innovator
PPI	0.318*** (0.120)	0.567*** (0.107)	0.557*** (0.161)	0.596*** (0.159)	0.106 (0.177)	0.517*** (0.154)
PPI X Absorptive capacity	-0.272 (0.548)	-2.488*** (0.743)	-0.606 (0.819)	-2.435** (1.006)	0.106 (0.726)	-1.809 (1.329)
Absorptive capacity	1.243*** (0.391)	2.203*** (0.554)	0.958* (0.577)	1.814** (0.827)	1.335** (0.563)	2.477*** (0.757)
Cooperation	0.0619 (0.117)	0.571*** (0.0771)	0.136 (0.170)	0.633*** (0.117)	-0.0967 (0.159)	0.483*** (0.107)
Incentive	-0.0249 (0.0836)	0.171** (0.0793)	-0.214** (0.107)	0.0582 (0.113)	0.142 (0.137)	0.274** (0.113)
Export	0.190** (0.0964)	0.298*** (0.101)	0.466*** (0.132)	0.273* (0.144)	-0.0733 (0.140)	0.278* (0.150)
Size	-0.150*** (0.0202)	-0.00312 (0.0210)	-0.172*** (0.0282)	0.0110 (0.0305)	-0.112*** (0.0294)	-0.0190 (0.0302)
Human resources		0.122*** (0.0269)		0.124*** (0.0340)		0.115** (0.0458)
EU Membership	-0.174** (0.0748)	0.0186 (0.0769)				
lambda		0.302 (0.373)		0.416 (0.450)		-0.183 (-0.653)
Constant	4.352*** (0.428)	-0.197 (0.345)	4.499*** (0.567)	-0.378 (0.452)	3.916*** (0.601)	0.0860 (0.518)
Observations	1,797	1,797	912	912	885	885

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6.1.2. Estimation results for the mediator role of the absorptive capacity

As a further step, a mediator variable was included in the model to test our hypothesis related to the intermediary role of absorptive capacity in the relation between public procurement and innovation. Due to estimation results shown in Table 6.1, the findings did not yield empirical evidence supporting the hypothesized mediator role of absorptive capacity in the association between public procurement and innovation. From our point of view, there could be two possible reasons for this unexpected result. First, using a single measurement (R&D intensity measured by internal R&D expenditure/sales) was insufficient to measure the absorptive capacity. The second rationale can be the inconvenience of conducting only a quantitative research method to unearth the researched mediator effect. This outcome prompts further exploration and refinement of the conceptual framework, highlighting the need for more representative variables and diverse research methods in future studies. For this reason, the case study method was preferred to examine this research question in more depth in the next section.

6.2. Qualitative Analysis Results

In this part, summary information about the cases and findings were elaborated. After that, cross-case analysis was conducted and modified propositions have been derived.

6.2.1. Case Studies

6.2.1.1. Case ROV

The first case is related to the procurement of Remotely Operated Underwater Vehicle (ROV) by a public organization in Turkey⁹.

Three semi-structured interviews were conducted to collect data. Special importance was given to ensure that the interviewees were in a position to provide the most

⁹ This case study is published under the responsibility of the author. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the supplier and procurer public organization.

detailed information about the recruitment process. Summary information about the interviewees is presented in Table 6.3.

Table 6. 3. Some Descriptive Information About the Interviewees-Case ROV

S.Nu.	Interviewee Position	Organization
1	Project Manager	Supplier Company A
2	Technical Manager	Supplier Company A
3	Procurement Manager	Procurer Public Organization

The procurement procedure took started in the middle of 2017 and ended at the end of 2018. While products with similar functionalities existed and had been utilized in various countries, the innovative product procured during this process introduced novel features not present in its counterparts. Additionally, it represented a new frontier for the procuring public organization. The system was innovative in terms of providing instant and high-quality images from underwater, removing corpses and items under the sea, and ease of use.

ROVs are teleoperated robotic systems that can make a variety of underwater operations efficiently. Human divers become inadequate in some underwater missions and operations because of the human body's limitations and the unsafe weather conditions for diver's entry. In such cases, ROVs can ensure the fulfillment of challenging tasks more effectively in a safer environment. Since their initial design in the 1960s, ROVs have been extensively utilized for years in diverse applications such as rescue operations, marine research, and industrial tasks. The benefits and advantages they offer over human divers (Petillot et al., 2019). The significance of generating innovations in the field of ROVs is underscored by the positive impact on various aspects, including risk reduction in hazardous environments, minimizing costs associated with unnecessary searches, and the ability to perform tasks that may be impractical or unsafe for human divers.

Company A has strategically recognized the increasing significance of unmanned underwater systems, prompting them to engage in R&D initiatives for approximately a decade. During this period, the company has diligently studied potential solutions, competitors in both local and global markets, and identified potential customers

along with their anticipated demands. The wealth of information held by Company A in the realm of unmanned underwater systems is substantial, owing to their extensive academic research and the founders' wealth of experience. The company has navigated its research activities to cater to both national and international markets for ROVs. In addition to their R&D endeavors, the company has actively sought and received public financial support and made significant investments in human capital, hiring highly qualified staff to enhance its overall capacity and innovation capabilities.

On the other hand, as technological advancements and evolving needs unfold both locally and internationally, there has been a gradual increase in the inclination of public organizations in Turkey to acquire innovative products. This increasing trend is notably influenced by national public policies and strategic plans in Turkey, which advocate for strategies aimed at enhancing organizational capabilities. Consequently, certain public organizations have been propelled to actively seek and procure new products, driven by the objective of enhancing performance in the delivery of public services.

To this end, public organization A -which performs search and rescue operations at marine and coastal areas- launched a tender procedure to purchase an innovative ROV. The capability acquisition by the purchase of such an innovative product was one of the objectives in the buyer organization's strategic plan. The experienced search and rescue personnel of the institution were making need analysis regularly to assess the products and technologies that might contribute to perform their missions better. They found that ROVs might efficiently perform some search and rescue tasks under unsafe weather conditions making human divers ineffective. The acquisition of such technologies would support search and rescue personnel on completing underwater missions and operations more effectively and safely, even in bad weather conditions.

As a result of the comprehensive comparison of alternative solutions, it was realized that the acquisition of ROVs would increase the institution's capability in search and rescue operations and enhance the efficient use of public resources. It was decided

that it would be more appropriate to launch a procurement by describing the institution's needs rather than buying ready-made (off-the-shelf) products that are not certain to meet the requirements perfectly.

Tender documents and requirements were prepared by including functional necessities rather than limited specifications to allow innovative solutions. Although innovation was not obligatory in the tender documents, there were some other stimulating factors for submitting innovative product offer. Firstly, firms were required to consider the specific conditions of Turkey's three different marine environments during production. Secondly, it was necessary to achieve cost-efficient improvements compared to existing products in the market to submit the best offer in the tender. Lastly, the national innovation system and the public procurement regulations promoted and encouraged the innovative products designed and produced within the country. Therefore, it is reasonable to assert that the procurement process was structured in a manner that actively encouraged and welcomed innovative proposals.

The tender was open to all potential suppliers, fostering a competitive and inclusive environment. After the submission of bids, the evaluation process was conducted transparently. Subsequently, the tender submitted by Firm A, an SME, was confirmed as the most suitable and advantageous solution. A contract was signed between the winning company and public organization A, and it was stipulated that the production and delivery must be completed within one year. One of the interviewees from company A stated that:

“The ability to engage in continuous Research and Development (R&D) efforts and the strategic employment of skilled personnel were fundamental factors that empowered us to present a successful and cost-effective solution.”

Company A started production immediately after contracting. During the production process, interaction and knowledge exchange were needed in some phases. Edler and Yeow (2016) also underscored -by investigating two cases- that procuring something novel to a public organization entails interaction and networking between two parts.

There were restrictions in the public procurement regulations for cross-organizational dialogue during the tendering process; however, a close interaction, knowledge exchange, and collaboration between parts became more available after awarding the contracting. Thus, collaboration and knowledge exchange were established during the production phase to learn the task requirements and administration priorities for generating the ideal solution. According to our observations, such a collaborative network ensured significant improvements in the product's technical properties and capabilities.

At the end of the production process, the ROV system was successfully manufactured and made ready for use. It was delivered to the public organization after being subjected to various performance and technical examinations, as stipulated in the tender documents. The product included innovations in the areas of image quality, underwater object removal and ease of use. Ultimately, the public organization embraced the system, and Company A conducted end-user training during and after the delivery. This initiative aimed to facilitate the successful implementation and adoption of the system within the public organization. The training sessions provided crucial insights into the system's operation and maintenance procedures, ensuring that end-users were well-informed. These training efforts played a significant role in the swift adoption and effective utilization of the new ROV product by public organization A.

6.2.1.2. Case SEG

The second PPI case deals with the procurement of solar power plant technologies based on the demand of two public organizations: the General Directorate of Agricultural Enterprises (TİGEM)¹⁰ and the General Directorate of Renewable Energy (YEGM). The primary objective is to procure innovative solar modules composed of Mono PERC type photovoltaic cells, manufactured by a consortium formed through collaboration between domestic universities and industries. Since Turkey is dependent on imported photovoltaic cells, this innovation procurement

10 The General Directorate of Agricultural Enterprises (TİGEM) is an Economic State Organization, which is free in its activities and limited by its capital, established in order to produce all kinds of goods and services needed by the agriculture and agriculture industry in Türkiye.

intends to meet the needs of the public organizations by producing an innovative product in solar power plant technologies through the national university-industry effort. There are four general objectives of the project:

- **Development and Production of Photovoltaic Cell:** The main output of the project is the 10 MW Solar Power Plant (SPP). The power plant will be installed with solar modules consisting of Mono PERC type photovoltaic cells. The production processes of the Mono PERC type cell will be developed at the university R&D center and the final product will be produced at the contractor's production facilities.
- **Development and Production of Inverter:** Within the scope of this project, it is aimed to develop 10 inverters by TÜBİTAK MAM, using up-to-date power electronics technologies and taking into account the high life expectancy. The inverters, which are requested to have 1 MW power, are expected to have a centralized structure ideal for large area applications of PV systems and to have power and control features that can interfere with voltage fluctuations in the application area. In addition, thanks to the remote monitoring system to be produced by TÜBİTAK MAM, it will be ensured that the SPP can be continuously controlled and run smoothly.
- **Production of Solar Modules:** It is planned to produce the solar modules in the facilities of the supplier company using standard lamination technique. It is expected that 250 – 300 Wp power will be obtained from the produced modules containing 60 cells. The goal is to ensure that the produced modules undergo testing and receive certification from an accredited laboratory in accordance with the IEC 61215 and IEC 61730 standards.
- **Integration and Installation of the System:** The supplier will be responsible for the design, equipment supply, and installation of the 10 MW Solar Power Plant (SPP) at the Urfa Ceylanpınar facilities of TİGEM. Additionally, Harran University, operating in the same region, will offer researcher support throughout the design, installation, and operational phases of the Solar Power Plant.

The author conducted three semi-structured interviews to collect data, emphasizing the selection of interviewees who could offer the most comprehensive information about the case. A summary of information about the interviewees is provided in Table 6.4.

Table 6. 4. Some Descriptive Information About the Interviewees-Case SEG.

S.Nu.	Interviewee Position	Organization
1	Project Manager	TÜBİTAK
2	Project Manager	YEGM
3	Project Manager	AYDEM Energy

The need for innovative public procurement in the field of solar energy technologies in Turkey is essentially based on a top-level strategy document: 26th meeting of the Supreme Council of Science and Technology (2013). The decision to support R&D and increase investments in solar energy technologies was included in the final document of the 26th meeting of the Supreme Council of Science and Technology in 2013. The designated coordinating public agency for this strategic task is the General Directorate of Renewable Energy (YEGM). This agency is responsible for overseeing, evaluating, and analyzing studies and developments, actively tracking international projects associated with renewable energy sources worldwide.

Following extensive domestic and international analyses conducted by YEGM, it was identified that Turkey exhibits a reliance on imports within the solar energy sector. Recognizing the strategic significance of reducing dependence and aligning with the increasing global demand, it was deemed crucial to domestically produce innovative products in the solar energy sector. In light of this, the joint evaluation between TİGEM and YEGM led to the conclusion that developing a solar power plant, incorporating innovative products to meet the needs of a public agricultural enterprise, would serve as an effective strategy to stimulate innovation in this sector. Consequently, as a result of collaborative investigations, a decision was made to initiate a procurement process for establishing a 10 MW Solar Power Plant (SPP) at the Urfa Ceylanpınar enterprises of TİGEM.

Experts from YEGM, TİGEM, scientific institutions and private sector came together to exchange information about the needs and the production capacity in the local market. As a result of the joint efforts, it was decided to conduct a PPI for the procurement of solar modules consisting of Mono PERC type photovoltaic cells as an innovative product. An interviewee from YEGM highlighted that the team at YEGM boasts significant experience in PPI, having successfully executed 8-9 similar projects in the past.

During the pre-tendering phase, meetings were conducted with the active participation of private sector representatives, scientists, and public personnel to collaboratively establish technical specifications and contract details. Essential prerequisites were incorporated into the tender documents as selection criteria. One crucial requirement specified that a public R&D center should be involved in the executive institutions to ensure the sustainability of knowledge acquired through the project. Additionally, a significant criterion in the bid evaluation process was the consideration of the rate of reducing dependency on imports for components used in the SPP. There is also a clause in the tender documents to encourage low-cost production: *“The cost per Watt of the photovoltaic cells to be developed will be the selection criterion”*. In addition, because of the drawbacks of the evaluation based on the lowest price, the issues related to product quality and certification were also included in the tender specifications.

The tender announcement was publicized in June 2013, resulting in submissions from seven different groups. The procurer authority opted for a competitive procurement dialogue, inviting each group to participate in the technical and financial evaluation panel. Following a thorough assessment, the contract was ultimately awarded to the selected consortium. The executive consortium leading the project comprises two public institutions, namely TÜBİTAK MAM and the Center for Solar Energy Research and Applications at METU (ODTÜ-GÜNAM), alongside the private company Bereket Energy A.Ş.

The consortium has benefited from the feasibility report that was prepared by a consulting firm during the proposal preparation phase. The division of labor was

made taking into account the knowledge base and past experiences of the partners. Mono PERC type "photovoltaic cells" were developed by ODTÜ-GÜNAM, and the inverters were produced by TÜBİTAK MAM. Solar modules were produced in the facilities of the supplier company in partnership with TÜBİTAK MAM, using standard lamination techniques. The final system integration and installation of 10 MW SPP was completed by Bereket Energy A.Ş. in Urfa Ceylanpınar enterprises of TİGEM.

During all these processes, a tight network was established among the stakeholders. One interviewee from the supplier company stated that:

“The delivery of an innovative product to the public customer was achieved through the synergistic utilization of the expertise and laboratories of public research institutions in tandem with the production capabilities of the private sector. While the innovation introduced through this project may not represent a radical shift on a global scale, it stands as a testament to the transformation of knowledge generated by national public research institutions into a practical and innovative Solar Power Plant (SPP) production capability by our company.”

The interviewees highlighted certain restrictions and barriers during the discussions. A notable concern raised by all interviewees was the potential impediment that the consortium, which developed the product in this project, might not be given priority in subsequent public procurements. The initial high investment cost of an SPP was mitigated by the public procurement guarantee, facilitating the consortium to initiate production. However, if no priority is accorded to the consortium in subsequent tenders, other Multinational Enterprises (MNEs) could secure contracts by bidding lower prices. This scenario raises the risk of losing the technological gains achieved in the SEG project. As a solution, interviewees proposed the need for legislative adjustments that provide a competitive advantage to companies developing innovative products in PPI projects in subsequent public procurements.

Another problem reported by an interviewee from the supplier company is being dependent on the imported wafer, which is the raw material of solar cell. The interviewee stated that:

“ In subsequent periods, our company capitalized on the gains obtained from this project, enabling the production of Solar Power Plants (SPPs) for various customers. However, a notable challenge emerged as we import some of the raw materials for solar cells, resulting in higher costs compared to firms in certain countries, notably Chinese manufacturers. The foreign dependency and elevated costs associated with these raw materials have posed a constraint on our global competitive advantage.”

Another challenge encountered in the course of this project was cost escalation. Interviewees highlighted that the fluctuation in exchange rates led to an increase in costs, particularly for imported raw materials used in production. As the costs increased in Turkish Lira (TL) due to currency exchange rate variations, the final cost exceeded the initially budgeted amount. To mitigate this challenge, a potential solution proposed by the interviewees is to calculate the costs associated with imported materials within the total cost in foreign currency rather than TL.

The interviewees also highlighted a noteworthy observation that by the end of the 4th year of the project's completion, the procured product had become equipped with previous-generation technology. This shift was attributed to the rapid technological advancements in the sector, particularly evident in China's production of more efficient solar cells using different technologies during the same period. This obstacle underscores the importance of active contributions from R&D units throughout the production process. It emphasizes the necessity for continuous monitoring and updating of technological requirements during production to ensure that the final product remains aligned with the latest advancements in the field.

The interviews revealed another crucial insight: the know-how and experience gained through this PPI project diminished over time due to the departure of experienced personnel from the company and institutions involved. This underscores the significance of absorptive capacity for organizations. To prevent the loss of knowledge and skills when experienced personnel leave a PPI project, it is essential to assimilate and transfer the gained knowledge and experience to all employees within the organizations, rather than having it concentrated in specific individuals.

In conclusion, the case SEG facilitated the development of Mono PERC solar cells with at least 18% efficiency, the production of solar cells and panels, and the creation of a 1 MW central inverter and solar power plant automation system through a collaborative effort involving the national industry, university, and public sector. However, the challenges encountered during this PPI project should be considered, and solutions must be developed to achieve better outcomes in subsequent PPI initiatives.

6.2.2. Cross-Case analysis

In this section, the findings were subjected to a comparative analysis, highlighting both similarities and differences across the cases.

The theoretical frameworks employed for this cross-case comparison were the concepts of PPI and absorptive capacity. The fundamental strategy involved linking the cases to two propositions.

To achieve this, themes were established to group and analyze the case findings pertaining to the propositions. These themes were developed by taking into account the mediating role of absorptive capacity between public procurement and innovation, as evidenced in three PPI examples from European countries presented in section 4.

This step's outcome was the comparison of evidence about the initial propositions and a set of final propositions modified through findings (Atkinson,2002). As Eisenhardt and Graebner (2007) suggested, the presentation of evidence is mostly done in tables and figures to increase reliability.

6.2.2.1. Generating themes through three PPI cases from Europe

In this section, themes were devised for each of the two propositions by utilizing evidence about the relationship between AC and innovation obtained from the three PPI cases. These cases, presented in Table 6.5, are discussed in chapter 4.

Table 6. 5. Three PPI cases from Europe

Case	Innovative product	Sector	Country
Case Apron	Disposable bio-based aprons	Healthcare and Textile	Sweden
Case Ecm	Electrical construction machinery	Machinery and equipment	Norway
Case Cloud	Open cloud services	ICT	European Consortium

The identified themes representing both propositions are outlined in Table 6.6. Subsequently, the case study findings pertaining to these themes are discussed individually.

Table 6. 6. Themes and descriptions

Proposition	Specific theme	Specific theme description
Public organization's need and solution absorptive capacity moderate the relationship between public procurement and innovation.	PACPPI	Public agency's prior level of knowledge about PPI concept
	PACNEED	Public agency's ability to define and exploit knowledge related to the needs requiring innovation.
	PACSOL	Public agency's ability to acquire and use external knowledge about the potential solutions in the market.
Supplier's need and solution absorptive capacity moderate the public procurement and innovation association.	SUBMIT	Supplier's ability to submit and deliver a satisfying solution.
	COLLAB	Supplier's capability on establishing successful collaboration with the public customer.

- **Theme 1.1. Public agency's prior level of knowledge about the PPI concept.**

In Case Ecm, the City of Oslo implemented a Public Procurement Strategy emphasizing innovative procurement as a particular challenge for the period of 2013-2016. The strategy highlighted the importance of innovation procurements, indicating a strategic focus on fostering innovation within public procurement practices. In Case Apron, the Skåne Regional Council conducted an analysis of the region's climate impact as part of its Environmental Program (2017-20201). Subsequently, the analysis led to the decision to undertake an innovation procurement aimed at purchasing more environmentally-friendly protective disposable aprons. In Case Cloud, the pre-commercial procurement initiative was co-

funded by the H2020 Framework Program. The buyer group comprised a consortium consisting of leading IT providers and ten European public research centers with prior experience in innovation procurement projects.

- **Theme 1.2: Public agency's ability to define and exploit knowledge about the needs requiring innovation**

In Case Ecm, the public organization serves as a public building owner in Oslo, and it has strategically embraced the construction of green and energy-efficient buildings. As part of this strategic goal, suppliers were mandated to construct four new kindergartens with the condition that construction sites operate 100% free of fossil fuel emissions. To further assess the detailed needs and challenges, the public agency sought assistance from an independent non-profit organization. The findings from this collaboration highlighted the necessity for innovative solutions, specifically the use of electrical construction machinery, to achieve emission-free construction sites. Consequently, the procurement approach aimed to incentivize suppliers to utilize innovative electrical construction machinery on the construction sites.

In Case Apron, the public agency, driven by its environmental targets and the findings of a climate impact analysis, identified that a significant portion of CO₂ emissions in the healthcare sector was attributed to the use of disposable products. Consequently, the procurer established targets to reduce unnecessary consumption and promote the procurement of more environmentally friendly and high-performance innovative products. Through market analysis and feedback from suppliers, it was determined that a PPI focused on acquiring innovative aprons containing at least 70% renewable materials would be a logical and impactful approach.

In Case Cloud, a consortium of ten public research organizations from seven European countries collaborated to identify the need and specifications for an innovative platform. The collective analysis revealed that there was a requirement for an innovative platform that could facilitate the sharing, storing, and analysis of large volumes of data, particularly in the context of large-scale European research projects. The innovation procurement project aimed to address the deficiency of a platform

that provided quick and easy access to large-scale data storage and analysis by leveraging hybrid cloud technologies.

- **Theme 1.3: Public agency's ability to acquire and use external knowledge about the potential solutions in the market**

In Case Ecm, the public agency initiated pre-procurement information exchange activities with potential suppliers in the market, seeking feedback on potential solutions. The effective exchange of information about solutions with the market, both before and during the procurement procedure, was identified as a critical factor contributing to the successful completion of the procurement process. In Case Apron, a seminar was organized, fostering knowledge exchange with suppliers, and a market analysis was conducted before tendering to assess the solutions available in the market. Through these analyses and dialogues with suppliers, the public agency identified that aprons should contain at least 70% renewable (bio-based) material. In Case Cloud, the buying group conducted an analysis of market capabilities and relevant standards in the pre-procurement phase. Additionally, CERN organized an open market dialogue to gather information about existing solutions and capabilities in the market. The consortium utilized this information to specify requirements and shape the procurement process.

- **Theme 2.1: Supplier's ability to submit and deliver a successful solution in an innovation procurement**

In Case Ecm, bid evaluation was conducted based on the weights of two criteria: price (40%) and quality (60%). The short timeline allotted for bid submission highlighted the importance of absorptive capacity developed through prolonged Research and Development (R&D) studies. Suppliers needed this capacity to provide a satisfactory solution within the constraints of a limited timeframe. The winning bidder was ultimately chosen for having the highest potential to meet the innovative demand. This observation suggests that excelling in such assessment procedures requires suppliers to possess a superior ability to acquire and exploit both need and solution knowledge compared to other bidders.

The significance of suppliers' need and solution absorptive capacity is seemingly reinforced in Case Apron by the failure of a previous innovation procurement

attempt. A few years before the Apron case, three country councils and regions had collectively initiated an innovation procurement for bio-based plastic aprons. However, this procurement did not conclude successfully, primarily due to the unpreparedness and inadequacy of the market and suppliers to generate solutions for the innovative need.

In Case Apron, which commenced a few years after the initial unsuccessful attempt, open dialogue meetings were organized by the procurer to disseminate information to suppliers and encourage their participation in the tender. The company that better absorbed the expectations and features of the need expressed in these meetings might have been in a more advantageous position in the tender process. Furthermore, during the negotiation round, suppliers presented the properties of the solutions they had developed. The procurer assessed how well the companies understood the need and how successful they were in developing a solution. Throughout these activities, the identification and utilization of need and solution knowledge, or absorptive capacity, proved to be of paramount importance for companies.

In Case Cloud, potential suppliers were informed about the end-users' needs and ambitions through an open market consultation. This activity served to expedite suppliers' access to detailed knowledge about the identified needs. The Most Economically Advantageous Tender (MEAT) method, which considers both technical and non-technical dimensions alongside price, was employed by the public sector for the initial bid evaluation. Given that the MEAT method emphasizes contracting with the tenderer offering the most optimal combination of requirements outlined in the tender documents, suppliers were compelled to effectively acquire and utilize need and solution knowledge throughout the procurement. In Case Cloud, the ability of suppliers to obtain and exploit both need and solution knowledge was identified as crucial.

- **Theme 2.2: Supplier's capability of establishing successful collaboration with the public customer**

In Case Apron, continuous knowledge exchange was emphasized as critical for the success of the procurement process. Collaborative efforts resulted in substantial

improvements in technical properties and pricing. Similarly, in Case Ecm, significant time was dedicated to market dialogue and negotiation, which was identified as a prominent success factor in the procurement procedure. In Case Cloud, where the procurer was a consortium comprising ten public research organizations from seven European countries, close cooperation with contractors was acknowledged as a critical element contributing to the initiative's success.

6.2.2.2. A Comparison of two PPI cases from Turkey

As a result of the comparison, various similar and distinct findings were identified and inferred regarding the mediating role of absorptive capacity in the relationship between public procurement and innovation. These consolidated findings are presented in Table 6.7. Subsequently, modified versions of the propositions were elaborated to specify the assertions derived from the comparison.

Theme 1.1. Public agency's prior level of knowledge about the PPI concept

In the initial step, evidence related to the three themes of the first proposition was discussed respectively. In Case ROV, it was identified that capability development through the acquisition of innovative products was a goal included in the public organization's strategic plan. The need assessment for the innovative product was conducted through analysis by experienced search and rescue experts within the organization. A comparative assessment of alternative solutions revealed that acquiring an innovative ROV rather than purchasing ready-made products would enhance the institution's capacity and capabilities. In Case SEG, the General Directorate of Renewable Energy (YEGM), one of the customer public organizations, possessed knowledge and experience about PPI, having previously undertaken projects for the supply of innovative products for public organizations.

Briefly, in two cases, the findings suggest that the public agencies had high prior knowledge about utilizing public procurement as a tool of innovation policy. This absorptive capacity equipped public organizations to initiate and manage innovation procurement activities more consciously and systematically.

Theme 1.2: Public agency's ability to define and exploit knowledge about the needs requiring innovation

Our observations align with the second theme of the first proposition. In Case ROV, experienced search and rescue personnel within the public organization regularly conducted analyses to identify products and technologies that would enhance their task execution. These analyses revealed that ROVs could work effectively and safely in challenging weather conditions where divers might be insufficient. Additionally, market analysis indicated that defining needs and providing opportunities for innovative solutions, rather than purchasing ready-made products, would be a more efficient use of public resources. In Case SEG, the General Directorate of Renewable Energy (YEGM), appointed as the institution responsible for monitoring, evaluating, and analyzing studies and developments related to renewable energy resources, played an active role in identifying the innovative products needed by public institutions. Analyses conducted by YEGM indicated that developing a solar power plant using innovative products would be an efficient type of PPI.

Briefly, in Case ROV, the main motivation that reveals the need for innovation is the objective of performing the task better, whereas in Case SEG, the production of an environmentally friendly energy system through national university-industry collaboration serves as an igniting factor for innovation procurement. In summary, both cases demonstrate that the procurer's ability to identify and utilize need knowledge is one of the initiating and triggering factors for PPI activities.

Theme 1.3: Public agency's ability to acquire and use external knowledge about the potential solutions in the market

The cases provide confirmative evidence for the third theme of the first proposition. In Case ROV, the experienced staff of the organization specified requirements after conducting market research and comparing alternative technologies. Consideration of the pros and cons of existing solutions paved the way for the submission of innovative products alongside ready-made ones. In Case SEG, YEGM conducted domestic and international analyses during the need identification phase to pinpoint

the innovation-required need. YEGM gathered information about the technology readiness level and production capacity of the local market from experts in TIGEM, scientific institutions, and the private sector. In both cases, the high solution absorptive capacity of public organizations enhanced the identification and generation of innovations through public demand.

The observed successful cases indicate that market capabilities and relevant standards were analyzed in the pre-procurement phase. This finding underscores the importance of acquiring and utilizing solution knowledge effectively during the pre-procurement phase.

A PPI initiated without considering the market's readiness and the willingness of companies is likely to face challenges. The evidence presented so far supports the notion that the procurer's solution absorptive capacity acts as a mediator in the relationship between public procurement and innovation. Furthermore, this impact is likely to be more substantial in the early phases of the procurement process.

In summary, in all cases, the high ability of the public procurer to acquire and use external knowledge about the need and solutions led to the determination of requirements aligned with market capabilities and technological conditions. Furthermore, designing the process and documentation in line with this information facilitated the more accurate completion of innovation procurement activities. This situation underscores the crucial mediator role of the procurer's need and solution absorptive capacity in the relationship between public procurement and innovation.

The most notable result from the data is that the high-level absorptive capacity at the procurer level plays a more critical role, specifically in the pre-tendering phase compared to the tendering and delivering phases of the procurement process. Therefore, the first hypothesis is revised as follows:

H₁: Public agency's need and solution absorptive capacity moderate the association between public procurement and innovation, in particular in the pre-tendering phase.

Theme 2.1: Supplier's ability to submit and deliver a successful solution in an innovation procurement

The exploration of findings related to the second proposition involves delving into two distinct themes. In the case of ROV, the supplier, operating as an academic spin-off situated in a technopark, had devoted a decade to extensive research and development initiatives and gained substantial market experience regarding potential solutions, competitors, and market demands within the local and global ROV market. This decade-long commitment and experience significantly elevated the company's need and solution absorptive capacity in the relevant technology. Our observations underscore the pivotal role played by the supplier's absorptive capacity in enhancing the submission and delivery of a successful solution within the context of innovation procurement.

In the case of SEG, the executive consortium comprised three institutions, each an expert in its respective field. These institutions included TÜBİTAK MAM and the Center for Solar Energy Research and Applications at METU (ODTÜ-GÜNAM), along with the supplier company Bereket Energy A.Ş. While TÜBİTAK MAM and the Center for Solar Energy Research and Applications at METU (ODTÜ-GÜNAM) contributed valuable scientific insights into the innovative product to be developed, Bereket Energy A.Ş., the manufacturing company, possessed substantial production capability and infrastructure in solar energy technology. Consequently, our observations indicate that the high level of need and solution absorptive capacity within the executive consortium had a positive impact on submitting and delivering a successful solution in this particular PPI implementation.

In conclusion, our observations highlight the positive impact of knowledge-sharing activities and open dialogue meetings initiated by public agencies to facilitate suppliers' access to need knowledge. Additionally, the consideration of quality-related factors alongside price by public procurers has been revealed to enhance suppliers' absorption of need and solution knowledge. Therefore, our findings suggest that the supplier's capability to successfully submit and deliver a solution in an innovation procurement acts as a mediator in the innovation impact of public procurement.

Theme 2.2: Supplier's capability of establishing successful collaboration with the public customer

In Case ROV, despite the limited networking opportunities before the contract due to restrictions in public procurement regulations, close interaction and knowledge exchange after the contract award contributed significantly to the success of the procurement process. This post-award collaboration led to substantial improvements in the technical properties of the product, demonstrating the critical role of such knowledge exchange in stimulating the innovation impact of public demand. In Case SEG, there was extensive cooperation and interaction between the consortium and the public customer during both the proposal preparation and production processes. Additionally, the information exchange between the supplier company and the university research unit throughout the procurement process exemplifies the importance of university-industry cooperation in innovation activities. Our observations indicate that the coordination and cooperation of the supplier company with both the customer public institution and the public institutions in the executive consortium played a significant role in the successful completion of the PPI application.

In summary, our findings align with prior research emphasizing the significance of collaboration between procurers and suppliers in the context of PPI processes (OECD, 2016; Uyarra, 2014). The most notable insight derived from our data comparison is the critical role of knowledge sharing and collaborations in PPI activities. However, the effectiveness of these interactions and networks requires a sufficient level of absorptive capacity. Across all cases, procurers and suppliers with higher absorptive capacity demonstrated a greater propensity to learn and derive benefits from collaborations. Conversely, low absorptive capacity increased the risk of failure in tenders as it hindered the effective absorption of need and solution knowledge. These findings align with previous studies (Tsai, 2009; Edquist & Zabala-Iturriagoitia, 2012; Uyarra, 2014) asserting that a satisfactory absorptive capacity is crucial for maximizing the benefits of collaboration in PPI processes. Notably, while the procurer's absorptive capacity exerts more influence in the pre-procurement phase, the mediating role of suppliers' need and solution absorptive

capacity becomes more critical in the tendering and post-award phases. Although the supplier's absorptive capacity can contribute to accurately defining needs and preparing documents in the pre-procurement phase, a high level of absorptive capacity is particularly effective at the supplier level during bidding, production, and delivery stages, aiding in a better understanding of needs and the generation of satisfactory innovative solutions. In light of these observations, our hypothesis can be refined as follows:

H₂: The supplier's ability to define and use the external need and solution knowledge moderates the relationship between public procurement and innovation, specifically in the tendering and post-award phase.

In conclusion, this section has thoroughly examined and compared the evidence related to the propositions positing the mediating role of absorptive capacity in the relationship between public procurement and innovation. The data presented here seem to affirm the hypothesis that various facets of absorptive capacity at both supplier and procurer levels play a more or less crucial and influential mediating role in different stages of the procurement process. While the absorptive capacity of a public agency proves more effective and critical in the pre-tendering phase, particularly in needs assessment and documentation, a high level of absorptive capacity becomes indispensable at the supplier level during the tendering and post-award phases.

Drawing insights from these findings, this study offers several noteworthy implications for policymakers. The subsequent section is dedicated to concluding remarks and policy recommendations aimed at benefiting suppliers, procurer agencies, and policymakers alike.

Table 6. 7. Linking cases to the propositions

Proposition	Specific theme	Specific theme description	Case ROV	Case SEG
Public organization's need and solution absorptive capacity moderate the relationship between public procurement and innovation.	PACPPI	Public agency's prior level of knowledge about PPI concept	The capability development through the acquisition of innovative products was one of the goals included in the strategic plan	General Directorate of Renewable Energy (YEGM), one of the customer public organizations, had knowledge and experience about PPI, as it had previously carried out projects for the supply of innovative products for public organizations.
	PACNEED	Public agency's ability to define and exploit knowledge related to the needs requiring innovation.	Internal R&D was the basic tool for defining the innovative need. experienced search and rescue personnel of the public organization regularly explore for the products and technologies that will help them on executing the task better. Through these analyzes, it was noticed that ROVs might work effectively and safer in hard weather conditions where divers are insufficient.	YEGM is an institution which was appointed in the 26th Meeting of the Supreme Council of Science and Technology (2013) as the responsible organization for monitoring, evaluating and analyzing studies, developments and international projects related to renewable energy resources. As a result of the analyzes conducted by YEGM, it was detected that developing a solar power plant using innovative products would be an efficient type of PPI.
	PACSOL	Public agency's ability to acquire and use external knowledge about the potential solutions in the market.	Specification of the requirements and the procurement process after conducting market research and comparing the alternative technologies.	Besides analyzing international projects, YEGM collected information about the technology readiness level and production capacity of the local market from the experts in TIGEM, scientific institutions and the private sector.

Table 6.7. *continued*

Proposition	Specific theme	Specific theme description	Case ROV	Case SEG
Supplier's need and solution absorptive capacity moderate the public procurement and innovation association.	SUBMIT	Supplier's ability to submit and deliver a satisfying solution.	Supplier, as an academic spin-off established in a Technopark, has long-term R&D effort and market experience on the potential solutions, rivals and potential demands in the local and global ROV market.	While TÜBİTAK MAM and Center for Solar Energy Research and Applications in METU (ODTÜ-GÜNAM) had valuable scientific information about the innovative product to be produced, the manufacturer company Bereket Energy A.Ş. had significant production capability and infrastructure in solar energy technology.
	COLLAB	Supplier's capability of establishing successful collaboration with the public customer.	Limited networking before the contract because of the legal restrictions A close interaction and knowledge exchange after awarding the contract contributed positively to the production and delivery activities	There was intense cooperation and interaction between the consortium and the public customer both during the proposal preparation and production processes. Information exchange between the supplier company and the university research unit during the procurement process is a good example of the importance of university-industry cooperation in innovation activities

6.3. Chapter Summary

This part of the thesis has investigated the extent to which public procurement influences firms' innovation performance and whether absorptive capacity mediates this relationship. Guided by hypotheses asserting that public procurement serves as a potent demand-side driver of innovation, and that absorptive capacity positively mediates this association, qualitative and quantitative research methods were used to find answers to two research questions of the study.

At first, the study employed Heckman two-step estimation. The analysis was conducted using a sample derived from the CIS microdata encompassing 11 European countries. Additionally, the sample was stratified into two subsamples to investigate variations in results between EU and non-EU countries.

Our research adds valuable insights to the existing understanding of the innovation impact of public procurement. Primarily, our comprehensive findings indicate a substantial and positive influence of public procurement on the innovation capacity and performance of firms. The evidence suggests that public procurement holds a greater potential for catalyzing innovation compared to other prevailing determinants. Nevertheless, the magnitude of this effect exhibits variations across different subsamples. Notably, the positive association between public procurement and innovation is more pronounced in the subset of EU member countries than in the entire sample. Conversely, the innovation impact of public procurement loses significance within the subset of Non-EU countries.

The examination of the effects of public procurement on innovation probability yields noteworthy insights. Firms engaged in Public Procurement for Innovation (PPI) demonstrate a higher propensity to introduce product innovation. However, a nuanced analysis across three different samples reveals a weaker impact for firms in non-EU countries. In summary, our findings substantiate the hypothesis regarding the substantial potential of public procurement activities in stimulating the innovation probability of firms. Furthermore, the study suggests that this influence might be more robust in EU countries compared to their non-EU counterparts.

Despite initial expectations, our estimations did not reveal significant evidence supporting the moderator role of absorptive capacity in the association between public procurement and the innovation performance of firms. Two primary reasons could be attributed to this unexpected and insignificant outcome.

Firstly, the measurement of absorptive capacity relied on a single parameter, which might be insufficient to comprehensively capture the intricacies of absorptive capacity. A more nuanced and inclusive set of variables may be necessary to provide a more accurate representation of absorptive capacity.

Secondly, our research predominantly employed quantitative methods, overlooking the tacit and embedded nature of absorptive capacity. The complexity and multifaceted aspects of absorptive capacity may require a more comprehensive qualitative study to unveil its true role in moderating the relationship between public procurement and innovation performance. As a response to these limitations, the forthcoming chapter is dedicated to a more in-depth qualitative exploration.

Several limitations warrant acknowledgment in the context of this quantitative study. Firstly, the present investigation was constrained by the utilization of cross-sectional data. To enhance the robustness of the findings, future analyses should consider utilizing data from upcoming periods or panel data spanning multiple periods for retesting the identified relationships. Secondly, a significant data loss occurred from the initial dataset owing to a low response rate to the public procurement question. To address this, it would be advantageous to undertake further analyses with a sample that incorporates a higher number of observations and spans a more extensive range of countries.

Another objective of this chapter was to investigate the moderating effects of absorptive capacity on the relationship between public procurement and innovation. Initially posited was the idea that both procurer's and supplier's absorptive capacity play a moderating role in influencing the innovation impact of public procurement. Utilizing the case study method for data collection, evidence derived from four case studies not only substantiated our initial assertions but also provided insights for refinement.

The cases demonstrated that absorptive capacity is indeed pivotal in effectively acquiring and exploiting external knowledge related to the innovation needs of public organizations. Furthermore, understanding the technical requirements and expectations of procurers during the tendering process necessitates a significant degree of absorptive capacity. A high level of absorptive capacity ensures that a firm can generate quick and effective innovative solutions in response to public demands. All these findings underscore the critical importance of a sufficient degree of absorptive capacity at the firm level, both before and during the tendering process, for successfully delivering innovative solutions through public procurement. Consequently, it becomes imperative for firms to develop this capacity well in advance of tender announcements, achieved through ongoing R&D activities, hiring qualified personnel, and providing training on innovation procurement.

Secondly, interaction and coordination across the various phases of the procurement procedure are crucial for the success of innovation procurement. The absorptive capacity of the firm acts as a process facilitator and mediator between the supplier and customer during collaborative networks. The firm's absorptive capacity plays a pivotal role in ensuring the maximum benefit is derived from knowledge exchanges and collaborations. The cases demonstrated that procurers and suppliers with higher absorptive capacity were more inclined to learn within networks. Conversely, low absorptive capacity may lead to an insufficient understanding of need and solution knowledge.

Thirdly, the cases demonstrate that the firm's absorptive capacity positively contributes to the adoption of an innovative product by the customer public agency. As highlighted by Bhattacharjee (1998), the success of the innovation process is contingent upon the internalization and exploitation of the innovative product by the customer, namely its adoption. Brem and Viardot (2015) further emphasize that absorptive capacity strongly influences the management of innovation and its adoption by users. A company with high absorptive capacity can more effectively identify and utilize external knowledge, facilitating the user's adoption of the innovative product (Brem & Viardot, 2015). Such firms can also take into account user-adoption criteria during the design and production stages.

Accordingly, in Case ROV, the interplay between users and producers during production, along with end-user training provided by the supplier after delivery, significantly contributed to the successful adoption of innovative goods by the public organization. Problems might have been encountered if this product were used without training, potentially impeding its acceptance and adoption by the public agency. Edler and Yeow (2016) similarly found in their case study that resistance to the use of new technology by public personnel was a significant obstacle to overcome. In this context, end-user training and user-producer interactions during procurement facilitated users in using and adapting to the product more easily.

As a result of the analysis and comparison of the cases, the evidence also led us to revise the initial propositions. It is asserted, as a step forward, that the priority of the absorptive capacity of the buyer and the supplier varies due to the different stages of the procurement process. While the procurer's absorptive capacity plays a more critical role in the pre-procurement phase, the absorptive capacity of the supplier is more influential in the tendering and post-award phases.

CHAPTER 7

POLICY IMPLICATIONS

This chapter focuses on presenting policy recommendations derived from the innovation literature and the research findings. The formulation of these policies followed a structured approach, depicted in Figure 7.1, encompassing three distinct phases aligned with the Systems of Innovation (SI) framework (Borrás & Edquist, 2013; Chaminade & Edquist, 2005; Freeman, 1987; Lundvall, 1992; Nelson, 1993).

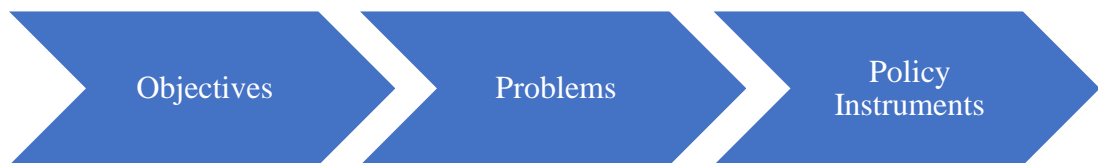


Figure 7. 1. The three phases of the policy-making process

Source: Author's own work

The first step is to set goals, as shown in Figure 7.1. In alignment with the insights derived from the analyses conducted in the previous chapters of the thesis, two objectives have been identified with the primary goal of enhancing innovation performance in PPI activities. These objectives are outlined as follows:

- *Promotion and dissemination of PPI implementations*
- *Enhancement of the PPI-related absorptive capacity of suppliers and procurers*

Subsequently, within the scope of the outlined objectives, challenges within the innovation system that contribute to diminished innovation performance in PPI activities have been discerned, drawing insights from both existing literature and our research findings. Lastly, the policy instruments crafted to address and alleviate these

identified challenges have been expounded, categorized across macro (system/national), meso (organizational/industrial), and micro (individual/skill) levels. Before delving into the presentation of these policy instruments, the subsequent section discusses the theoretical framework adopted in the design of these policies, providing thorough insights into the underlying rationales.

7.1. The Rationales for Using Systems of Innovation Approach in PPI Policy Design

Innovation policies encompass governmental actions or interventions designed to shape the inception, advancement, and dissemination of innovations. Two predominant theoretical frameworks guiding government involvement in innovation policies are the neoclassical and evolutionary theories (Bleda & Del Río, 2013; Borrás & Edquist, 2013; Chaminade & Edquist, 2010). These theories stand in explicit contradiction, offering distinct perspectives on the rationale behind government intervention in the innovation process. This section has delved into an exploration of how these theoretical frameworks address the PPI procedure, examining their respective implications for designing and implementing effective PPI policies.

In the neoclassical approach, the primary justification for government intervention in innovation lies in the recognition of market imperfections. According to this perspective, innovation policies should be crafted and implemented specifically for cases and domains where market mechanisms fail to operate optimally (Bleda & Del Río, 2013; Chaminade & Edquist, 2010). The neoclassical viewpoint traditionally perceives the innovation process as a linear sequence—a fixed progression of steps without feedback loops—where research activities directly yield novel products (Rosenberg, 1994). Additionally, market failures may arise due to the three characteristics of scientific knowledge—uncertainty, indivisibility, and inappropriability—resulting in inefficient allocation and insufficient investment in R&D. Consequently, neoclassical technology and innovation policies often focus on designing financial R&D subsidies to address these market failures (Chaminade & Edquist, 2005; Lipsey & Carlaw, 1998).

However, the neoclassical approach faced substantial criticism from evolutionary theorists during the 1980s and 1990s for its limitations in capturing and explaining the intricacies of the innovation process (Freeman et al., 1982). According to evolutionary theorists, innovation occurs within a system, and government intervention becomes necessary not only in the case of market failure but particularly when there is a systemic failure. The innovation process is complex and uncertain, heavily influenced by the surrounding environment and institutions. In this view, firms, universities, and governments interact as key actors within the innovation system to create innovations. Consequently, innovation policies crafted through the evolutionary approach primarily aim to establish a well-functioning innovation system (Akçomak, 2016; Dosi, 1988; Erdil et al., 2016; Lundvall, 1992; Metcalfe, 1998; Nelson, 1993).

In the contemporary literature, numerous studies and reports persist in framing the innovation process and policies within the confines of the neoclassical perspective. Neoclassical-driven innovation policies for PPI activities predominantly center on addressing market failures and advocating for financial R&D investment, rooted in the assumption that the innovation process follows a linear trajectory (Chaminade & Edquist, 2010; Edquist, 2014). Despite the valuable insights provided by these studies, which enhance our comprehension of innovation procurement activities, this thesis contends that formulating PPI policies solely through a conventional neoclassical approach would be inadequate and insufficient. The arguments supporting this assertion can be delineated under the following two subheadings.

Firstly, the flaw in some prior studies lies in the defective portrayal of the PPI process as a linear sequential activity. For instance, Edquist and Zabala-Iturriagoitia (2012) define the typical PPI process as a combination of five interconnected stages. However, this definition inadequately addresses the evolved understanding of the innovation process over time, as the PPI process encompasses not only public procurement activities but also an innovation procedure. While the first and second generations of innovation models in the 1950s and 1960s (need-pull and technology push) perceived innovation through a neoclassical lens, defining it as a procession of steps, more recent models view innovation as a systemic activity integrating feedback loops, collaborations, interactions, and IT-based networking.

This shift is prompted by the recognition of the risky, uncertain, and complex nature of innovation phenomena (Rothwell, 1994).

Hence, this study posits that the PPI process, functioning as an innovation policy tool, unfolds within an economic environment, involving interactions among various agents. Edquist et al. (2000) underscores the critical importance of user competence in markets and technologies, interactions between public experts and producers, and the correct timing for early and sophisticated demand that triggers new technologies. Edler and Georghiou (2007) argue that reconciling additional public needs with supplier capacities at early stages is a key provision for enhancing performance and mitigating complexity in innovation procurement activities. Edler and Yeow (2016) particularly emphasize that achieving innovation as a result of procurement activities often requires interactions and risk-sharing between parties, making intermediation crucial both between and within organizations to overcome challenges and complexity in the process. Additionally, Rolfstam (2009) asserts that a conventional conceptualization of public procurement as a procedure for supplying ready-made products and services inadequately comprehends the PPI process. While regular public procurement is seen as a linear activity primarily regulated by laws, PPI is a more intricate process linked not only to procurement regulations but also to the innovation system. The PPI process possesses a systemic character that necessitates evolution through feedback loops and well-established networks.

Secondly, a notable shortcoming in many previous policy studies, as well as some EU reports, lies in the recommendation of identical strategies for all countries and sectors, neglecting the context-specific and socially embedded nature of innovation procurement activities. In this regard, Edquist et al. (2000) compare various public technology procurement (PTP) cases and assert that an efficient PTP requires a planning approach that acknowledges this procedure is not an isolated activity but is deeply connected to the historical and political-economic environment in which it takes place. They caution against the adoption of PTP cases universally and at any cost, advocating instead for the identification of specific cases where this type of procurement can be advantageous. Similarly, Akçomak (2016) underscores one of the major challenges in innovation policy development: the implementation of uniform policies across countries without considering the unique conditions

prevailing in each nation. He advocates adapting policies to contextual and social requirements specific to each country.

Furthermore, Rolfstam (2009) highlights the critical role of institutions in innovations stemming from public procurement. He emphasizes that PPI is a market process significantly influenced by the social, collaborative, and institutional conditions of the relevant environment. Thus, it can be asserted that institutions play a pivotal role in designing PPI policy plans, and policy recommendations should be tailored by considering country and sector-specific conditions rather than adopting a "one-size-fits-all" approach.

Building upon the justifications outlined above, this study contends that developing effective plans and policies for PPI activities necessitates a more comprehensive understanding than the neoclassical approach can provide. It becomes apparent that achieving successful innovation outcomes through PPI policy instruments developed solely through a neoclassical lens is unlikely. This study posits that the evolutionary approach offers a more holistic understanding of the PPI process compared to the neoclassical approach, and the SI framework serves as an apt foundation for formulating efficient PPI policies. Within this perspective, our approach initially identified the innovation system problems hindering the attainment of our objectives and subsequently crafted policy tools to address these challenges. The problems identified regarding both of our objectives are shown in Table 7.1. The following section delves into a detailed discussion of these identified problems and the recommended policy instruments.

Table 7. 1. The Objectives and Problems

Policy Aim	Policy Level	Problems
Promotion and Dissemination of PPI Implementations	Micro-level policies	Lack of awareness and motivation of actors about the innovation potential of public needs.
	Meso-level policies	Lack of knowledge sharing and interactive learning among organizations
		Risk aversion and lack of risk management
	Macro-level policies	Lack of a tailor-made action plan and a specialized agency
		Deficiencies and uncertainties in the legal framework
		The presence of factors that reduce transparency

Table 7.1. (continued)

Enhancement of the PPI-related Absorptive Capacity of suppliers and procurers	Micro-level policies	The inability of public personnel to identify the public innovation need by acquiring and using need and solution knowledge
		the supplier's inability to understand the need knowledge and deliver a satisfactory innovative solution
	Meso-level policies	Lack of intra-organizational and inter-organizational coordination for the assimilation and use of need and solution knowledge
	Macro-level policies	establishing intermediation mechanisms and actors R&D subsidies for research activities related to PPI activities

7.2. Promotion and dissemination of PPI implementations

7.2.1. Micro-level strategies

7.2.1.1. Lack of awareness and motivation of actors about the innovation potential of public needs.

In recent years, numerous studies have explored how governments can leverage public demand to drive innovation, aiming to enhance the effectiveness of the public sector and services. However, despite these efforts, actors and organizations still lack sufficient awareness and motivation concerning the process and added value of innovation procurement. According to country responses in the OECD Survey on Strategic Innovation Procurement (2015), awareness-raising emerges as a significant challenge in the context of Public-Private Innovation (PPI) policies across OECD countries. This challenge prompted the OECD to designate "awareness-raising" as one of the nine action areas requiring framework development in PPI activities (OECD, 2016). Georghiou et al. (2014) have similarly identified the lack of awareness regarding the innovation potential of public demand as a significant deficiency in organizations. A survey of 800 suppliers in the UK revealed that the explicit demand for innovation in tender documents is the most influential factor among the 17 variables affecting the PPI process (Uyarra et al., 2014).

Our study aligns with these observations, indicating that while there is a certain level of awareness in both the public and private sectors regarding the potential of public

demand to drive innovation, there exists a knowledge gap on how to implement the process. Moreover, there is insufficient motivation due to uncertainties and a high-risk perception associated with the PPI process.

Various initiatives aimed at raising awareness have been undertaken by policymakers. Notably, the Norwegian authorities have introduced startup programs to incentivize and reassure both public organizations and suppliers about adopting the PPI method. The European Commission organized conferences in Germany (2016) and Estonia (2017) dedicated to capacity building, experience sharing, and fostering networks in PPI activities. Additionally, the EU authorities established the Innovation Procurement Platform (<https://innovation-procurement.org/>) to bolster awareness and motivation through the organization of numerous events and summits spanning diverse sectors and stages. In addition to these examples, the following activities are proposed to further enhance awareness and motivation regarding PPI activities in both the public and private sectors:

- Organizing domestic and international workshops and seminars.
- Encouraging and supporting study visits to exchange examples of good practice among countries and institutions.
- Setting up a web page and using social media tools for announcements and information sharing.
- Establishing reward and financial incentive mechanisms for public personnel applying PPI.
- Designing specialized training and certification program to train PPI experts.

7.2.2. Meso level strategies

7.2.2.1. Lack of knowledge sharing and interactive learning among organizations

The innovation literature underscores the paramount importance of interaction and interactive learning among actors within the innovation system (Nelson & Winter, 1982; Edler et al., 2005; Tsai 2009; Ozman, 2009; Zeng et al. 2010). Accordingly, studies on PPI also emphasize the necessity of procurer-supplier dialogue and

knowledge exchange before and during the procurement process (OECD, 2016; OGC, 2004; Edler & Yeow, 2016; Georghiou et al. 2014). Despite such recognition, insufficient knowledge sharing and interactive learning among organizations pose significant obstacles in PPI activities. A survey examining various aspects of innovation activities among 800 suppliers in the UK, conducted by Jakob Edler et al. (2015), identified "early interaction with the procuring organization" as the second most critical factor in PPI activities. However, 45% of suppliers highlighted the lack of dialogue and knowledge sharing with procurer organizations as a substantial barrier.

Our case studies similarly underscore the importance of high levels of communication and coordination between procurers and suppliers in reducing barriers and enhancing the potential for innovation. Conversely, a low level of interaction between these parties impedes the successful execution of the PPI process. In light of these findings, this study recommends the following activities to facilitate interaction and networking among stakeholders before and during PPI implementations:

- Organizing regional and sectoral workshops and seminars before tendering to inform all potential producers about the PPI
- Establishing pre-tender dialogue to obtain information on existing and potential innovative solutions and technologies
- Requesting feedback from the market on the requirements and specifications prepared by the public experts
- Exchanging information during the production process by including interim inspection and feedback at certain stages of production in the tender documents.
- Cooperating with the supplier for easy adaptation of the product within the procurer agency by including a provision in the tender documents regarding the training on the use of the delivered product.
- Involving intermediary mechanisms to facilitate communication and networking.

A guiding principle throughout all these activities is to avoid any behaviors that could compromise transparency, impartiality, and competition. The repetitive execution of these activities while upholding transparency serves to enhance interactive learning, knowledge exchange, and trust among the involved actors.

7.2.2.2. Risk aversion and lack of risk management

Risk aversion and insufficient risk management strategies in the public sector are the critical barriers encountered during the PPI procedure (Edler et.al, Edler 2005). Risks associated with financial, technological, organizational, market, and turbulence issues can lead to inaccurate determination of requirements, poor satisfaction of demand, delays in delivery, inefficiencies in R&D, and wastage of public resources, among other potential challenges (Edler et al., 2015; Miller & Lessard, 2008; Tsipouri et al., 2010).

While it is impossible to eliminate all these risks, effective management of risks can significantly contribute to the success of innovation procurement activities (Bannerman, 2008). Both Edler et al. (2015) and Tsipouri et al. (2010) recommend that a risk management strategy in PPI activities should be structured around three main tasks. Firstly, risks and potential rewards in the PPI process need to be identified, addressing and evaluating these risks by considering their causes, sources, probabilities, and potential consequences. Subsequently, activities and responsibilities that can mitigate the likelihood of each risk occurring should be determined. The final step involves outlining actions to minimize the potential consequences of the risks and allocating responsibilities for bearing the costs and diminished benefits of these activities. All these steps necessitate accurate information, negotiation, and the cultivation of qualified personnel in the field.

In this context, this study proposes the development of a tailored risk management plan by qualified personnel at the commencement of the procurement process. This plan can be crafted by following the steps advocated by Tsipouri et al. (2010). Such a strategic approach not only enhances the likelihood of realizing a successful innovation through PPI but also minimizes the potential crises that may arise in the event of activity failure.

7.2.3. Macro level strategies

7.2.3.1. Lack of a tailor-made action plan and a specialized agency

The increasing emphasis on national innovation policies to catalyze innovation through public demand has prompted numerous action plans and policy initiatives in recent years. While the strategy of fostering innovation and technology development through public demand has historical roots, its formal inclusion in official documents, particularly as national and regional targets in Europe, gained prominence mostly after the 2000s. Notably, the European Commission's "Research Investment Action Plan (2003)" is recognized as the initial step in articulating the objective of stimulating innovation through public procurement activities at the EU level.

In response to the European Commission's Research Investment Action Plan in 2003, numerous European countries have issued their own national action plans to stimulate innovation through public procurement. Notable examples include Finland's "Action Plan for Demand and User-Driven Innovation" in 2010, Denmark's establishment of a council and the preparation of a "Strategy for Intelligent Public Procurement" in 2013, and Belgium's regional-level "Action Plan on Procurement of Innovation" initiated in 2008.

Turkey marked its first official initiative on innovation procurement activities in the "National Science, Technology, and Innovation Strategy 2011-16" published in 2010. The Netherlands stimulates innovation procurement within the action plan "Innovatiegericht Inkopen," while the German federal government established the competence center KOINNO in 2014 to coordinate and promote PPI activities.

In Sweden, public demand as a vehicle for innovation is included in the National Public Procurement Strategy (2016) and the Swedish innovation strategy (2012). The National Agency for Public Procurement and Sweden's innovation agency VINNOVA play key roles in supporting and financing the procurement of innovations. In the United States, the Small Business Innovation Research Program (SBIR) was enacted in the 1980s, and the United Kingdom established the SBRI

(Small Business Research Initiative) in 2009, inspired by the U.S. SBIR, managed by Innovate UK.

While some countries, like Sweden and the United States, have actively embraced PPI, others prefer a "no policy" strategy, omitting direct targets for PPI activities in their national strategic and innovation plans. However, Lember et al. (2014) criticize existing PPI policies for relying heavily on supply-side policy instruments like R&D incentives. They argue for more effective plans that address chronic problems of PPI, such as risk aversion, lack of interaction, and a shortage of qualified human resources.

Moving forward, new action plans should be designed with insights gained from past experiences and successful PPI practices to address persistent challenges. Recognizing the context-specific nature of innovation policies, tailor-made plans should be developed, considering the social, economic, geographical, technological, and other conditions of individual countries.

Furthermore, it is notable that surveillance and assessment issues are often overlooked and not adequately incorporated into many of these action plans and strategies (OECD, 2016). OECD (2014) recommends considering monitoring and evaluation issues at the design stage of innovation policies. In light of this, it is suggested that a state-level public agency or center be established or appointed to monitor the realization of set targets, swiftly address process obstacles, and facilitate decision-making and political support. Germany's KOINNO, Sweden's VINNOVA, and Innovate UK serve as commendable examples that can be studied and draw inspiration for countries and regions adopting this strategy.

7.2.3.2. Deficiencies and uncertainties in the legal framework

The early instances of innovation procurement lacked a solid foundation of legal regulations. Initial efforts to align public procurement legislation with innovation procurement were reflected in the directives published by the EC in 2005 and 2011. The increasing body of research in this area prompted decision-makers in the EU to undertake more comprehensive revisions in public procurement regulations. In 2014,

the European Parliament and the Council issued three new directives (2014/23/EU, 2014/24/EU, and 2014/25/EU) to establish a legal basis for PPI implementations.

These directives mandated many European countries to revise their legislation in accordance with PPI principles. However, the implementation of the procedures outlined in the directives varied significantly among EU countries. While some nations achieved positive outcomes through these revisions, others did not experience notable effects (Georghiou et al., 2014; OECD, 2016). The importance of "procurement law compliance" was underscored as the most significant challenge by 77% of participants in the "Public procurement of innovation" survey conducted in 2016 by the Bundeswehr University of Munich at the request of the Innovative Procurement Competence Center (KOINNO).

Another survey exploring the main barriers to PPI (Jakob Edler et al., 2015) identified prominent impediments such as an excessive focus on price, restrictions on variants, risk aversion, and inadequate management of IPR. The absence of clear and guiding regulations in procurement laws and directives was recognized as a leading cause for these challenges. Therefore, this study proposes that the modernization of the legal framework, aimed at facilitating and encouraging innovation procurement in public organizations, stands as the most crucial task for lawmakers and public authorities.

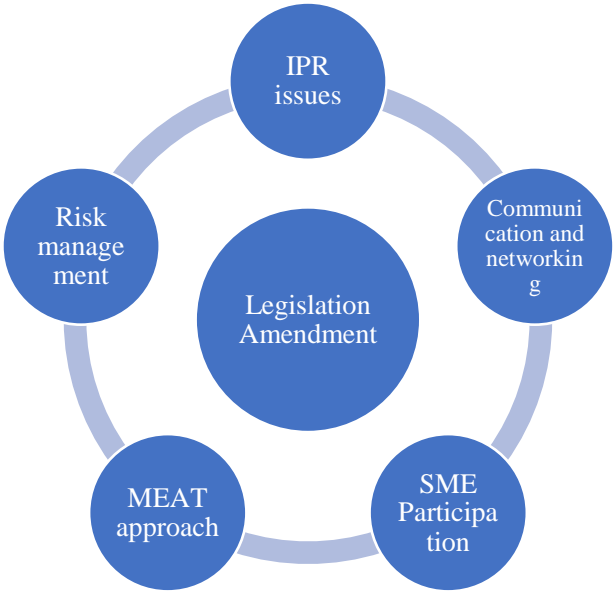


Figure 7. 2. Main issues subject to the Amendment of Legislation

Source: Author's own work

7.2.3.3. The presence of factors that reduce transparency

As a general rule, one of the fundamental principles of the public procurement directives is transparency. The principle of transparency stipulates that all pertinent suppliers should be provided with equal information, enabling them to participate in the tender process without discrimination. Decisions are expected to be made impartially and transparently by public authorities at every stage. Transparency serves as a linchpin for fostering competitiveness in both price and quality, ensuring the effective utilization of public resources. Establishing a transparent system in public purchasing is crucial for achieving a higher level of efficiency and accountability, as emphasized by Bovis (2012).

Hence, transparency should be a guiding principle in PPI activities. Throughout various stages of innovation procurement, including early communication, market research, bid evaluation, awarding, and contract management, all activities and decisions must be conducted with a commitment to transparency. The importance of transparency is underscored by the results of the "Public procurement of innovation" survey conducted in 2016 by the Bundeswehr University of Munich, where "Transparency of procurement process" emerged as the second most crucial factor among the 15 identified (Edler et al., 2015).

In the UK, Uyarra et al. (2014) identified a lack of transparency as one of the major barriers to PPI activities. Case studies conducted by various authors reveal that public institutions achieving successful results adhere to the principles of transparency, openness, and accountability in all PPI processes. This transparent approach not only mitigates the risk perceptions of public personnel toward PPI but also enhances the willingness of other procurers and suppliers to participate in subsequent PPI practices.

In this context, the initial focus for countries should involve identifying regulations and practices that hinder transparency, followed by the development of an action plan to rectify any potential adverse impact on transparency. This study proposes the following activities as integral components of these action plans aimed at enhancing transparency in PPI activities:

- Prioritizing open and accessible dialogues over closed ones
- Avoiding favoritism or discrimination against a firm based on political, regional, personal, or other interests
- Promoting a fair and equitable evaluation procedure for potential suppliers
- Applying Most Economically Advantageous Tender (MEAT) criteria rather than focusing solely on the lowest price
- Ensuring the transparency and visibility of the utilization of public resources
- Activating intermediary mechanisms in cases where there is a significant absorptive capacity gap between the parties
- Ensuring free access to tender documents through an online portal

7.3. Enhancement of the PPI-related Absorptive Capacity of suppliers and procurers

7.3.1. Micro level strategies

7.3.1.1. The inability of public personnel to identify the public innovation need by acquiring and using need and solution knowledge

The public organization plays a central role in the PPI process, serving as the entity that identifies needs, evaluates bids, and ultimately utilizes the innovation. For a PPI implementation to be successful, public procurers must continuously enhance their knowledge and skills in areas such as need identification, market engagement, bid evaluation, contract management, risk assessment, and more. The inadequacy of the procurer agency at any stage can potentially lead to the failure of the entire process (Semple, 2014).

In a survey conducted by OECD (2016), countries reported the insufficiency of public personnel to identify needs and understand the innovation potential in the market as primary obstacles in PPI activities. The low capabilities of procurers were also highlighted as a major challenge in a survey of 800 suppliers in the UK (Edler et al., 2015). According to Edler and Yeow (2016), the specification and understanding of not only existing but also potential solutions in the market pose a significant barrier to PPI activities.

Case studies reveal that public organizations capable of identifying innovation needs aligned with market opportunities and articulating requirements clearly are more likely to achieve successful PPI processes. Therefore, public institutions and policymakers should conduct various research and training activities to enhance the ability of public procurement staff in identifying innovation needs by acquiring and applying knowledge related to needs and solutions. Some of these activities may include:

- designing tailor-made training programs for procurement staff focused on need and solution assessment
- conducting R&D activities led by public organizations for long-term needs planning
- identifying potential sectors and technologies conducive to PPI activities
- conducting market research on existing solutions and potential technological advancements that could be developed in the future
- employing PPI experts within the public sector
- seeking support from PPI intermediaries for needs assessment and process planning

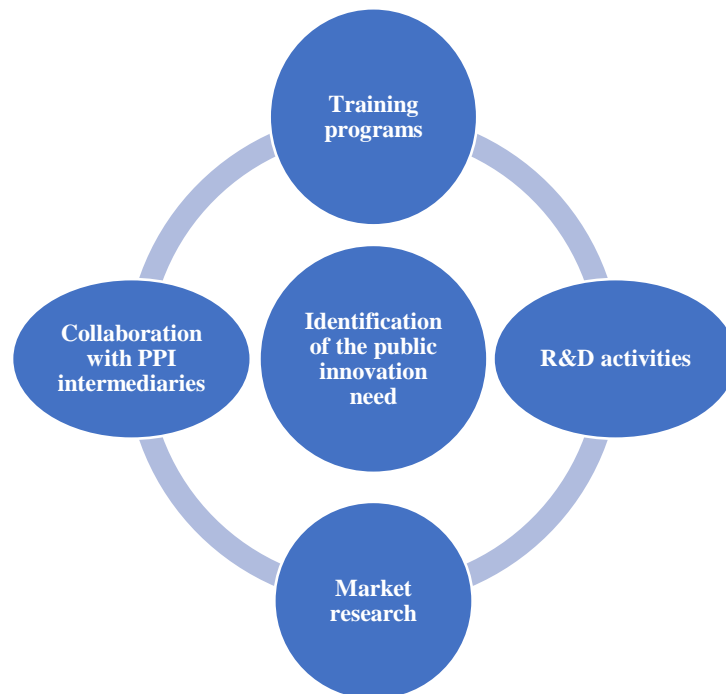


Figure 7. 3. The process of innovative needs identification

Source: Author's own work.

7.3.1.2. The supplier's inability to understand the need knowledge and deliver a satisfactory innovative solution

Since a PPI activity aims to procure an innovative product with novel properties, efficiently acquiring and leveraging external knowledge about procurers' needs becomes crucial for potential suppliers (Edler et al., 2005). Suppliers must effectively comprehend and utilize need information to develop a satisfactory solution for the public organization's unmet requirements (Ancori et al., 2000; Georghiou et al., 2014). However, one of the primary challenges in PPI activities is the insufficient ability to understand the procurer's need and the functional improvements to be achieved through innovation (Edler & Yeow, 2016).

This thesis emphasizes the significance of the need and solution absorptive capacity of suppliers in detail (see section 2.2.2). Consequently, our case study analysis has demonstrated that the key requirement for a successful innovative procurement by the public sector is to identify companies in the market that can accurately understand needs and integrate this knowledge with solution expertise for an innovative product. Based on this insight, the following policy recommendation focuses on activities aimed at enhancing the ability of existing and prospective suppliers to provide a satisfactory innovative solution to procurers by obtaining and utilizing external need knowledge related to public demand.

The first of these activities should focus on enhancing suppliers' knowledge of PPI procedures and the legal framework. PPI involves a process that may require specific qualification documents and adherence to stages defined within the framework of procurement laws and regulations. Firms lacking experience in public procurement may find many requests unfamiliar, from correctly preparing bids to participating in the tender. This challenge increases the risk that innovative firms with the potential to contribute to innovation may encounter difficulties in PPI due to shortcomings in the tendering and paperwork processes. To address this, public authorities and policymakers should organize seminars and training sessions, with a particular emphasis on the responsibilities of suppliers in a PPI. Additionally, suppliers should consider recruiting PPI specialists or outsourcing PPI consultancy to navigate the complexities of the process more effectively.

Another effective strategy to enable suppliers to produce more effective results for the public's PPI demands in a shorter time would be to inform suppliers about long-term and high-volume public needs. Public authorities should proactively communicate the market's long-term needs planning and potential future PPI purchases to guide the R&D activities of suppliers. In this regard, it would be valuable for public institutions to conduct collective needs analysis through projects that involve public-university-industry cooperation, periodically sharing the results with all potential suppliers.

7.3.2. Meso-level strategies

7.3.2.1. Lack of intra-organizational and inter-organizational coordination for the assimilation and use of need and solution knowledge

The positive impact of collaborative networks on innovation performance has been extensively discussed in the innovation literature. Many of these studies have concurred on the positive influence of cooperation in harnessing knowledge for the generation of innovation (W. Becker & Dietz, 2004; Miotti & Sachwald, 2003; Nieto & Santamaría, 2007; Ozman, 2009; K.-H. Tsai, 2009). In line with this, studies on PPI have emphasized the importance of collaboration between procurers and suppliers (OECD, 2016; Uyarra, 2014). Furthermore, numerous studies have indicated that maintaining a sufficient level of absorptive capacity is imperative for both parties to facilitate interactive learning within the network between suppliers and customers (Mowery et al., 1996; Kim, 1998; Lane & Lubatkin, 1998; Lane et al., 2001). Our case studies have revealed that both intra-organizational and inter-organizational cooperation are essential in PPI activities to effectively acquire and utilize need and solution knowledge by each party.

Nevertheless, insufficient coordination and networking have emerged as major challenges in PPI activities. Country responses to surveys presented in OECD (2016) have highlighted that dialogue with stakeholders and the lack of communication or cooperation are the foremost issues policymakers need to address. Therefore, this study proposes that policymakers and public authorities should take specific actions

to improve intra-organizational and inter-organizational coordination for the effective assimilation and utilization of need and solution knowledge. According to our perspective, some of these actions could be listed as follows.

First and foremost, this study recommends enhancing intra-agency coordination within the public sector. In a PPI activity, various stages are typically managed by different units within a public agency. For instance, user units are responsible for determining needs and requirements, while purchasing units handle the evaluation of offers and the tendering process. Given that PPI involves greater uncertainty and risk than the standard procurement process, increased coordination among these units is essential for effectively acquiring and utilizing need and solution knowledge. To ensure internal coordination, conducting meetings before, during, and after the PPI process would significantly contribute to building a high absorptive capacity within the public sector.

Similarly, close coordination among the technical, logistics, financial, etc., units of the company is essential during the stages of tendering, production, and delivery for the acquisition and efficient use of external knowledge. Deficiencies in intra-coordination within the company may heighten the risk of failure by impeding the complete understanding and exploitation of need and solution knowledge. Therefore, interdepartmental knowledge exchange and coordination channels should be established and utilized extensively to comprehend the public need and develop an innovative solution.

In addition, a dense network with cohesive ties between actors significantly contributes to absorptive capacity at the procurer and supplier levels. This study suggested several actions to facilitate interaction and dialogues among stakeholders in PPI implementations. It is anticipated that these activities would also be beneficial in increasing the absorptive capacity of the parties through interactive learning. In addition to these activities, it is suggested that universities, as important actors in an innovation system, should be involved in collaborations to emphasize the enhancement of absorptive capacity. Both the public and private sectors can leverage the R&D capacity and capabilities of universities to improve their absorptive capacity related to PPI.

7.3.3. Macro-level strategies

7.3.3.1. Establishing intermediation mechanisms and actors

The importance of interactions and linkages in innovation activities is a well-established theme in the literature (Edquist, 1997; Freeman, 1995; Lundvall, 1988; Nelson & Winter, 1982). These interactions can manifest within an organization, between different parties, and with various stakeholders. Our case studies have revealed that conflicts arising in these interactions pose an increased risk of failure at various stages. Intermediation in innovation emerges as a recommended and effective mechanism to alleviate these conflicts by facilitating knowledge sharing and bridging knowledge gaps within and between parties (Edler & Yeow, 2016).

Intermediaries play an active role in facilitating knowledge diffusion, managing innovation within organizations, establishing a general foundation for connecting systems within and between networks, and engaging specialist service organizations (Howells, 2006). In a PPI implementation, actors or organizations serving as intermediaries can be involved in various stages, either partially or comprehensively (Bessant & Rush, 1995). Edler and Yeow (2016) propose four distinct roles for intermediaries in a PPI process. They may oversee the procurement procedure partially or entirely, acting as brokers to establish linkages between the involved parties. Intermediaries can also provide essential intelligence, serving as content experts to assist the procurer organization in defining needs, conducting market research, and facilitating interactions. Additionally, intermediaries may contribute as trainers, enhancing the organization's capacity and developing process capabilities for effective learning within the procurer organization (Edler & Yeow, 2016).

In light of the theoretical considerations mentioned earlier, this study proposes the establishment of intermediation mechanisms, instruments, and actors at both regional and national levels. These actors may include experts, consultancy service providers, or public organizations; however, it is crucial that they possess a high level of education, qualifications, and impartiality. The creation of intermediaries, tasked with rectifying deficiencies on the part of both procurers and suppliers, would significantly contribute to the success of PPI activities.

7.3.3.2. R&D subsidies for research activities related to PPI activities

The most effective tool to enhance the absorptive capacity of an institution is the internal R&D efforts (Cohen & Levinthal, 1990). However, since the R&D activities carry a high risk of financial investment loss due to the risk of failure, countries and policy organizations have developed financial support mechanisms to encourage organizations to bear these risks (Ciftci & Darrough, 2016; OECD, 2015).

On the other hand, PPI implementations exhibit a more knowledge-intensive and research-intensive nature compared to conventional procurement practices. The process involves various stages, ranging from identifying public needs that demand innovation to evaluating potential market solutions, and from formulating technical specifications to developing prototypes – each stage necessitates significant financial Research and Development (R&D) resources (Edler et al., 2015; Edquist et al., 2015). Recognizing the intricate demands of these phases, some governments have initiated diverse financial support programs to invigorate and facilitate PPI implementations. Examples include the Small Business Innovation Research (SBIR) program in the United States, the Small Business Research Initiative (SBRI) program in the United Kingdom, the Small and Medium Business Administration (SMBA) program in Korea, and PPI funding under the Research and Innovation Program Horizon 2020 in the European Union (OECD, 2016).

The study highlights that a majority of the success stories examined underscore the essential requirement of ample financial resources. However, according to OECD (2016), the general opinion in countries is that the existing funds and financial incentives for PPI are insufficient. In this context, this study proposes not only an overall increase in financial support allocated to PPI but also specific financial incentives aimed at augmenting the absorptive capacity of both procurers and suppliers. These proposed incentives align closely with the central focus of this thesis.

Initially, it has been observed that there is a notable absence of financial support for the crucial stage of "needs and market analysis," anticipated to be undertaken by

public organizations. While certain public agencies may have the capacity to conduct such analyses, the majority face limitations in terms of both financial resources and manpower required for comprehensive research in this domain. Consequently, providing financial support to these public organizations for their research endeavors related to "determining public needs requiring innovation and exploring potential innovative solutions in the market" would not only alleviate their constraints but also stimulate the identification of prospective areas for innovation procurement.

Secondly, as detailed in section 4.3.1.2, a notable challenge in PPI implementations lies in the supplier's difficulty in comprehending the required knowledge and delivering a satisfactory innovative solution. To address this issue, this study proposes the allocation of financial resources for activities specifically designed to enhance the absorptive capacity of suppliers in understanding needs and providing innovative solutions, as outlined in article 4.3.1.2

Finally, the financial support for need analyses and training, conducted collaboratively among three key actors (University-Industry-Public), emerges as another crucial area for funding. By facilitating financial backing for these joint research and training initiatives, there is an opportunity to streamline knowledge exchange and learning among the involved parties. This not only encourages collaborative efforts but also significantly bolsters the absorptive capacity of all stakeholders involved.

CHAPTER 8

CONCLUSIONS

8.1. Concluding Remarks

The dissertation pursues a dual objective. Firstly, it delves into the extent to which public procurement serves as a catalyst for innovation. The study systematically assesses the impact of public procurement on the innovation performance of firms, drawing comparisons with the influence of other drivers such as demand pull and technology push factors. The contention put forth is that the active demand and procurement of innovative products by the public sector can serve as a valuable instrument in enhancing the innovation performance of the private sector. Notably, by utilizing a sample encompassing multiple countries, this study surpasses prior research, resulting in more comprehensive findings and implications.

The estimation results affirm the pivotal role of public procurement as a significant tool in fostering the innovation performance of firms. Furthermore, the findings suggest that the positive impact may be more pronounced for firms operating within EU member countries. I believe that this is a positive reflection of the regulations, policies and effective incentives developed by EU policy-making authorities in recent years. I think it would be beneficial for non-EU countries to follow the EU policies on PPI and implement them in accordance with the country-specific conditions.

Furthermore, this dissertation analyzes the mediating role of absorptive capacity in the interplay between innovation and public procurement, elucidating the mechanisms through which this mediation takes place. While the quantitative estimation conducted in the second chapter did not yield statistically significant results concerning the mediating impact of absorptive capacity, the insights obtained

from case studies conducted in Turkey suggest a notable mediator effect in the relationship between innovation and procurement. It can be asserted quite confidently that firms and public agencies having higher level of absorptive capacity are more likely to accomplish successful innovation through public procurement.

In two specific cases, the research findings underscored that public agencies equipped with absorptive capacity, characterized by a robust understanding of utilizing public procurement as a tool for innovation policy, demonstrated a more conscious and systematic initiation and management of innovation procurement activities. Building on this insight, I contend that the strategic plans of public organizations should incorporate capability development through the acquisition of innovative products. By explicitly including PPI as a target in top policy documents, awareness within public institutions can be heightened, motivating them to proactively develop absorptive capacity in this critical domain.

Furthermore, I propose that designating specific public institutions with expertise in particular sectors and product groups to oversee and coordinate innovation procurement efforts would enhance the efficiency and effectiveness of both procurement and innovation processes. I firmly believe that expecting public institutions to evolve their PPI-related absorptive capacity necessitates the implementation of incentive and support mechanisms, as outlined above, to foster a conducive environment for growth and innovation within the public sector.

In my view, there is a crucial need to elevate the knowledge and expertise of personnel involved in PPI within public decision-making bodies and procurement units. The case studies underscored the significant contributions made by expert personnel possessing a high absorptive capacity to the success of PPI processes. It would be a wrong strategy to expect public personnel to shoulder all risks associated with PPI without providing the requisite training and support. Empowering public personnel with the necessary knowledge and training enables them to design optimal PPI processes through comprehensive studies and analyses during the pre-procurement phase. Such skilled personnel can adeptly navigate the innovation procurement procedure from inception to completion. Most importantly, successful

completion of PPI processes fosters learning within the public sector, and these experiences become invaluable lessons applied in subsequent procurements.

In my perspective, the primary challenge hindering public procurement for innovation lies in the prevalent high-risk perception among public personnel. There is a tendency for public personnel to shy away from purchases involving risks, such as those associated with PPI, opting instead for standard purchases perceived as less risky. To address this issue, I propose the establishment of consultancy and legal support units specifically designed to mitigate the challenges that public personnel may encounter during the PPI process.

On the other hand, I argue that the absorptive capacity of suppliers, particularly in understanding and providing innovative solutions related to the pertinent technology, holds paramount importance for the successful execution of innovation procurement. I firmly believe that achieving the targeted performance in innovation procurement programs is contingent on planning for markets where suppliers possess such capabilities. This assertion stems from the understanding that meeting the public organization's need for innovation and developing solutions that align with these needs necessitate the adept identification, assimilation, transformation, and optimal utilization of external information at every stage. Furthermore, given that public procurement must adhere to specific legal processes, it becomes imperative for bidders to be well-versed in these processes and legal regulations. Failing to comply with these requirements may expose bidders to sanctions and prohibitions in the realm of public procurement.

Another insight garnered from case study analysis is the positive correlation between supplier companies' collaboration with universities and heightened absorptive capacity, ultimately contributing to increased innovation potential. This observation underscores the importance of designing innovative public procurement policies that actively incentivize supplier companies to engage in closer collaboration with universities. From my perspective, the existing innovation policies in both Turkey and the EU lack such incentives. In light of this, I propose a strategic shift that encourages Technology Transfer Offices (TTOs) and academic entrepreneurs to

actively participate in innovative procurement initiatives aimed at developing innovative products for public customers.

The comprehensive findings led us to formulate innovation policies oriented towards PPI. In aligning with established theoretical frameworks for government intervention in innovation activities, Systems of Innovation approach was chosen to derive policy recommendations aimed at promoting and augmenting PPI implementations. These policy recommendations have been carefully crafted to operate at multiple levels: macro (system/national), meso (organizational/industrial), and micro (individual/skill). The objective is to address the prevailing challenges that contribute to suboptimal innovation performance in PPI activities.

This study contributes significantly to the existing literature in several noteworthy ways. One key original aspect is its status as one of the pioneering studies to utilize a multi-country dataset for analyzing the relationship between public procurement and innovation. This approach has yielded unique empirical evidence, shedding light on the robust potential of public procurement as an effective tool in innovation policy.

Another distinctive contribution lies in being the first study to undertake an analysis of the mediating impact of absorptive capacity on the innovation outcomes of public procurement. Furthermore, the dissertation distinguishes itself by employing a combination of quantitative and qualitative research methods to test hypotheses. This dual-method approach has enhanced the persuasiveness and inclusiveness of the study's results.

Lastly, this thesis is the first study to formulate public innovation procurement policies grounded in the SI approach, emphasizing nonlinearities and feedback loops by integrating institutions and collaborations into the process. The prioritization of addressing challenges within the innovation system is identified as an effective strategy for enhancing the success rate of PPI implementations. I hope the policy recommendations developed at macro, meso, and micro levels in this thesis may serve as guiding tools for policy makers and public authorities for increasing the quality and quantity of PPI activities.

8.2. Limitations and Further Research

A number of limitations must be acknowledged in relation to this study. Firstly, it is regrettable that the final sample, derived from the CIS 2014 microdata of 14 European countries, included fewer observations than initially intended. This reduction was primarily due to the limited number of firms that responded to the public procurement question and the restricted access granted by some countries to the CIS survey results. Secondly, the study faced weaknesses related to the number of interviews conducted and the available information in the case studies. These limitations were imposed by concerns about sharing confidential information related to public procurement. Given the inherent confidentiality associated with public procurement activities for both buyers and sellers, the necessity of conducting an analysis without divulging confidential information served as a substantial barrier, limiting the depth of the research.

The author anticipates that this research will provide valuable insights and serve as a foundation for future studies in various dimensions. Firstly, there is a need to re-examine the relationship between public procurement and innovation using more recent surveys applied globally. By doing so, the results obtained from this study could be validated with a larger sample size, and the long-term effects of PPI policies would become more evident. Secondly, the limited number of studies on absorptive capacity in the public sector prompts a recommendation for future research in this domain. Lastly, this study represents the initial step in designing PPI policies using the SI approach. Future research endeavors should focus on refining and expanding this approach, concentrating on designing PPI policies within specific national, regional, or sectoral innovation systems.

As a final note, this study concludes that well-executed PPI initiatives can serve as a formidable tool for addressing a myriad of grand challenges faced by public organizations, sectors, regions, and countries. These challenges encompass diverse areas, including public sector efficiency, climate change, food security, sustainable agriculture, air pollution, energy, and transportation. In light of these findings, it is proposed that innovative procurement should be integrated as an indispensable

component within the research and innovation strategies and funding programs of regions, countries, and international organizations.

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APPENDICES

A. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER



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01 AĞUSTOS 2019

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Erkan ERDİL

Danışmanlığını yaptığınız **Mustafa CAN**'ın "**Kamu Alımlarının Yeniliği Teşvik Etme Potansiyeli ve Yenilik Sistemleri Yaklaşımının Politika Tasarımında Aktifleştirilmesi**" başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülmüş ve **298 ODTÜ 2019** protokol numarası ile onaylanmıştır.

Saygılarımızla bilgilerinize sunarız.

B. SOME ADDITIONAL STATISTICS

Table B-1

Correlation matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Innovation performance	1								
(2) Innovator (yes/no)		1							
(3) PPI	0.1027*	0.1462*	1						
(4) Absorptive capacity	0.2241*	0.1467*	0.1415*	1					
(5) Cooperation	0.0256	0.1770*	0.0826*	0.2417*	1				
(6) Incentive	-0.0292	0.2109*	0.1573*	0.1310*	0.3038*	1			
(7) Export	0.0319	0.1326*	0.1189*	0.0852*	0.2254*	0.1045*	1		
(8) Size	0.2719*	-0.0008	0.0087	0.2421*	0.1052*	0.1763*	0.1821*	1	
(9) Human resources	0.0492	0.1985*	0.1382*	0.2793*	0.2163*	0.1776*	0.1111*	0.0812*	1

Statistical significance: * $p < 0.1$

Table B-2

Distribution of PPI variable by Country

Country	PPI		Total
	0	1	
Bulgaria	76	33	109
Estonia	0	8	8
Greece	41	31	72
Croatia	69	28	97
Hungary	36	26	62
Latvia	7	16	23
Norway	654	127	781
Portugal	735	47	782
Romania	0	6	6
Slovakia	23	19	42
Turkey	160	127	287
Total	1,801	468	2,269

Table B-3**Distribution of PPI variable by Sector**

Sector	PPI		Total
	0	1	
Manufacturing	592	154	746
Wholesale and retail trade; repair of motor vehicles and motorcycles	287	35	322
Information and communication	362	131	493
Professional, scientific and technical activities	202	70	272
Others	358	78	436
Total	1,801	468	2,269

Table B-4**Distribution of Observations by Sector**

Sector	Freq.	Percent
Manufacturing	746	32.88
Wholesale and retail trade; repair of motor vehicles and motorcycles	322	14.19
Information and communication	493	21.73
Professional, scientific and technical activities	272	11.99
Others	436	19.22
Total	2,269	100

C. INTERVIEW QUESTIONS

The aim of this study is to investigate the mediating role of absorptive capacity in the relationship between public procurement and innovation.

In the research, information will be collected through semi-structured interviews from companies and public personnel who took part in a PPI activity. During the interviews, only if you give permission, audio recordings can be made to be analyzed in later stages. If voice recording is not allowed, handwritten notes will be taken by the researcher. The results of the study and the text to be included in the thesis will be shared with you.

Within the scope of the study, it is envisaged that the interview will be completed with 45-60 minute interviews. Interview questions are as follows. You will not be asked to answer questions that you have no knowledge of or do not want to answer.

QUESTIONS

CHAPTER 1 - COMPANY AND SECTOR INFORMATION

1. What is the interviewee's title, job description and position?
2. What are the sectors and products you operate in?
3. Does your company have a separate R&D unit?
4. What design capabilities and testing laboratories do you have?
5. Are joint R&D activities carried out with universities?
6. Do you receive support from the public for R&D activities?

CHAPTER 2 - INFORMATION ON THE PROCUREMENT PROCEDURE

1. How did you learn about this acquisition? - How did you enter into this process/recruitment?
2. By whom was the need defined?
 - a. Company
 - b. Public organization
 - c. Company and KK together.
3. Which of the following situations applies to the emerging innovation?
 - a. It was a mandatory issue requested by the public in contracts.
 - b. It was a purchase that was not included in the contracts but forced innovation.
 - c. It was an innovation made spontaneously by the company in a standard procurement process.
4. How was the contractor selection made: Open tender, tender among certain bidders, single source?
5. What criteria were taken into consideration in company selection?
6. Is the method of evaluation of offers based on evaluation of specified criteria (MEAT) or lowest price method?
7. Were there views on technical and financial issues exchanged during the company selection process?

8. What is the contract type (fixed-cost or cost-plus) and amount?
9. When determining the contract terms, are different issues and situations regarding innovation taken into account, unlike other standard purchases?

CHAPTER 3 - RESULTS / IMPACTS

1. Did the resulting innovative product meet the need? Did it improve a process/service in the public sector?
2. What are its advantages over existing technology? Cost-effectiveness quality etc.
3. Has the resulting innovative product been marketed to other customers?
4. Has it improved the company's innovation capabilities? What capabilities did PPI provide?
5. Is there a patent for the resulting innovation?
6. Would this product/innovation have been created without this public procurement? Was the goal of becoming the first customer achieved?

CHAPTER 4 - QUESTIONS RELATED TO THE ABSORPTIVE CAPACITY

4.1. QUESTIONS TO THE SUPPLIER PUBLIC ORGANIZATION

Knowledge acquisition

How did you obtain external information about the need for this innovative product and its production potential in the domestic/international market?

Is external knowledge researched and obtained for innovative products that will help you solve problems related to your field of duty, enable you to work more effectively, or provide your needs in a more cost-effective manner? Are employees encouraged in this regard? Are your employees willing to do this?

Knowledge assimilation

Has the information you obtained from outside regarding the need for this innovative product and its production potential in the domestic/international market been analyzed, interpreted and evaluated within the institution and shared among the units?

Knowledge transformation

Have your employees/organization combined the newly acquired knowledge about this innovative product with their existing knowledge and turned it into new knowledge that can be used in public procurement activities and needs identification processes?

Knowledge exploitation

Did your employees use the new information obtained, internalized and transformed about this innovative product in public procurement processes (need identification, tendering, etc.)?

Are your employees willing and diligent to use the new product provided by PPI while doing their jobs? Have existing absorptive capacities affected adaptation?

4.2. QUESTIONS TO THE CONTRACTOR COMPANY

Knowledge acquisition

How did you identify and access external information about the public's need for this innovative product and its production potential with domestic/international opportunities? Are these types of studies conducted regularly? Are employees encouraged in this regard? Are your employees willing to do this?

Knowledge assimilation

Has the information you obtained from outside regarding the public's need for this innovative product and the production potential of this product through domestic/international opportunities been analyzed, interpreted and evaluated within the institution and shared between units?

Knowledge transformation

Has the information you have obtained about the innovative product requested by the public been combined with your existing information and made available to your business?

Knowledge exploitation

Has your business used the new information obtained, internalized and transformed regarding the innovative product requested by the public in its business and production processes?

CHAPTER 5 - QUESTIONS TO DETECT SYSTEM FAILURES

1. Are there any physical and information infrastructure deficiencies regarding public procurement for innovation purposes? What are they?
2. Are there any legal regulatory gaps/gaps that negatively affect public procurement activities for innovation purposes? Is there a regulation regarding innovation procurement in your country's public procurement legislation?
3. Have the norms, values and culture that negatively affected public procurement activities for innovation purposes negatively affected the process?
4. To what extent was there cooperation with public officials during the procurement process? What are the factors that affect cooperation positively and negatively?
5. What are the challenges of working on innovation with the public?
6. How was risk sharing? Is there a practice that reduces the risk of purchasing?
7. What are the issues that negatively affect the procurement process?

CHAPTER 6 - RECOMMENDATIONS ON PUBLIC PROCUREMENT FOR INNOVATION PROCEDURE

1. What should be changed in the innovative public procurement process?
2. What are your suggestions for legislative changes?

D. CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: CAN, Mustafa

Nationality: Turkish (TC)

Date and Place of Birth:

Phone:

email:

EDUCATION

Degree	Institution	Year of Graduation
PhD	METU Science and Technology Policy Studies	2023
Ms	Ankara University Business Administration	2011
Bs	Turkish Naval Academy Electrical - Electronics Engineering	2004

WORK EXPERIENCE

Year	Organization	Position
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FOREIGN LANGUAGES

English (advanced), German (beginner)

PUBLICATIONS

Conference Presentations

Can M., Public Procurement of Innovation: Proposal of a New Model, EY International Congress on Economics II, Ankara, November 5-6, 2015

THESES

Can Mustafa, ‘Analysis of R&D Efficiency between Countries Operating in the Defense Industry’ MSc. Thesis, (2008)

Can Mustafa, ‘Promoting Innovation through Public Procurement: A Systems of Innovation Approach’ . PhD Thesis, (2023)

E. TURKISH SUMMARY / TÜRKÇE ÖZET

Giriş ve Arka Plan

21. yüzyıl, rekabet gücü ve büyümenin önemli bir itici gücü olarak yenilik faaliyetlerine artan ilgiye tanık olmuştur (Antonelli ve Carlsson, 1994; Freeman ve diğerleri, 1982; Lundvall, 1992). Hangi aracın yeniliği teşvik etme potansiyelinin daha yüksek olduğunu ve bir yenilik politikası aracı olarak ne ölçüde odaklanılmaya değer olduğunu tespit etmek politika yapımcılar için son derece önemli olmuştur. Bu temelde, genel mal ve hizmet talebinin büyük bir bölümünü oluşturan kamu alımları, yenilik politikası hedeflerine ulaşmada etkin bir araç olarak giderek daha fazla kabul görmektedir (Edler, 2010; Uyarra ve Flanagan, 2010).

Avrupa Komisyonu'nun çeşitli raporları da Avrupa Birliği'nin gayri safi yurt içi hasılabının (GSYİH) tahmini yüzde 16'sı ile kamu alımlarının önemli bir yenilik potansiyeline sahip olduğunu vurgulamıştır (Aho ve diğerleri, 2006; Nyiri ve diğerleri, 2007; Tsipouri ve diğerleri, 2010). OECD'ye (2016) göre kamu alımları, OECD ülkeleri genelinde ortalama olarak toplam hükümet harcamalarının yüzde 29'unu ve GSYİH'nin yüzde 12'sini oluşturacak şekilde önemli bir mali büyüklüğe sahiptir. Kamu talebinin toplam ekonomi içindeki bu yüksek payı nedeniyle, son yıllarda kamu alımlarının bir yenilik politikası aracı olarak kullanılmasına daha fazla önem verilmektedir. Pek çok yazar çoğunlukla ülkelerin yenilik politikasının önemli bir dayanağı olarak kamu alımlarından yararlanması gerektiğini savunuyor (Edquist ve diğerleri, 2000; Rolfstam, 2009; Uyarra ve Flanagan, 2010).

Bu artan ilgiyle birlikte birçok araştırma, kamu alımlarının yeniliği nasıl tetiklediğini araştırmaya yönelik vaka çalışmalarına odaklanmıştır (Edler ve diğerleri, 2015; Edler ve Yeow, 2016; Charles Edquist ve Zabala-iturriagoitia, 2012; Rolfstam, 2009; Tsipouri ve diğerleri, 2010; Uyarra ve diğerleri, 2020; Zelenbabic, 2015). Çok az yazar bu ilişkiyi araştırmak için nicel analiz yapabilmıştır (Aschhoff ve Sofka, 2009; Saastamoinen ve diğerleri, 2018). Bu çalışmalar tek bir ülkeden elde edilen verilere dayandığından ve sınırlı sayıda değişken içerdiğinden, literatür bize kamu

alımlarının, özellikle Ar-Ge, iş birliği, ihracat ve büyüklük gibi diğer yenilik belirleyicileriyle karşılaştırılmalı olarak, firmaların yenilik başarısını etkileme potansiyeli hakkında tatmin edici niceliksel kanıtlar sunmuyor. Bu tez, Yenilik Anketi (CIS) verilerinin geniş bir örneğinden elde edilen veriler aracılığıyla kamu alımlarının yenilik etkisini diğer yenilik belirleyicileriyle karşılaştırmalı olarak analiz ederek bu boşluğu doldurmayı amaçlamaktadır. Bu argümanlar bağlamında, bu tezdeki temel araştırma sorusu şu şekildedir: “Kamu alımları ürün yeniliğini ne ölçüde etkiliyor?”. Ayrıca bu çalışmada aşağıdaki alt sorulara da yanıt verilmesi amaçlanmaktadır:

- Bu etki diğer yenilik belirleyicileriyle karşılaştırıldığında ne kadar güçlü?
- Bu etki AB'ye üyelik durumuna göre değişiyor mu?

Yazar, talebin önemli bir parçası olan kamu alımlarının diğer belirleyicilerle karşılaştırıldığında değerli bir yenilik potansiyeline sahip olduğunu savunuyor. Ayrıca bu etkinin AB üyesi ülkelerde daha yüksek olma potansiyeline sahip olması da bekleniyor.

Öte yandan, yenilik belirleyicilerinin firmaların yenilik performansı üzerindeki doğrudan etkisinin analizine artan ilginin yanı sıra, üçüncü bir değişkenin, özellikle de özümseme kapasitesinin bu ikili ilişkilerdeki aracılık rolünün incelenmesine de artan bir ilgi vardır (Aliasghar ve diğerleri, 2019; Aljanabi, 2018; Escibano ve diğerleri, 2009; Noor ve Aljanabi, 2016; Wu ve diğerleri, 2010). Ancak, yenilik ve kamu alımları arasındaki ilişkide özümseme kapasitesinin aracı rolü hakkında literatürde çok az bilimsel çalışma bulunmuştur. Bu araştırma boşluğunu gidermek için bu tez, özümseme kapasitesinin yenilik ve kamu alımı arasındaki bağlantıya nasıl aracılık ettiğini analiz etmeyi amaçlamaktadır.

Bu bağlamda, bu tezdeki bir diğer araştırma sorusu da özümseme kapasitesinin yenilik ve kamu alımı arasındaki ilişkide arabulucu etkisinin olup olmadığı ve bu aracı etkinin nasıl oluştuğudur. Hipotezimiz ise özümseme kapasitesinin yenilik ve kamu alımı arasındaki ilişkide önemli bir arabulucu olduğu, yani özümseme kapasitesi daha yüksek olan firmaların ve kamu kurumlarının kamu alımları yoluyla başarılı yenilik elde etmeye daha yatkın olduğudur.

Mevcut politika çalışmalarının çoğunda gözden kaçırılan bir diğer nokta ise Yenilik Amaçlı Kamu Alımları (YAKA) prosedürünün doğrusal bir faaliyet olarak ele alınmasıdır. Buna göre, YAKA faaliyetleri için önerilen mevcut politika araçları genellikle sadece Ar-Ge teşviklerine odaklanarak piyasa başarısızlığı yaklaşımını benimseme eğilimindedir. Bu nedenle YAKA literatürü ve politika çalışmaları; geri bildirimler, ağlar ve etkileşimler gibi yenilik faaliyetlerinin temel yapı taşlarını dikkate alan politika araçlarından yoksundur. Bu çalışma YAKA faaliyetlerini desteklemek ve geliştirmek amacıyla yenilik politikalarının tasarlanmasında Yenilik Sistemleri (SI) yaklaşımının etkili bir çerçeve olduğunu iddia etmektedir. Literatürdeki bu boşluğu gidermek için bu tezin amaçlarından biri, karşılıklı ilişkilere, iş birliklerine ve bilgi alışverişine yüksek öncelik veren Yenilik Sistemleri (SI) yaklaşımına dayalı politika önerileri geliştirmektir.

Bu çalışma, giriş bölümü dahil 8 bölümden oluşmaktadır. Giriş bölümünde çalışmanın literatürdeki hangi boşlukları doldurmayı amaçladığı, araştırma sorularının neler olduğu, metodoloji ve veri hakkında bilgiler yer almaktadır.

İkinci bölümde kamu alımı kavramına, sürecine ve mevzuatlarına ilişkin bilgilere yer verilmiştir. OECD ve AB dahil olmak üzere literatür tarafından genel olarak kabul edilen kamu alımı tanımı; devlet daireleri veya yerel yönetimler gibi kamu idarelerinin şirketlerden iş, mal veya hizmet satın alma sürecini ifade eder. 'Kamu alımları' terimi, bir ihtiyacın belirlenmesinden başlayarak sözleşmenin tamamlanması ve teslimatına kadar mal, hizmet ve iş edinme sürecinin tüm adımlarını içerir (Lloyd ve McCue, 2004). Hem bölgesel hem de ulusal ölçekte gerçekleştirilebilir ve prosedür, ilgili kararların nasıl alınacağını belirten özel yasa ve yönetmeliklerle düzenlenir.

Üçüncü bölüm, yenilik amaçlı kamu alımları kavramına ve kamu alımları ile yenilik arasındaki ilişkinin teorik arka planına kısa bir genel bakış sunarak başlamaktadır.

İlk olarak literatür taraması ile kamu alımları ile yenilik arasındaki ilişkinin altında yatan temeller ve teorik çerçeveler ayrıntılı olarak ele alınmıştır. Ardından Yenilik Amaçlı Kamu Alımı (YAKA) sürecine dair bilgiler sunulmuş olup konuya ilişkin AB çapında yürütülen çalışmalara ve raporlara yer verilmiştir. Literatürdeki YAKA

tanımları eleştirel boyutları ile birlikte sunularak yazar tarafından yapılan tanımlama tavsiyesi şu şekildedir: ‘‘ Kamu kurumunun ihtiyalarını yeniliki bir özümle karşılayan bir satın alma’’. Türkiye’de YAKA faaliyetlerine dair yapılan politika ve mevzuat alışmalarına da yer verilerek, tüm bu abalara rağmen YAKA uygulamalarının Türkiye’deki kamu kurumlarında ve sektörlerde istenilen düzeyde yaygınlaşmamış olması eleştirilmiştir.

Dördüncü bölümde, yenilik ve kamu alımları arasındaki ilişkide özümseme kapasitesinin nasıl arabuluculuk rolü oynadığı sorusundan hareketle bu etkinin izleri araştırılmaktadır. Yeni ekonomide bilgi ve yeniliğın artan öneminin ardından (Dasgupta ve David, 1994; Gibbons ve diğeri, 1994; Grant, 1996; Ancori ve diğeri, 2000), dışsal bilginin özümsemesi, yenilik alışmalarında büyük ilgi çekmiştir. Öncü bir alışma olarak Cohen ve Levinthal (1990), firmanın dış bilgiyi etkili bir şekilde kullanma yeteneğinin kritik rolünü vurgular ve firmanın dış bilgiyi tanıma, özümseme ve ticari amaçları için kullanma yeteneği için özümseme kapasitesi terimini önermektedir (1990, s. 128).

Özümseme kapasitesinin firmanın yenilik performansı üzerindeki etkisini ampirik olarak araştıran birçok alışma yapılmış ve bu iki kritik kavram arasındaki pozitif ilişki güçlü bir şekilde doğrulanmıştır (Anderson ve Tushman, 1990; Helfat, 1997; Kim ve Kogut, 1996; Tsai, 2001; Lane ve diğeri). al.,2006 Chen, Lin ve Chang, 2009; Fosfuri ve Tribó, 2008; Tseng, Chang Pai ve Hung, 2011). İlave olarak, özümseme kapasitesinin bu doğrudan rolünün yanı sıra, bazı alışmalar özümseme kapasitesinin yenilik faaliyetlerindeki arabulucu rolüne de dikkat çekmektedir (Aljanabi, 2018; Wu et al., 2010). Bildiğimiz kadarıyla, kamu alımları ile yenilik arasındaki ilişkide özümseme kapasitesinin arabulucu rolünü anlamaya yönelik alışma yapılmamıştır. Bu nedenle bu alışma, özümseme kapasitesinin kamu alımları ile yenilik arasındaki ilişkiye nasıl arabuluculuk ettiğini incelemeyi amaçlamaktadır.

YAKA kavramına ilişkin literatür, kamu alım faaliyetlerinde yeniliği teşvik etmede itici güç ve engel görevi gören faktörleri büyük ölçüde tartışmıştır (Edquist ve diğeri, 2000; Edler ve diğeri, 2005; Rolfstam ve diğeri, 2009; Rolfstam,

2013; Georghiou ve diğeri, 2014; OECD, 2016). Bu faktörlerden, özümseme kapasitesinin yenilik ve kamu ilişkisindeki arabulucu rolünün önemini doğrulayanlar aşağıdaki üç başlık altında tartışılmıştır.

- Kamu alıcısının pazar yeteneklerini dikkate alarak yenilik gereksinimlerini tanımlama yeteneği
- Potansiyel tedarikçilerin ihtiyacı anlama ve tatmin edici bir yenilik sunma yeteneği
- Kamu alıcısı ve yüklenici arasındaki etkileşim ve iş birliği

Daha sonra bu önermelerin gerçek yaşam bağlamında nasıl ortaya çıktığını incelemek amacıyla 3 Avrupa ülkesinden 3 örnek YAKA uygulaması ele alınmıştır. Birinci örnek, tek kullanımlık bio-bazlı önlüklerin İsveç'teki bir kamu kurumu tarafından satın alınmasıyla ilgilidir. İkinci örnek, Norveç'teki bir kamu kurumu tarafından elektrikli inşaat makinelerinin satın alınmasını konu almaktadır. Üçüncü örnek, Avrupa araştırma topluluğu için yenilikçi bir "hibrit bilim bulut platformu" tedarik etmek amacıyla, yedi Avrupa ülkesinden on kamu araştırma kuruluşu tarafından (CERN, CNRS, DESY, EMBL, ESRF, IFAE, INFN, KIT, STFC ve SurfSARA) Ocak 2016'da toplu olarak alım başlatıldı. Bu girişimin amacı, Avrupa'nın önde gelen kamu araştırma kuruluşları arasında büyük veri iletimi için yüksek performanslı hibrit bulut teknolojileri oluşturmaktır (ICLEI, 2019).

Bu 3 örnek olaydan hem tedarikçi kamu idaresinin hem de yüklenicinin özümseme kapasitesinin, kamu alımları ile yenilik arasındaki hangi aşamalarda ne şekilde arabulucu rol oynadığına dair bulgular elde edilmiştir.

Veri ve Metodoloji

Araştırma sorularımıza yanıt bulmak için nicel ve nitel araştırma yöntemlerinden yararlanıldı. Firmaların yenilik performansının kamu alımlarına bağımlılığına ilişkin ampirik kanıtlar bulmak için ilk olarak Yenilik Anketi verileri kullanılarak ekonometrik bir analiz yapılmıştır. Özümseme kapasitesinin aracı rolüne ilişkin hipotezimizi test etmek için modele bir etkileşim terimi de dahil edildi. Daha sonra kamu alımları ile yenilik arasındaki ilişkide özümseme kapasitesinin aracı rolünün nasıl ortaya çıktığını araştırmak için örnek olay yöntemi tercih edildi.

Nicel veriler ve analiz yöntemi: Nicel analiz bölümünde, Yenilik Anketi verileri kullanılarak ekonometrik bir analiz yapılmıştır. Literatürde çok sayıda politika raporu ve vaka çalışması yer almasına karşın, sınırlı sayıda çalışma (Aschhoff & Sofka, 2009; Guerzoni & Raiteri, 2015; Saastamoinen ve diğerleri,2018) kamu alımlarının yenilik etkisine ilişkin nicel analiz yürütmüştür. Yapılan nicel analizler ise çoğunlukla tek ülke verileriyle sınırlıdır. Ek olarak, özümseme kapasitesinin bu ilişkide arabulucu rolü olup olmadığı inceleyen bir çalışmaya rastlanmamıştır. Bu bağlamda, bu bölüme ait araştırma sorusu şu şekildedir: "Kamu alımları, firmaların yenilik performansını ne ölçüde etkiliyor ve özümseme kapasitesinin bu ilişkide arabulucu etkisi var mıdır?"

Bu tezde kullanılan veri seti, 2012-2014 yılları arasındaki üç yıllık yenilik istatistiklerini içeren Topluluk Yenilik Anketi (Community Innovation Survey-CIS)'nden elde edilmiştir. Yenilik Anketi (CIS), AB ve bazı AB üyesi olmayan ülkeler tarafından iki yılda bir üç yıllık bir süre boyunca yürütülmekte ve işletmelerin yenilik faaliyetlerine ilişkin soruları içermektedir. Temel olarak politika yapıcılara firmaların yenilik faaliyetleri hakkında fikir vermeyi amaçlamaktadır.

Kapsamlı bir veri seti elde etmek amacıyla, bir dizi adımdan oluşan bir süreç takip edilerek Eurostat'tan CIS 2014 mikro verileri talep edildi. 14 Avrupa ülkesinin mikro verileri, Türkiye İstatistik Kurumu (TÜİK) tarafından sağlanan Türkiye mikro verileriyle eşleştirildi. İlk örnekleme çok sayıda gözlem bulunmasına rağmen, veri eşleştirme prosedürü nedeniyle, özellikle de firmaların kamu alımlarına katılım sorusuna düşük yanıt verme oranından dolayı çoğu gözlem örneklemin dışında tutuldu. Nihai örnekleme 11 ülkeden 2269 gözlem bulunmaktadır. 1201 firma 9 Avrupa Birliği ülkesinde yer alırken, 1068 firma AB üyesi olmayan iki Avrupa ülkesinde (Türkiye ve Norveç) yer almaktadır.

Bu çalışmada yenilik performansı, yalnızca yenilikçi firmalar için gözlemlenen sürekli bir değişken olan, "piyasaya yeni çıkan yenilikçi ürünlerden kaynaklanan satışların firmanın toplam satışları içindeki yüzdesi" ile ölçülmektedir. Bir dizi bağımsız değişkenin bağımlı değişkenimiz (yenilik performansı) üzerindeki etkisini incelemek için bir regresyon modeli oluşturulmuştur.

Modelimizde bağımlı değişkenimiz sadece yenilikçi firmalar için gözlenen bir değer olduğu için; örneklem seçiminde yanlılık sorununa, yani taraflı ve verimsiz bir tahmine neden olabilir (Heckman, 1976, 1979; Verbeek, 2004; Wooldridge, 2012). Bu nedenle, yenilik araştırmalarında da aynı darboğaza dikkat çeken önceki yenilik çalışmalarını takiben (Frenz ve Ietto-Gillies, 2009; Mansury ve Love, 2008; Sapprasert ve Clausen, 2012; Tavassoli, 2015; Zang, 2018), yaygın olarak kullanılan Type II Tobit model olan Heckman iki-aşamalı tahmin yöntemi kullanılmıştır. Heckman iki-aşamalı tahmin prosedürü, bu tür modellerde örneklem seçim yanlılığı problemini kontrol etmek için etkili bir yöntemdir (Heckman, 1979).

Nitel veriler ve analiz yöntemi: İlk olarak örnek olay araştırma yöntemi tanıtılmış, daha sonra bu yöntemin seçilmesinin gerekçeleri tartışılmıştır. Daha sonra vaka seçimi, veri toplama ve analiz stratejileri anlatılmıştır. Örnek olaylara ve bulgulara ilişkin bilgiler sunulduktan sonra, revize edilmiş önermeler ve politika önerileriyle bölüm tamamlanmıştır. Araştırma tasarımı Yin (2009: s.57) tarafından önerilen modele göre oluşturulmuştur.

Vaka Seçimi: Genel prensip olarak vaka seçimi, çalışmanın amacına ve araştırma sorusuna bağlıdır. Analiz yapılacak örnek olaylar, araştırma sorusunu en kapsamlı açıklayan ve yeterli bilgiyi içerenler arasından seçilmelidir. Ayrıca araştırmacı, ilgilenilen olgunun daha geniş bir anlayışına ulaşmak için tekli veya çoklu vaka çalışmasından hangisinin daha uygun olacağını değerlendirmelidir (Yin, 2009).

Bu amaca ve çalışmamızın keşfedici niteliğine uygun olarak, kamu alımları ile yenilik arasındaki ilişkide özümseme kapasitesinin arabulucu rolü hakkında bize zengin bilgi verebilecek potansiyel vakalar araştırılmıştır. Pek çok alternatif arasından vaka seçiminde bilgi odaklı örnekleme tekniği tercih edilmiştir (Flyvbjerg, 2006). Bu örnekleme tekniğinde, bilgi kapsamına ilişkin beklentiler doğrultusunda durum seçimi yapılmaktadır. Bu tekniğin altında yatan mantık şudur; rastgele örnekleme yoluyla seçilen ortalama bir vaka büyük olasılıkla ortalama verileri sağlarken, ortalamadan çok daha fazla bilgi içeren ilgi çekici bir vaka daha iyi içgörüler sağlayabilir. Kapsamlı bulgulara bu tür bilgi yoğun vakalar aracılığıyla ulaşılabilir.

Bu şekilde, potansiyel adayların geniş kapsamlı taraması sonucunda iki vaka tespit edildi. Türkiye'deki kamu kurumlarının merkezi satın alma kuruluşlarının çoğunlukla başkent Ankara'da yer alması nedeniyle PPI vakaları Ankara ilinde yürütülen satın alma uygulamalarından seçilmiştir. ROV ve SEG kısaltmaları ile adlandırılan bu iki örnek olay, bu çalışmanın odağına ilişkin bilgi zenginliği nedeniyle birçok alternatif arasından seçilmiştir.

Veri Toplama: Araştırmamızda iki veri toplama yöntemi kullanılmıştır: doküman analizi ve yarı-yapılandırılmış görüşmeler. Öncelikle açık kaynak belgeler, ihale çağrıları, politika belgeleri ve raporlar incelenerek ön bilgiler derlendi. Daha sonra kamu ihale sürecine doğrudan dahil olan firmalar ve satın alma kuruluşlarındaki personel ile yarı-yapılandırılmış görüşmeler gerçekleştirilmiştir. Kurum ve firmada satın alma süreci hakkında bilgisi olan personel sayısı sınırlı olduğundan sınırlı sayıda görüşme yapılabildi. Ancak görüşme yapılan kişilerin tüm süreç hakkında kapsamlı bilgiye sahip olmalarına özen gösterildi.

Görüşmelerden önce seçilen uzmanlarla açık uçlu sorular üzerinde iki kez değerlendirme yapılmıştır. Görüşme protokolünün katılımcılarla paylaşılmasının ardından yaklaşık bir saat süren toplantılar gerçekleştirildi. Hepsi kayıt altına alındı ve transkript edildi. Görüşme transkripsiyonları yazar tarafından derlendi ve onay, düzeltme ve eklemeler için katılımcılara e-postayla gönderildi. Bu çalışmada kullanılan görüşme kılavuzu Ek C'de verilmiştir.

Veri Analizi: Bir vaka çalışması araştırmasının kritik adımlarından biri, toplanan verilerin nasıl analiz edileceği ve yorumlanacağıdır. Yin (2009) bir vaka çalışması analiz prosedürünün kanıtları incelemeyi, kategorize etmeyi, tablolaştırmayı, test etmeyi veya yeniden birleştirmeyi içermesi gerektiğini belirtmektedir. Veri analiz sürecimiz Yin (2009) temel alınarak Miles ve Huberman'ın (1994) yöntemi ve Atkinson'un (2002) "Kodlar ve Kodlama" tekniği ile uyum içinde ilerlemektedir. Veri analizi sürecini tasarlarken öncelikli odak noktamız, toplanan verileri araştırma soruları ve önermelerle etkili bir şekilde ilişkilendirmektir.

Bulguların sunumu ve yorumlanması iki aşamada gerçekleştirilmiştir. İlk başta YAKA vakaları, kamu alımları ve yenilik ilişkisinde özümseme kapasitesinin

arabulucu rolünü yakalamak için özümseme kapasitesi teorisinin temel kavramları etrafında anlatsal bir şekilde tanımlandı ve tartışıldı. Bu aşama, satın alma sürecinin belirli aşamalarında hangi tür özümseme kapasitesinin daha aktif olduğunu ortaya koymaya odaklandı.

Daha sonra vakalardaki benzer ve farklı bulguları eşleştirmek ve bir araya getirmek için çapraz vaka karşılaştırması yapıldı. Yapı geçerliliğini sağlamak için her bir önermeye ilişkin bulguların açık bir şekilde sunulmasıyla çapraz durum analizi yapılmıştır (Ketokivi ve Choi, 2014). Bu adımın sonucu, ilk önermeler hakkındaki kanıtların karşılaştırılması ve bulgularla değiştirilen nihai önermelerin ortaya konulması olmuştur (Atkinson, 2002). Eisenhardt ve Graebner'in (2007) önerdiği gibi, güvenilirliği artırmak için kanıtların sunumu çoğunlukla tablo ve şekillerle yapılmıştır.

Özümseme kapasitesi literatürü (Cohen ve Levinthal, 1990) ve YAKA literatürü bu analiz sırasındaki temel teorik çerçevelerdi. Özümseme kapasitesi boyutlarına ilişkin farklı önermelerden, kanıtların toplanması ve yorumlanması için Schweisfurth ve Raasch (2009) tarafından önerilen ayrıştırma benimsenmiştir: ihtiyaç ve çözüm özümseme kapasitesi. Bu tercih, YAKA sürecinin kamu kurumlarının karşılanmamış ihtiyaçlarını piyasalardaki çözümlerle eşleştirmeyi içeren yapısından kaynaklanmıştır.

Bulgular

Nicel Analiz Sonuçları: Geliştirdiğimiz hipotezleri test etmek amacıyla, üç farklı örneklemden oluşan veri setleri üzerinde Heckman iki-aşamalı tahmin prosedürü uygulandı. İlk başta model, tüm gözlemleri içeren örneklem için tahmin edildi. Daha sonra örneklem, AB üyeliği kriterlerine göre iki alt örnekleme bölündü. Sonuçlar, YAKA'nın firmaların yenilik performansı ile oldukça anlamlı ve pozitif bir ilişkiye (0,309, $p<0,01$) sahip olduğunu göstermektedir. Bir sonraki adım olarak örneklem ikiye ayrıldığında, AB üyesi ülkeler örnekleminde olumlu etkinin büyüklüğünün (0,527, $p<0,01$) tüm örneklemden daha yüksek olduğu bulgulara ulaşmaktadır. Diğer taraftan kamu alımlarının yenilik etkisi AB üyesi olmayan ülkelerdeki firmalar için önemsizdir. Tüm bu bulgular, YAKA faaliyetlerinin firmaların yenilik performansını

teşvik etme konusunda büyük bir potansiyele sahip olduğunu ve bu etkinin AB genelinde geliştirilen düzenlemeler ve politikalar sayesinde AB üyesi ülkelerdeki firmalar için daha güçlü olabileceğini öne süren hipotezimizi güçlü bir şekilde desteklemektedir.

Bir sonraki adım olarak, kamu alımları ile yenilik arasındaki ilişkide özümseme kapasitesinin aracılık rolüne ilişkin hipotezimizi test etmek amacıyla modele bir aracı değişken dahil edilmiştir. Tahmin sonuçları doğrultusunda bu çalışmada bu önermeyi destekleyen herhangi bir anlamlı kanıt bulunamamıştır. Bize göre bu beklenmeyen sonucun iki nedeni olabilir. İlk olarak, özümseme kapasitesini ölçmek için tek bir değişkenin (dahili Ar-Ge harcamaları/satışlar ile ölçülen Ar-Ge yoğunluğu) kullanılması özümseme kapasitesini ölçmek için yetersizdir. İkinci gerekçe ise araştırılan aracı etkiyi ortaya çıkarmak için yalnızca niceliksel bir araştırma yöntemi yürütmenin sakıncası olabilir. Bu nedenle bu konuyla ilgili daha fazla temsili değişkenin ve farklı araştırma yöntemlerinin dikkate alındığı daha detaylı çalışmaların yapılması önerilmektedir.

Ardından, özümseme kapasitesinin, kamu alımları ile yenilik arasındaki arabulucu rolüne dair literatür ve hipotezler sunulduktan sonra Türkiye'den 2 adet örnek olay çalışması yapılmıştır.

Nitel Analiz Sonuçları

Örnek Olay ROV: İlk örnek olay, Türkiye'de bir kamu kuruluşunun Uzaktan Kumandalı Sualtı Aracı (ROV) satın almasıyla ilgilidir. İhale süreci 2017 yılı ortasında başlamış ve 2018 yılı sonunda sona ermiştir. Her ne kadar benzer ürünler daha önce bazı ülkelerde üretilip kullanılmış olsa da bu yenilikçi ürün, kullanımdaki muadillerine göre yenilikler içermesinin yanı sıra, satın alan kamu kuruluşu için de yenilikler içermektedir.

Örnek Olay SEG: İkinci örnek olay iki kamu kuruluşunun (Tarım İşletmeleri Genel Müdürlüğü (TİGEM) ve Yenilenebilir Enerji Genel Müdürlüğü (YEGM)) talebi üzerine güneş enerjisi santrali teknolojilerinin satın alınmasını konu alıyor. Temel amaç, yurtiçinde üniversite-sanayi iş birliği konsorsiyumu tarafından üretilen Mono

PERC tipi fotovoltaik hücrelerden oluşan yenilikçi güneş modüllerinin tedarikidir. Türkiye'nin ithal fotovoltaik hücrelere bağımlı olması nedeniyle, bu inovasyon alımıyla, ulusal üniversite-sanayi iş birliğiyle güneş enerjisi santrali teknolojilerinde yenilikçi bir ürün üretilerek kamu kuruluşlarının ihtiyaçlarının karşılanması amaçlanıyor.

Çapraz Vaka Analizi: Örnek olaylara ilişkin bilgilerin sunulmasına müteakip, bu vakalar arasındaki benzerlik ve farklılıklara dikkat çekilerek bulgular karşılaştırılmıştır. Bu karşılaştırmadaki temel strateji, vakaları iki önermeye bağlamaktır. Bu amaçla önermelere ilişkin durum bulgularının gruplandırılması ve analiz edilmesi amacıyla temalar oluşturulmuştur. Bu temalar, dördüncü bölümde sunulan üç YAKA örneğindeki, özümseme kapasitesinin kamu alımları ile yenilik arasındaki arabulucu rolü dikkate alınarak oluşturulmuştur.

Vakaların analizi ve karşılaştırılması sonucunda elde ettiğimiz deliller, başlangıçtaki önermelerimizi desteklemekle birlikte bizi bu önermelerde iyileştirmeye yöneltti. Satın alma sürecinin farklı aşamalarında, alıcı kamu kurumu ve tedarikçi firmanın özümseme kapasitesinin önceliğinin değiştiğini gördük. İhale öncesi aşamada alıcı kamu kurumunun özümseme kapasitesi daha kritik bir rol oynarken, ihale ve ihale sonrası aşamalarda ise tedarikçi firmaların özümseme kapasitesinin daha etkili olduğu sonuca ulaşılmıştır.

Politika Önerileri

Bu bölüm, yenilik literatürü ve bu çalışmada elde edilen bulgulara dayanarak geliştirilen politika önerilerine ayrılmıştır. Politika geliştirme faaliyeti, Yenilik Sistemleri (SI) yaklaşımına dayalı olarak üç aşamada gerçekleştirilmiştir (Borrás ve Edquist, 2013; Chaminade ve Edquist, 2005; Freeman, 1987; Lundvall, 1992; Nelson, 1993).

İlk olarak, yapılan analizler sonucunda elde edilen bulgular doğrultusunda YAKA faaliyetlerinde yenilik performansını artırmayı amaçlayan iki amaç belirlenmiştir. Bu hedefler aşağıdaki gibidir:

- YAKA uygulamalarının teşvik edilmesi ve yaygınlaştırılması
- Kamu alıcısı ve tedarikçilerin YAKA ile ilgili özümseme kapasitesinin artırılması

Belirlenen hedefler kapsamında YAKA faaliyetlerine ilişkin düşük yenilik performansına neden olan yenilik sistemi sorunları literatüre ve bulgularımıza dayanılarak tespit edilmiştir. Son olarak bu sorunların azaltılmasına yönelik geliştirilen politika araçları makro (sistem/ulusal), orta (örgütsel/endüstriyel), mikro (bireysel/beceri) düzeyde detaylandırılmıştır. Bu politika araçlarının sunumuna geçmeden önce, politika tasarımında benimsenen teorik çerçeve, gerekçeleriyle birlikte bir sonraki bölümde tartışılmıştır.

PPI Politika Tasarımında İnovasyon Sistemleri Yaklaşımını Kullanmanın Gerekseleri: Yenilik politikaları, yeniliklerin yaratılmasını, geliştirilmesini ve yayılmasını etkileyen hükümet eylemleri veya müdahaleleridir. Yenilik politikalarına devletin katılımına ilişkin iki ana akım teorik çerçeve vardır: neoklasik ve evrimsel teori (Bleda ve Del Río, 2013; Borrás ve Edquist, 2013; Chaminade ve Edquist, 2010). Bu iki teori, yenilik sürecine devlet müdahalesinin gerekçeleri konusunda açıkça çelişmekte ve farklılaşmaktadır. Bu bölümde bu teorik çerçevelerin YAKA prosedürünü nasıl ele aldığı ve YAKA politikalarını tasarlarken ve uygularken hangisinin daha uygun olabileceği tartışılmıştır.

Neoklasik yaklaşımda müdahalenin temel gerekçesi piyasa aksaklıklarının varlığıdır. Yenilik politikaları yalnızca piyasa mekanizmalarının iyi işleyemediği durum ve alanlar için tasarlanmalı ve uygulanmalıdır (Bleda ve Del Río, 2013; Chaminade ve Edquist, 2010). Bu geleneksel yaklaşıma göre, yenilik süreci çoğunlukla araştırma faaliyetlerinin doğrudan yeni bir ürünle sonuçlandığı doğrusal bir prosedür (geri bildirim olmayan sabit bir adım dizisi) olarak değerlendirilir (Rosenberg, 1994). Ayrıca bilimsel bilginin üç özelliği (belirsizlik, bölünmezlik ve uygunsuzluk), verimsiz tahsis ve Ar-Ge'ye yetersiz yatırım nedeniyle piyasa başarısızlığına neden olabilir. Bu nedenle neoklasik bakış açısına göre çizilen teknoloji ve yenilik politikaları çoğunlukla piyasa başarısızlıklarını hafifletmeye yönelik finansal Ar-Ge sübvansiyonlarının tasarlanmasına odaklanmaktadır (Chaminade ve Edquist, 2005;

Lipsey ve Carlaw, 1998). Ancak neoklasik yaklaşım, 80'li ve 90'lı yıllarda evrim teorisyenleri tarafından, yenilik sürecini yakalama ve açıklama konusunda büyük sınırlamalara sahip olduğu için yoğun bir şekilde eleştirilmiştir (Freeman ve diğerleri, 1982). Evrimci teorisyenlere göre yenilik süreci bir sistem içinde gerçekleşir ve piyasa başarısızlığından ziyade sistemsel bir başarısızlık söz konusu olduğunda devlet müdahalesi gerekli hale gelir. İnovasyon, çevre ve kurumlardan oldukça etkilenen karmaşık ve belirsiz bir süreçtir. Firmalar, üniversiteler ve hükümetler yenilik sisteminin aktörleri olarak yenilik yaratmak için birbirleriyle etkileşim halindedir. Bu nedenle evrimsel yaklaşımla tasarlanan yenilik politikaları öncelikle iyi işleyen bir yenilik sistemi oluşturmayı amaçlamaktadır (Akçomak, 2016; Dosi, 1988; Erdil vd., 2016; Lundvall, 1992; Metcalfe, 1998; Nelson, 1993).

Bu perspektiften bakıldığında literatürdeki birçok çalışma ve raporun yenilik prosedür ve politikalarından hala neoklasik bakış açısının ışığında söz ettiği görülmektedir. Neoklasik yaklaşımın YAKA faaliyetlerine yönelik çizdiği yenilik politikaları, yenilik sürecinin doğrusal bir karaktere sahip olduğunu kabul ederek, piyasa başarısızlıkları ve finansal Ar-Ge yatırımları üzerinde yoğunlaşmaktadır (Chaminade ve Edquist, 2010; Edquist, 2014). Literatürdeki çalışmalarda her ne kadar, YAKA faaliyetlerine ilişkin anlayışımızı geliştirmesine rağmen, bu tezde YAKA'ya ilişkin politikaların geleneksel neo-klasik yaklaşımla geliştirilmesinin yetersiz kalacağı iddia edilmektedir. Bu iddianın altında yatan argümanları aşağıdaki iki alt başlık altında tartışmak mümkündür.

İlk olarak, YAKA süreci daha önceki bazı çalışmalarda kusurlu bir şekilde doğrusal sıralı bir aktivite olarak değerlendirilmiştir. Örneğin, Edquist ve Zabala-Iturriagoitia (2012) tipik PPI sürecini birbirine bağlı beş aşamanın birleşimi olarak tanımlamaktadır. Aslında YAKA süreci sadece kamu alımları faaliyetini değil aynı zamanda bir yenilik prosedürünü de içeriyor; dolayısıyla bu tanım, zaman içinde önemli ölçüde değişen yenilik prosedürü anlayışına yeterince dikkat etmemektedir. Her ne kadar 1950'li ve 1960'lı yıllardaki birinci ve ikinci nesil yenilik modelleri (ihtiyaç-çekim ve teknoloji itişisi), yeniliği neoklasik bakış açısıyla ele alıp, sıralı adımlar dizisi olarak tanımlamış olsa da; daha yeni modeller yeniliği geri bildirimleri bütünleştiren sistemik bir faaliyet olarak görüyordu (Rothwell, 1994). Edler ve Yeow (2016) özellikle kamu alımı faaliyetleri sonucunda yeniliğe ulaşmanın çoğunlukla

parçalar arasında etkileşimi ve risk paylaşımını gerektirdiğini; dolayısıyla süreçteki zorlukların ve karmaşıklığın üstesinden gelmek için hem kuruluşlar arasında hem de kuruluşlar içinde aracılık gerekli hale geldiğini savunmaktadır. Ayrıca Rolfstam (2009) da kamu alımlarının hazır ürün ve hizmetlerin tedariki prosedürü olarak standart bir şekilde kavramsallaştırılmasının YAKA prosedürünü tam olarak kavramayacağını belirtmektedir. Standart kamu alımı süreci yasalarla sınırlı olarak düzenlenen doğrusal bir faaliyet olarak görülürken, YAKA prosedürü yalnızca kamu satın alma düzenlemeleriyle değil aynı zamanda yenilik sistemiyle de ilgili olan geri bildirimler ve köklü ağlar yoluyla geliştirilmesi gereken daha karmaşık bir süreçtir.

İkincisi, daha önceki pek çok politika çalışması ve bazı AB raporları, yenilik satın alma faaliyetlerinin bağlama özgü ve sosyal olarak bütünleşik karakterini göz ardı ederek tüm ülkeler ve sektörler için aynı stratejileri önermektedir. Bu anlamda Edquist v.d. (2000) çok sayıda kamu teknoloji alımı (PTP) vakasını karşılaştırmış ve etkili bir PTP için temel gereksinimin, bu prosedürün gerçekleştirildiği tarihsel ve politik-ekonomik ortamdan izole edilmiş bir faaliyet olmadığını dikkate alan bir planlama yaklaşımı olduğu sonucuna varmıştır. Edquist v.d. (2000) PTP vakalarının her koşulda ve ne pahasına olursa olsun uygulanmasının yanlış bir strateji olacağını ileri sürmekte; bunun yerine, bu tür bir satın alma işleminden yararlanmak için spesifik vakaların belirlenmesi gerekmektedir. Buna göre Akçomak (2016) da inovasyon politikası geliştirmedeki en büyük zorluklardan birinin, ülke bazında değişen koşulları dikkate almadan aynı politikaların her ülkede uygulanması olduğunu vurgulamaktadır. Ülkelerdeki bağlamsal ve sosyal gereksinimler nedeniyle politikaları uyarlamayı teklif ediyor. Ayrıca Rolfstam (2009) kamu alımlarından kaynaklanan yenilikler için kurumların önemine dikkat çekmektedir. ÜFE'nin, ilgili ortamın sosyal, işbirlikçi ve kurumsal koşullarından oldukça etkilenen bir piyasa süreci olduğunu vurguluyor. Buradan hareketle, YAKA politika planlarının tasarımında kurumların kilit rol oynadığı ve politika önerilerinin “herkese uyan tek çözüm” yaklaşımı yerine ülkeye ve sektöre özgü koşullar dikkate alınarak geliştirilmesi gerektiği ileri sürülebilir.

Yukarıda tartışılan gerekçelere dayanarak, YAKA faaliyetlerine yönelik etkili plan ve politikaların geliştirilebilmesi için neo-klasik yaklaşımdan daha kapsamlı bir

anlayışa ihtiyaç duyulduğunu savunuyoruz. Neo-klasik yaklaşımla geliştirilen YAKA politika araçları sonucunda başarılı bir inovasyon elde etmek mümkün olmayacaktır. Bu çalışma, evrimsel yaklaşımın YAKA sürecini neo-klasik yaklaşıma göre daha kapsamlı bir şekilde kapsadığını ve Yenilik Sistemleri yaklaşımının etkili YAKA politikaları geliştirmek için uygun bir çerçeve olduğunu iddia etmektedir. Bu perspektifte, öncelikle hedeflerimize ulaşmamızı engelleyen sistem sorunlarını tespit ettik, ardından bu sorunlara yönelik politika araçları geliştirdik. Aşağıdaki bölümde bu sorunlar ve önerilen politika araçları ayrıntılı olarak tartışılmaktadır.

Amaç 1: YAKA uygulamalarının tanıtılması ve yaygınlaştırılması

- **Mikro düzey stratejiler**
- **Kamu ihtiyaçlarının yenilik potansiyeli konusunda aktörlerin farkındalık ve motivasyon eksikliği.**

Son yıllarda hükümetlerin kamu sektörünü ve hizmetlerini daha etkin hale getirmek amacıyla yeniliği teşvik etmek için kamu talebini nasıl kullanabileceği konusunda çok sayıda çalışma yapılmasına rağmen, aktörler ve kuruluşların yenilik süreci ve katma değeri konusunda yeterince bilinçli ve motive olmadığı değerlendirilmektedir. Bu nedenle kamu ve özel sektörde YAKA faaliyetlerine ilişkin farkındalık ve motivasyonu artırmak amacıyla aşağıdaki faaliyetler önerilmektedir:

- Yurt içi ve yurt dışı çalıştaylar ve seminerler düzenlemek.
- Ülkeler ve kurumlar arasında iyi uygulama örneklerinin paylaşılması amacıyla çalışma ziyaretlerinin teşvik edilmesi ve desteklenmesi.
- Duyuru ve bilgi paylaşımı amacıyla web sayfası kurmak ve sosyal medya araçlarını kullanmak.
- YAKA uygulayan kamu personeline yönelik ödül ve mali teşvik mekanizmalarının oluşturulması.
- YAKA uzmanlarını eğitmek için özel eğitim ve sertifikasyon programının tasarlanması.

- **Orta düzey stratejiler**
- **Kuruluşlar arasında bilgi paylaşımı ve etkileşimli öğrenme eksikliği**

Yenilik literatürü, sistemdeki aktörler arasındaki etkileşime ve etkileşimli öğrenmeye son derece önem vermektedir (Nelson ve Winter, 1982; Edler vd., 2005; Tsai 2009; Ozman, 2009; Zeng vd. 2010). YAKA çalışmaları da alım süreci öncesinde ve sırasında taraflar arasında diyalogun ve bilgi alışverişinin gerekliliğini tartışmaktadır (OECD, 2016; OGC, 2004; Edler ve Yeow,2016; Georghiou ve ark. 2014). Ancak kuruluşlar arasında bilgi paylaşımı ve etkileşimli öğrenmenin yetersiz olması durumu, YAKA faaliyetlerinde engel olarak karşımıza çıkmaktadır. Bu perspektiften bakıldığında, YAKA uygulamaları öncesinde ve sırasında paydaşlar arasındaki etkileşimi ve ağ oluşturmayı kolaylaştırmak için aşağıdaki faaliyetler önerilmektedir:

- İhale öncesi bölgesel ve sektörel çalıştaylar ve seminerler düzenlenerek tüm potansiyel üreticilerin YAKA konusunda bilgilendirilmesi.
- Mevcut ve potansiyel yenilikçi çözümler ve teknolojiler hakkında bilgi edinmek için ihale öncesi diyalog.
- Kamu uzmanları tarafından hazırlanan gereksinimler ve spesifikasyonlar konusunda piyasadan geri bildirim istemek.
- İhale dokümanlarında üretimin belirli aşamalarında ara denetim ve geri bildirimlere yer verilerek üretim süreci boyunca bilgi alışverişinde bulunulması.
- Teslim edilen ürünün kullanımına ilişkin eğitime ilişkin ihale dokümanına hüküm konularak, ürünün tedarikçi kurumu bünyesinde kolay adaptasyonu için tedarikçi ile iş birliği yapmak.
- İletişimi ve ağ oluşturmayı kolaylaştıracak aracı mekanizmaları dahil etmek.

Tüm bu faaliyetlerde temel kural; şeffaflığı, tarafsızlığı ve rekabeti tehlikeye atacak davranışlardan kaçınmaktır. Bu faaliyetlerin şeffaflığa saygı gösterilerek tekrar tekrar yürütülmesi, aktörler arasında etkileşimli öğrenmeyi, bilgi alışverişini ve güveni artıracaktır.

- **Riskten kaçınma ve risk yönetimi eksikliği**

Kamu sektöründe riskten kaçınma ve yetersiz risk yönetimi stratejileri YAKA prosedürü sırasında karşılaşılan kritik engellerdir (Edler ve diğerleri, Edler 2005).

Finansal, teknolojik, organizasyonel, piyasa ve türbülans sorunlarına ilişkin riskler, ihtiyaçların yanlış belirlenmesine, talebin yetersiz karşılanmasına, teslimatta gecikmeye, Ar-Ge'nin verimsizliğine, kamu kaynaklarının israfına vb. neden olabilir (Edler vd., 2015; Miller ve Lessard, 2008; Tsipouri v.d, 2010).

Tüm bu riskleri ortadan kaldırmak mümkün olmasa da risklerin yönetilmesi yenilik satın alma faaliyetlerinin başarısına katkı sağlayabilir (Bannerman, 2008). Edler vd. (2015) ve Tsipouri vd. (2010) YAKA faaliyetlerinde risk yönetimi stratejisinin üç ana görev çerçevesinde tasarlanmasını önermektedir. Öncelikle YAKA sürecinde oluşması muhtemel risk ve ödüllerin tespit edilmesi gerekmektedir. Bu risklerin nedenleri, kaynakları, olasılıkları ve olası sonuçları dikkate alınarak ele alınması ve değerlendirilmesi gerekmektedir. Daha sonra her bir riskin ortaya çıkma olasılığını azaltabilecek faaliyet ve sorumluluklar belirlenmelidir. Son adım, risklerin potansiyel sonuçlarını azaltmaya yönelik eylemleri tanımlamak ve bu faaliyetlerin maliyetlerini ve azalan faydalarını kimin karşılayacağını tahsis etmek olacaktır. Tüm bu faaliyetler doğru bilgilendirmeyi, müzakereyi ve alanında nitelikli personel yetiştirilmesini gerektirmektedir.

Bu perspektifte, alım sürecinin başında uzman personel tarafından kişiye özel bir risk yönetim planının hazırlanmasını öneriyoruz. Böyle bir strateji, YAKA'den kaynaklanan başarılı bir yeniliğe ulaşma olasılığını artıracak, hatta faaliyetin başarısız olması durumunda ortaya çıkabilecek olası krizleri en aza indirecektir.

- **Makro düzey stratejiler**
- **Kişiye özel bir eylem planının ve uzmanlaşmış bir ajansın bulunmaması**

Kamu talebiyle inovasyonu teşvik eden ulusal inovasyon politikalarına ilişkin artan endişeler, son yıllarda birçok eylem planını ve politika girişimini tetiklemiştir. Kamu talebi yoluyla yenilik ve teknoloji geliştirme stratejisinin kökeni çok eskilere dayansa da Avrupa'da resmi belgelerde ulusal ve bölgesel hedefler şeklinde yer alması çoğunlukla 2000'li yıllardan sonra gerçekleşmiştir. Böylelikle Avrupa Komisyonu'nun "Araştırma Yatırımı Eylem Planı (2003)", AB düzeyinde kamu alım

faaliyetleri yoluyla yenilikçiliği teşvik etme hedefini ortaya koyan ilk hamle olarak kabul edilmiştir.

Bu planın ardından birçok Avrupa ülkesi kendi ulusal eylem planlarını yayınladı. Öte yandan bazı ülkeler “politikasızlık” stratejisini tercih etmekte ve ulusal stratejik ve yenilik planlarında YAKA faaliyetlerine yönelik doğrudan hedeflere yer vermemektedir. Tüm bu plan ve strateji belgeleri, ülkelerin YAKA’ya verdikleri önemin göstergesi olsa da Lember vd. (2014) mevcut YAKA politikalarını çoğunlukla Ar-Ge teşvikleri gibi arz yönlü politika araçlarına dayandıkları için eleştirmektedir. Bu nedenle YAKA uygulamalarının istenilen ve beklenen düzeyde benimsenmesi ve yaygınlaştırılması için daha etkin planların üzerinde çalışılması gerekmektedir. Elbette bu planlar, inovasyon politikalarının 'herkese uyan tek kalıp' olmadığını ve bağlama özgü olma özelliğini dikkate almalıdır. Ülkelerin sosyal, ekonomik, coğrafi, teknolojik ve diğer koşulları dikkate alınarak en uygulanabilir “kişiye özel” planlar ortaya konulmalıdır.

Ayrıca bu eylem planları ve stratejilerinin çoğunda gözetim ve değerlendirme konularının çoğunlukla göz ardı edildiği ve bunlara yer verilmediği ileri sürülebilir (OECD, 2016). OECD (2014), yenilik politikalarının tasarım aşamasında izleme ve değerlendirme konularının dikkate alınmasını önermektedir. Bu temelde belirlenen hedeflerin gerçekleşme düzeyini izlemek, süreçlerin önündeki engelleri hızlı bir şekilde çözmek, karar almak ve siyasi destek sağlamak üzere devlet düzeyinde bir kamu kurumu/merkezinin kurulması veya görevlendirilmesi önerilmektedir. Almanya'daki KOIINO, İsveç'teki VINNOVA ve Innovate UK, bu stratejiyi benimseyecek ülke ve bölgeler tarafından ilham alınarak incelenmesi gereken güzel örneklerdir.

- **Yasal çerçevedeki eksiklikler ve belirsizlikler**

Yenilik alımı örneklerinin ilk sonuçları yasal düzenlemelere dayanmıyordu ve bu düzenlemelerle desteklenmiyordu. Kamu alım mevzuatını yenilik alımlarıyla uyumlu hale getirmeye yönelik ilk girişimler, Avrupa Komisyonu'nun 2005 ve 2011

yıllarında yayınladığı direktiflerdi. Artan sayıdaki çalışmalar, AB'deki karar vericileri kamu alım düzenlemelerinde daha kapsamlı revizyonlar yapmaya teşvik etti. YAKA uygulamalarına yasal bir temel oluşturmak amacıyla 2014 yılında Avrupa Parlamentosu ve Konsey tarafından 2014/23/EU, 2014/24/EU ve 2014/25/EU olmak üzere üç yeni direktif yayımlandı. Bu direktifler birçok Avrupa ülkesini mevzuatlarını bu doğrultuda revize etmeye zorladı. Ancak direktiflerde yer alan prosedürlerin uygulanması farklı AB ülkelerinde büyük farklılıklar göstermektedir. Bu nedenle, kamu kurumlarında yenilik alımına izin vermek ve teşvik etmek amacıyla yasal çerçevenin modernleştirilmesinin gerektiği savunulmaktadır.

- **Şeffaflığı azaltan faktörlerin varlığı**

Genel kural olarak kamu alım direktiflerinin temel ilkelerinden biri şeffaflıktır. Şeffaflık ilkesi, ilgili tüm tedarikçilerin ayırım gözetmeksizin ihaleye katılabilmeleri için aynı bilgilere sahip olmalarını ve kamu otoriteleri tarafından her aşamada kararların tarafsız ve açık bir şekilde alınmasını öngörmektedir. Şeffaflık, kamu kaynaklarının etkin kullanımının yanı sıra fiyat ve kalitede rekabet gücünün anahtarıdır. Öyle ki, daha fazla verimlilik ve hesap verebilirlik ancak kamu alımlarında şeffaf bir sistemin kurulmasıyla sağlanabilir (Bovis, 2012).

Bu nedenle YAKA faaliyetlerinde şeffaflığın ön planda olması gerekmektedir. Bu anlamda ülkeler için başlangıç noktası, şeffaflığı bozan düzenleme ve faaliyetlerin tespit edilmesi ve ardından şeffaflığın olumsuz etkilenme ihtimalini ortadan kaldıracak bir eylem planı hazırlanması olmalıdır. ÜFE faaliyetlerinde şeffaflığın artırılmasını amaçlayan bu eylem planlarının bir parçası olarak bize göre aşağıdaki faaliyetler yer alabilir:

- Kapalı diyaloglar yerine açık ve erişilebilir diyalogları tercih etmek.
- Siyasi, bölgesel, kişisel vb. çıkarlar nedeniyle bir firmaya öncelik vermekten veya ayrımcılık yapmaktan kaçınmak.
- Potansiyel tedarikçiler için adil ve eşitlikçi bir değerlendirme prosedürünü teşvik etmek.

- En düşük fiyat yerine Ekonomik Açıdan En Avantajlı İhale (MEAT) kriterlerini uygulamak.
- Kamu kaynaklarının kullanımının kamuoyu ve görünürlüğünü sağlamak.
- Taraflar arasındaki özümseme kapasitesi farkının yüksek olduğu durumlarda aracı mekanizmaları harekete geçirmek.
- İhale dokümanlarına çevrimiçi portal üzerinden ücretsiz erişimin sağlanması.

Amaç 2: Kamu Kurumlarının ve Tedarikçi Firmaların YAKA ile İlgili Hazmetme Kapasitesinin Artırılması

- **Mikro düzey stratejiler**
- **Kamu personelinin ihtiyaç ve çözüm bilgisini edinip kullanarak kamunun yenilik ihtiyacını tespit edememesi**

Kamu kurumu, ihtiyacı belirleyen, teklifleri değerlendiren ve yeniliği kullanan taraf olarak YAKA sürecinin merkezinde yer almaktadır (Semple, 2014). Buna göre, OECD (2016) tarafından yapılan bir araştırmada, kamu personelinin ihtiyacı tespit etme ve pazardaki inovasyon potansiyelini anlama konusundaki yetersizliği, ülkeler tarafından YAKA faaliyetlerinin önündeki temel engeller olarak rapor edilmiştir. Örnek olay çalışmalarımızda, pazar fırsatları doğrultusunda inovasyon ihtiyacını tespit edebilen ve gereksinimleri net bir şekilde dile getirebilen kamu kuruluşlarının, YAKA sürecini başarılı bir şekilde gerçekleştirmeye daha yatkın olduğu gözlemlendi. Bu nedenle kamu kurumları ve politika yapıcılar tarafından, kamu alım personelinin ihtiyaç ve çözüm bilgisini edinerek ve kullanarak yenilik ihtiyacını belirleme becerisini kolaylaştırmak için çeşitli türde araştırma ve eğitim faaliyetleri yürütülmelidir. Bu etkinliklerden bazıları şunlar olabilir:

- İhtiyaç ve çözüm değerlendirmesi için satın alma personeli için özel eğitim programlarının tasarlanması.
- Uzun vadeli ihtiyaç planlamasına yönelik kamu kuruluşları tarafından Ar-Ge faaliyetlerinin yürütülmesi.

- YAKA faaliyetlerine yatkın potansiyel sektörlerin ve teknolojilerin belirlenmesi.
 - Mevcut çözümler ve gelecekte geliştirilebilecek potansiyel teknolojik gelişmeler hakkında pazar araştırması yapmak.
 - YAKA uzmanlarının kamu sektöründe istihdam edilmesi.
 - İhtiyaç değerlendirmesi ve süreç planlaması için YAKA arabulucularından destek alınması.
- **Tedarikçi firmaların ihtiyaç bilgisini anlayamaması ve tatmin edici bir yenilikçi çözüm sunamaması**

Bir YAKA faaliyeti, yeni özelliklere sahip yenilikçi bir ürün tedarik etmeyi amaçladığından, kamu kuruluşunun ihtiyaçları hakkındaki dış bilgiler verimli bir şekilde elde edilmeli ve potansiyel tedarikçiler tarafından bundan yararlanılmalıdır (Edler ve diğerleri, 2005). Ancak YAKA faaliyetlerindeki başlıca zorluklardan biri, firmaların kamu kuruluşunun ihtiyacını ve yenilik yoluyla elde edilecek fonksiyonel iyileştirmeleri anlamadaki yetersizliğidir (Edler ve Yeow, 2016). Bu temelde, bu politika önerisi, potansiyel tedarikçilerin kamu talebiyle ilgili dış ihtiyaç bilgisini elde ederek ve kullanarak tatmin edici bir yenilikçi çözüm sunma yeteneğini artırmayı amaçlayan faaliyetlere odaklanmaktadır.

Bu faaliyetlerden ilki, tedarikçilerin YAKA prosedürleri ve yasal çerçeve konusundaki bilgilerinin artırılması olabilir. Bu amaçla kamu otoriteleri ve politika yapıcılar tarafından özellikle YAKA faaliyetlerine odaklanan seminer ve eğitimler düzenlenmelidir. Ayrıca YAKA uzmanlarının işe alınması veya YAKA danışmanlığının dış kaynaklardan sağlanması tedarikçiler tarafından değerlendirilmelidir.

Firmaların kamunun YAKA taleplerine daha kısa sürede, daha etkin sonuçlar üretmesini sağlayacak bir diğer faydalı strateji ise tedarikçilerin uzun vadeli ve yüksek hacimli kamu ihtiyaçları konusunda bilgilendirilmesi olacaktır. Ar-Ge faaliyetlerine rehberlik etmek amacıyla kamu otoritelerinin, halkın uzun vadeli

ihtiyaç planlamasını ve gelecekte olası YAKA alımlarını piyasaya bildirmesi gerekmektedir. Bu anlamda kamu kurumlarının kamu-üniversite-sanayi iş birliğine dayalı projeler aracılığıyla kolektif ihtiyaç analizi yapması ve sonuçlarını periyodik olarak tüm potansiyel tedarikçilerle paylaşması anlamlı olacaktır.

- **Orta düzey stratejiler**
- **İhtiyaç ve çözüm bilgisinin özümsemesi ve kullanılması konusunda kurum içi ve kurumlar arası koordinasyon eksikliği**

İşbirlikçi ağların inovasyon performansı üzerindeki olumlu etkisi inovasyon literatüründe geniş çapta tartışılmıştır. Bu çalışmaların çoğu, inovasyon üretmek için bilginin kullanılmasında işbirliğinin olumlu etkisi konusunda fikir birliğine varmıştır (W. Becker & Dietz, 2004; Miotti & Sachwald, 2003; Nieto & Santamaría, 2007; Ozman, 2009; K.-H. Tsai, 2009). YAKA faaliyetlerinde de, kamu ve tedarikçiler arasındaki işbirliğinin önemi ön plana çıkmaktadır (OECD, 2016; Uyarra, 2014). Ek olarak, kamu ve tedarikçiler arasında etkileşimli öğrenmeyi sağlamak için her bir taraf için yeterli düzeyde özümseme kapasitesinin zorunlu olduğu da bir gerçektir (Mowery ve diğerleri, 1996; Kim, 1998; Lane ve Lubatkin, 1998; Lane ve diğerleri, 2001). Örnek olay çalışmalarımızda da, YAKA faaliyetlerinde ihtiyaç ve çözüm bilgilerinin her iki kesim tarafından etkin bir şekilde elde edilmesi ve kullanılması için kurum içi ve kurumlar arası işbirliğinin gerekli ve hayati olduğunu gözlemlenmiştir.

Ancak yeterli koordinasyon ve ağ oluşturma eksikliği YAKA faaliyetlerindeki başlıca zorluklardan biri olarak görülmektedir. Bu nedenle politika yapıcıların ve kamu otoritelerinin, ihtiyaç ve çözüm bilgisinin etkin biçimde özümsemesi ve kullanılması için örgüt içi ve örgütler arası koordinasyonun artırılmasına yönelik bazı eylemlerde bulunmasını öneriyoruz. Bunlardan bazıları şunlar olabilir.

- YAKA süreci öncesinde, esnasında ve sonrasında iç birimler arasında bilgi ediniminin, yayılımının ve kullanımının sağlanması amacıyla periyodik toplantılar yapılması
- Özümseme kapasitesi yüksek olan üniversitelerin de YAKA iş birliklerine dahil edilmelerinin teşvik edilmesi

- **Makro düzey stratejiler**
- **Aracılık mekanizmalarının ve aktörlerinin oluşturulması**

Yenilik faaliyetlerinde etkileşim ve bağlantıların gerekliliği literatürde yaygın olarak vurgulanan bir konudur. (Edquist, 1997; Freeman, 1995; Lundvall, 1988; Nelson ve Winter,1982). Bu etkileşimler kuruluş içinde, taraflar arasında ve diğer paydaşlarla gerçekleşebilir. Tüm bu etkileşimlerde ortaya çıkabilecek anlaşmazlıkların farklı aşamalarda başarısızlık riskini artırdığını örnek olay incelemelerimizde gördük. Arabuluculuk mekanizmaları, bilgi paylaşımını kolaylaştırarak taraflar içindeki ve arasındaki bilgi boşluklarını kapatarak bu çatışmaları hafifletmek için önerilen etkili mekanizmalardan biridir (Edler ve Yeow, 2016).

Bu bağlamda, bölgesel ve ulusal bazda arabuluculuk mekanizmalarının/araçlarının/aktörlerinin oluşturulmasını öneriyoruz. Bu aktörler uzmanlar, danışmanlık hizmeti sağlayıcıları ya da kamu kuruluşu olabilir, ancak önemli olan bunların iyi eğitilmiş, nitelikli ve tarafsız olmalarıdır. Hem tedarikçinin hem de tedarikçinin eksikliklerini kapatarak sürecin yolunda gitmesini sağlayacak araçların oluşturulması YAKA faaliyetlerinin önemli bir parçası olacağı düşünülmektedir.

- **YAKA faaliyetleriyle ilgili araştırma faaliyetlerine yönelik Ar-Ge destekleri**

Bir kurumun özümseme kapasitesini artırmanın en etkili aracı kurum içi Ar-Ge çalışmalarıdır (Cohen ve Levinthal, 1990). Ancak Ar-Ge faaliyetleri başarısızlık riski nedeniyle yüksek finansal yatırım kaybı riski taşıdığından ülkeler ve politika yapıcılar, kuruluşları bu riskleri üstlenmeye teşvik edecek finansal destek mekanizmaları geliştirmişlerdir (Çiftci ve Darrough, 2016; OECD, 2015). YAKA uygulamaları da standart satın almalara göre daha bilgi yoğun ve araştırma gerektiren bir karaktere sahip olduğundan, genel olarak YAKA bağlantılı özümseme kapasitelerinin artırılmasına yönelik aşağıdaki mali teşvikleri özellikle öneriyoruz.

- Kamu kuruluşları tarafından yapılması beklenen "ihtiyaçlar ve pazar analizi" ile "inovasyon gerektiren kamu ihtiyacının ve piyasadaki potansiyel yenilikçi çözümlerin belirlenmesi" konusundaki araştırmalarına fon sağlanması.

- YAKA uygulamalarına katılması potansiyel tedarikçilerin ihtiyaç ve çözüm özümseme kapasitelerini iyileştirmeyi amaçlayan Ar-Ge faaliyetlerine mali destek verilmesi.
- Tüm paydaşların özümseme kapasitesini arttırmaya yönelik, üç aktör (Üniversite-Sanayi-Kamu) iş birliğiyle yapılacak ihtiyaç analizleri ve eğitimlere fon sağlanması.

Sonuç

Bu çalışmanın literatüre özgün katkı sağladığı birçok önemli alan bulunmaktadır. Çalışmanın bir yeniliği, kamu alımları ile inovasyon arasındaki ilişkiyi analiz etmek için çok ülkeli veri setini kullanan ilk çalışma olmasından kaynaklanmaktadır. Bu araştırma, bir yenilik politikası aracı olarak kamu alımlarının güçlü potansiyeline ilişkin önemli ampirik kanıtlar sağlamıştır. İkinci olarak, bu tez, kamu alımlarının inovasyon etkisinde özümseme kapasitesinin arabulucu etkisine ilişkin analiz yapan ilk çalışma olmuştur. Ayrıca hipotezimizi test etmek için hem nicel hem de nitel araştırma yöntemlerini kullanmak daha güçlü ve kapsayıcı sonuçlara ulaşmamızı sağlamıştır. İlave olarak, kurumları ve iş birliklerini sürece entegre ederek Yenilik Sistemleri (SI) yaklaşımına dayalı olarak kamu yenilik satın alma politikaları geliştiren ilk çalışmadır. İnovasyon sistemindeki mevcut sorunların çözümüne odaklanmanın, başarılı inovasyon YAKA uygulamalarının sayısını arttırmanın etkili bir yolu olabileceği görülmüştür. Bu tezde makro, orta ve mikro düzeyde geliştirilen politika önerilerinin, YAKA faaliyetlerinin nitelik ve niceliğinin arttırılması konusunda politika yapıcılara ve kamu otoritelerine yol gösterici araçlar olarak hizmet edeceği değerlendirilmektedir.

Bu çalışmayla ilgili bazı sınırlılıkların belirtilmesinde fayda vardır. 14 Avrupa ülkesinin CIS 2014 mikro verilerinden elde edilen nihai örneklemin, kamu alımları sorusuna yanıt veren firma sayısının sınırlı olması ve uzaktan erişim izni veren ülke sayısının sınırlı olması nedeniyle amaçlanandan daha az gözlem içermesi araştırmayı olumsuz etkileyen bir durumdur. Bu çalışmadaki bir diğer zayıflık kaynağı da mülakatların sayısı ve kamu alımlarına ilişkin gizli bilgilerin paylaşılması konusundaki endişeler nedeniyle vaka çalışmalarında mevcut bilgilerin sınırlı

kalmasıdır. Kamu alımları faaliyetleri hem alıcı hem de satıcı açısından belirli bir düzeyde gizlilik içerdiğinden, ilgili alıma ilişkin gizli bilgilerin paylaşılmadan analiz yapılması gerekliliği, araştırmanın derinleştirilmesinin önünde güçlü bir engel olmuştur.

Bu araştırmanın birçok açıdan gelecek çalışmalara ışık tutması ve temel oluşturması ümit edilmektedir. Öncelikle kamu alımları ile inovasyon arasındaki ilişki, küresel ölçekte uygulanan daha güncel araştırmalarla yeniden incelenmelidir. Böylece sonuçlarımız daha büyük bir örneklemle doğrulanacak ve YAKA politikalarının uzun vadeli etkileri görülecektir. İkinci olarak kamu sektöründe özümseme kapasitesine ilişkin sınırlı sayıda çalışmanın olduğu gözlemlenmiştir. Bu nedenle gelecekte bu konuyla ilgili çalışmalar yapılması önerilmektedir. Son olarak bu çalışma, YAKA politikalarının SI yaklaşımıyla tasarlanmasının ilk adımıdır. Daha sonraki çalışmalar, belirli ulusal, bölgesel veya sektörel yenilik sistemlerine odaklanarak SI yaklaşımıyla YAKA politika tasarımına odaklanmalıdır.

Son bir not olarak, bu çalışma, etkili bir şekilde yürütülen YAKA uygulamalarının; kamu sektörü verimliliği, iklim değişikliği, gıda güvenliği, sürdürülebilir tarım, sürdürülebilir tarım, hava kirliliği, enerji ve ulaşım zorlukları gibi kamu kuruluşlarının, sektörlerin, bölgelerin ve ülkelerin karşılaştığı birçok büyük zorluğun çözümünde bir araç olabileceği sonucuna varmaktadır. Bu nedenle YAKA uygulamaları; bölgelerin, ülkelerin ve uluslararası kuruluşların araştırma ve yenilik stratejilerinin ve finansman programlarının vazgeçilmez bir parçası haline gelmelidir.

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