How public procurement can foster innovation through effective tender formulation

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ABSTRACT,
Public procurement plays a crucial role in the acquisition of goods and services by governments and public entities. In 2020, global public procurement accounted for between 13% and 20% of GDP, with an estimated value of $9.5 trillion. This study investigates how the specification of PP tenders influences the selection of companies and their ability to innovate. A qualitative approach, involving interviews with procurement officials and suppliers in the Netherlands, was employed to gather insights. The findings reveal that to foster innovation through public procurement the application of a functional approach to tender formulation is paramount. By utilizing a functional approach market parties are invited to utilize their expertise and to apply their innovations. Furthermore, the inclusion of innovation as a reward criterion aids innovation. A lack of knowledge of market developments was found to be a barrier to the effective formulation of specifications, thereby limiting the innovation potential of the responding firms. Factors such as time constraints, risks and politics hinder innovation fostering specification formulation. The findings reveal that the complexity of tenders and time constraints are significant barriers to innovation, especially for SMEs. Furthermore, a lack of knowledge of public procurement procedures at SMEs was found to be a barrier to innovation. The study highlights the need for early market involvement and collaboration between public and private sectors to enhance the innovation potential of PP. These insights can aid policymakers in formulating tenders that meet public needs and drive technological advancements.

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Keywords
Public procurement, innovation, specifications, tenders, open innovation, SMEs

1. INTRODUCTION

Public procurement (PP) can be defined as "the acquisition of products and services needed for public organizations to fulfill their functional objectives" (Kristensen et al., 2021). PP plays a crucial role in the acquisition of goods and services by governments and public entities. Policymakers rely on this strategy to execute policies that benefit the public and promote sustainable development. In 2020, global PP accounted for between 13% and 20% of GDP, with an estimated value of $9.5 trillion (Bank, 2020a). In the Netherlands, this figure is estimated to be 20% of their GDP (Bank, 2020b). As such, PP is a significant topic of political debate due to the sheer amount of funds being spent.

PP is vital for the development of public spaces, including infrastructure, utilities, and supporting industries, especially during economic downturns. Governments also use it to support digital initiatives and create smart city projects. Additionally, PP can have the potential to encourage collaboration between public and private entities, facilitating resource sharing and risk management in project implementation.

There has been a recent surge in research on PP. This research has focused on five main themes, which are innovation, corruption, sustainable and green procurement, procurement contracts, and small and medium enterprises. Among these themes, the role of procurement in aiding innovation has received the most attention (Rejeb et al., 2023). In this paper innovation is defined as "the initiation, adoption and implementation of new ideas or activity in an organizational setting" (Pierce & Delbecq, 1977). PP is seen as an important force in driving innovation by providing the demand that can spur innovation and is a huge part of the local demand that can generate innovation in a given area (Edler & Georghiou, 2007). Innovations can also come with a significant amount of entry and switching costs. By providing the initial demand necessary PP can help to accelerate innovation by leveraging these risks. Innovations can also be accelerated through PP. Furthermore, PP can play a key role in the formation of markets for innovation (Bleda & Chicot, 2020). PP can help to coordinate knowledge in the originating stage of an innovation, by providing key information on existing and interested users in an innovation. Through PP demand can be expressed and created. It has also been found that PP is more likely to award contracts to more innovative companies (Blind et al., 2020; Georghiou et al., 2014; Uyarra et al., 2014). By awarding contracts to more innovative companies, PP is further fostering innovation.

However, there are risks. Krieger et al. (2024) argue that PP can hinder innovation. PP has an adverse effect on innovation through tenders without award criteria that consider more than price. Furthermore, Krieger et al. (2024) argue that firms that win non-innovative tenders see a decline in innovativeness and a stronger reliance on existing products. Additionally, PP tends to encourage incremental innovation, as opposed to radical innovation that introduces something completely new to the market (Czarnitzki et al., 2020). On top of that, they find that tenders with no contracted innovation have no comparable effect on turnover with innovations.

PP has the potential to stimulate innovation, however, certain requirements have to be met. There are multiple barriers to innovation in PP (Uyarra et al., 2014). One of them being the over-specified tenders. These over-specified tenders form a barrier from a supplier's perspective. The overcomplicated qualification procedures and/or conditions discourage smaller firms from participating. The time-consuming process is seen as a waste of time. This is especially problematic because small businesses provide the most conducive environment for innovation (Sahut & Peris-Ortiz, 2014). Additionally, Uyarra et al. (2014) find that rigid specifications are found to be barriers to innovation. Suppliers say that "we often find ourselves in situations where the procuring body may be open to innovations but there isn't time or opportunity to secure a departure from that specification" (Uyarra et al., 2014). Therefore, over-specified and rigid specifications hinder companies' innovation potential and the selection of firms is affected. Time consumption and complexity are also found to be significant barriers to PP innovation on the buyer's side (Amann & Essig, 2015). The complexity stems from the strongly regulated PP process and the interaction of different stakeholders. As a result of the backing of all actor groups the PP process could be classified as a tight-rope walk. PP tries to comprise goals such as cost savings and socially responsible targets. This can be hard to match and hinder innovation potential. Combined with the aforementioned limits on innovation through PP that focus on the formulation and set up of tenders.

1.1 Research question

Considering the need for PP tenders to contain specifications that can aid innovation, this research will focus on the following research question:

"How does the specification of PP tenders influence the selection of companies and their ability to innovate?"

In the context of this research companies are the firms that are competing for a tender and firms that are supplying the government.

1.2 Contribution

The goal of this research is to add to the understanding of how the specifications of a tender affect the selection of companies and the ability of firms to innovate. Furthermore, this research attempts to increase the understanding of the supplier's perspective on tender specifications. The need for research into the barriers to innovation through PP is highlighted by Rejeb et al. (2023).

The practical relevance of this study lies in its effort to contribute to the understanding of how to successfully promote innovation in a PP setting. Through the understanding of both the supplier's and the government's perspective tenders can be applied more efficiently. This can lead to more efficient use of public funds and better implementation of policies, which is crucial for achieving the goals established by our policymakers.

2. THEORETICAL BACKGROUND

Open innovation (OI) is a theory on innovation proposed by Chesbrough (2003). Chesbrough defines OI as "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology." OI can be contrasted with closed innovation. In closed innovation firms perform the entire innovation process internally. They "develop, build market, distribute, service, finance and support the innovation on their own" (Chesbrough, 2003). Recently firms are adopting a more open approach to innovation (Randhawa et al., 2016). Among a network of actors, the purposeful inflow and outflow of information gives rise to innovations. This open approach to innovation can be seen as part of a more general trend in which firms are developing into network organizations (Huizingh, 2011). OI can be seen as a logical consequence of the increase in outsourcing, agility and flexibility among firms.

The OI theory can be leveraged in PP. By understanding that ideas for innovations are sourced from both internal and external sources, PP can harness the innovative potential of its tenders. By providing vital information upon request, the public sector

can inspire firms to innovate (Bleda & Chicot, 2020). Such information may pertain to non-existent product demands, thus serving as an impetus for innovation. Furthermore, public institutions possess data that can be utilized to create and diffuse innovative solutions. Similarly, private companies hold valuable capabilities and information that could prove instrumental in fulfilling the public sector's requirements in an innovative manner. Additionally, applying OI in PP can increase public engagement and relationship building (Yuan & Gasco-Hernandez, 2021). By building relationships and stimulating public engagement, this approach aids idea generation and selection. This is a crucial step in the innovation process. Through an OI approach to innovation, PP can provide value to the innovation process. By articulating and specifying demand PP can accelerate the development of innovation.

Developing a nuanced understanding of the mechanics behind innovation through PP can greatly improve the effectiveness of innovation procurement. OI emphasizes the importance of sourcing ideas from within and outside the organization. If the government can act as a source of ideas for market parties, it could boost the level of innovation it fosters. By increasing the efficiency of the innovation process through specifying demand, PP can become a powerful catalyst for innovation. Realizing the open characteristics of innovation can help to better understand the effect PP can have on innovation. Furthermore, a better understanding of innovation can enable a better understanding of what PP practices are effective in stimulating innovation. The OI perspective in PP can help to understand how the specifications of a PP tender can influence the ability of companies to innovate.

3. LITERATURE REVIEW

In the procurement process, the most crucial point is seen as the articulating and specification of the to-be-purchased products (Askfors & Fornstedt, 2018). The formulation of the functional specification of a PP can influence the innovation it creates according to Edler (as cited by Uyarra et al. (2014)). Hence, these specifications must be formulated as effectively as possible. If the specifications of the tender are too rigid and narrow innovation potential could be lost. An over-specified tender prevents the suppliers from developing an innovative solution. Therefore, by formulating tender specifications that do not leave room for the supplier to develop innovative solutions, innovation potential can be lost. The rigidity of the tender can prevent suppliers from proposing new and innovative solutions, hindering the innovation potential (Uyarra et al., 2014). Suppliers often find themselves in situations where the procuring body is open to innovation but a lack of time and opportunity prevents a departure from rigid specifications. Therefore rigid tender specifications can harm the ability of firms to innovate. If the specifications are too rigid, possible innovations could be lost. Furthermore, the overcomplicated selection process in PP is perceived as a barrier by suppliers (Uyarra, 2014). Suppliers perceive this complicated process as a waste of time which prevents them from putting in a bid. However, the formulation of specifications that are effective and provide space for innovations also faces several barriers (Byatt, 2001). These barriers include developing additional requirements for tender evaluations, including defendable methodologies and evaluation criteria, and the transaction costs of change. As a result, effective specifications are not being applied comprehensively. Furthermore, if specifications are formed with a local view, this could lead to a fragmented market which would ultimately hurt the transferability of the innovation it may produce (Uyarra & Flanagan, 2010). The lost value of this innovation could be even greater when the innovation has a generic demand and could therefore be applied in a broader context. These barriers harm the ability of companies to create innovation through PP. However, by recognizing these barriers while formulating the specifications of the tender, PP officers could mitigate the limiting effect on the ability of companies to innovate in a tender bid. Understanding how these barriers can affect the innovation potential the tenders create, can help to better understand the effect of PP tenders on companies' ability to innovate.

For a tender process to be efficient a high-quality project brief that focuses on output specifications is found to be a pre-condition (Liu et al., 2016). The output specifications and service specifications can be contradictory which can leave room for interpretation of the requirements. This room for interpretation can hurt the effectiveness of the bid. The contradiction of the tender's specification creates issues on the supplier's side, as it can limit the ability of companies to create a comprehensive solution. The only way for this barrier to be lowered is to simplify the project brief and ensure it is project-specific (Liu et al., 2016). To facilitate high-quality tender specifications, that can be accurately and coherently interpreted, the development of standardized documents and policies is further found to be beneficial. Thus, by standardizing documents and policies in the specification formulation process of the tender, the resulting bids could be of higher quality. The use of standardization practices aids the quality of the bid and can thereby aid companies in creating an innovative bid that satisfies the tender's needs. Additionally, the need for standardization in the specifications of PP tenders is underscored by Rainville (2017). Rainville (2017) finds that when there is no market solution, and the demanded innovation is of a radical nature there is a further need for standardization. Ensuring that the specifications of the procured innovation comply with market standards can further drive demand for the created innovation. Thereby creating an incentive for innovative bids as it is more appealing for a supplier to form a bid when the created innovation can be applied in a broader context. By incorporating these standardization practices in the specifications as well as the PP procedure, the specifications of the PP tender can have a positive effect on the created innovation.

By explicitly rewarding innovation through an award criterion in the PP tender the innovation output of the tender is aided (Czarnitzki et al., 2020). This can be contrasted with standard PP which does not influence the turnover with market novelties. The importance of the inclusion of innovation in the awarding procedure of a PP tender is further outlined by Krieger et al. (2024). If innovation is not considered when selecting suppliers PP is found to hinder innovation. It further roots the suppliers in their ways, thereby hindering innovation. Therefore, by specifying innovation as a reward criterion of the tender, PP can foster innovation.

Research by Askfors and Fornstedt (2018) highlights some problems in the tender specification process that can hinder innovation. When formulating the specifications for a tender procurers consult a preference group made up of the end users of the procured product. However, Askfors and Fornstedt (2018) highlight that this procedure can create frustration in the preference group caused by the knowledge gap between the procurers and the preference group. This can hinder the effectiveness of the formulated specifications. This is an example of how the formulation of the specifications of a tender can limit the innovation potential that the tender has. By creating an improved procedure for formulating tender criteria this frustration can be mitigated. If the expectations of the different parties are better communicated, this could aid the effectiveness of the process. Furthermore, the requirements for tender specifications are a bottleneck for innovation diffusion (Askfors & Fornstedt, 2018). Therefore the importance of the specifications should not be underestimated when considering innovation policy.

Drawing from the literature previously examined, the following conclusions may be inferred. The specifications of a PP tender can influence innovation in multiple ways. The innovation potential could be lost by formulating the specifications in a way that is too narrow and does not leave adequate room for innovations to be developed. Furthermore, if the specifications of the tender leave room for interpretation this can harm the quality of the proposed solutions. If the objective is not formulated clearly, companies could struggle to effectively fulfill the need for the procuring entity. This can limit the innovation potential of companies bidding for the tender. If the specifications are too narrow and unclear, they can negatively impact innovation. When innovation is not included as an award criterion, PP tends to hinder innovation. Conversely, when innovation is considered an award criterion, PP promotes innovation. Therefore, by formulating clear specifications that allow room for innovation and rewarding innovation, PP can foster it.

There are barriers to the effective formulation of tender specifications. The knowledge gap between the procurers and the end users of the procured product is found to hinder effective tender formulation. Furthermore, when procuring innovation, additional award criteria and specifications need to be developed. This is found to further harm the effective formulation of specifications when procuring innovation, as this increases the transaction cost of change. However, by standardizing the specifications of the tender and the PP process, these barriers can be reduced.

4. METHODOLOGY

This research applies a qualitative approach. A qualitative approach can be used to study and ascribe meaning to human and social problems (Creswell & Creswell, 2009). The choice for qualitative research has been made because this research tries to understand the relationship between the formulation and specification of a tender and the innovation it creates. Given the aim to comprehend the compilation of the relationship between specification and innovation, qualitative research is more aptly suited. Furthermore, these variables are hard to quantify and therefore less suitable to study quantitatively. The data collection in this research involved primary data collection. Data has been through conducting interviews. This research will follow a combination of the inductive approach and the deductive approach where particulars will lead to codes and themes. Furthermore, themes have been identified in the prior literature review (Creswell & Creswell, 2009). Through an inductive process patterns, categories and themes are built from the bottom up. By analyzing interview responses and connecting them to broader themes, patterns can emerge. This will be complemented by a deductive approach which will compare the findings in the literature review to the interviews.

4.1 Interviews

This research will collect data through conducting interviews. The focus will be on interviewing experts in the field of PP and innovation, to get data. The interviews will focus on contacting procurement officials in the public sector. These procurement officials could provide valuable insights into the specifications of a PP tender. They could speak to their experience in formulating specifications and the effect of the specifications on the bids they receive. Their insights will help to understand the factors that shape the tender criteria and the barriers that exist in formulating effective specifications. Furthermore, they could offer examples of successful innovation procurement initiatives and identify the practices that contributed to their effectiveness. Additionally, contacting companies that supply the public sector could also provide valuable data. The supplier's perspective could prove to be fundamental to understanding the effect of the tender specifications on the innovation potential it creates. Their experience with PP tenders from a supplier's perspective can enlighten the effects of the specifications of a PP tender on the innovation potential it creates. By contrasting the perspective of the suppliers to the perspective of the public procurers a comprehensive understanding of the effect of specifications on the selection of companies and their innovation potential can be created. The type of companies that could be interesting to interview are small and medium enterprises (SMEs) as well as larger firms that have experience with supplying public entities. These companies could provide insights into the barriers they experience when supplying public entities. They could further provide information on what aids them to effectively put in innovative bids and the factors limiting it. Another group that could be of interest is industry experts, consultants with expertise in PP that work for the procurer's side could be approached. They can speak on the government's perspective on PP. Due to their broad experience in multiple government entities, they have a comprehensive understanding of PP and its effect on innovation. Whereas public procurement officials work at one procuring entity at a time. Their experience across entities will help to further understand the government's perspective as their experience in multiple entities will help to eliminate the entity specificity of the findings. Moreover, they could share their experience and provide case studies which could help to understand the effect of tender specifications on the capability of companies to innovate.

Before each interview, respondents provided consent for data processing and recording. The researcher introduced themselves and the research, followed by the interviewee's introduction of their role and experience. Government-related questions explored differences in procuring innovation, barriers to innovation, and the impact of tender specifications. Supplier-related questions examined their experience with public sector innovation, the government's effect on innovation, and challenges posed by tender specifications. Each interview concluded with an explanation of the data handling. The full interview protocol can be found in appendix a.

Interviewees have been contacted through various channels. Procurement officials were contacted via municipalities or other government agencies, while suppliers' representatives were contacted through their respective contractors. These government officials could further help to identify suppliers that are relevant to this research. By collecting both perspectives a comprehensive analysis of the effect of specifications of a PP tender on the selection of companies and their innovation potential could be created. Another effective option is to reach out to procurement consultancy firms, which have a wide network of clients and can provide suitable interviewees. Moreover, these firms can also offer valuable candidates for the interviews. By utilizing the networks of the consultancy firms and the government officials a pool of companies is created. From this pool, companies have been selected and contacted for conducting interviews based on the characteristics mentioned above.

The division of the respondents is presented in Table 1. The table categorizes respondents based on their respective roles within their organizations. Additionally, a distinction is made between respondents representing the government and those representing suppliers. Respondent 8 is active at a semi-government organization. This organization is owned by municipalities and is obligated to use PP procedures. However, this organization does aim to maximize profits.

The interviews have been conducted either in person or through a digital connection. Interviews as a method of data collection can be useful when participants cannot be directly observed (Creswell & Creswell, 2009). This makes interviewing a fitting choice for this research as PP processes and the development of innovations are hard to be directly observed.

The interviews have been recorded and transcribed. The interviews were conducted in Dutch. A rough translation of the transcriptions of the interviews has been provided. After conducting and transcribing the interviews, the data will be coded. The coding process has been done in Dutch, after which the findings will be translated and synthesized in English. The coding process will use a combination of the inductive and deductive methods. The deductive method entails the use of data to analyze themes that were predetermined in the literature review, the inductive method is used when themes are formed during the data analysis process, rather than before. As possible themes were identified in the literature review, the deductive method was applied as these themes could help to categorize and understand the data provided by the interviews. However, as the interviewees themselves could mention themes that had not been found in the literature review the inductive method will applied. The mix of inductive and deductive will aid the understanding of the data. While coding the theoretical framework of open innovation has been used. By taking an open approach to innovation the value of PP in stimulating PP can be understood. The coding will be done through the development of codes, which will lead to themes. These codes and themes can be found in appendixes b and c. Once the data has been coded it will be analyzed. This process will be done through the 6 steps suggested by Creswell and Creswell (2009).

Table 1 Interview respondents

Respondents	Respondent function	Years of experience	Supplier/government	Sector
Respondent 1	Senior procurement advisor	8 years	Government	Municipality
Respondent 2	PP consultant	12,5 years	Government	Consultancy
Respondent 3	PP consultant	7 years	Government	Consultancy
Respondent 4	Senior procurement advisor	9 years	Government	Municipality
Respondent 5	Entrepreneur	16 years	Supplier	Cleaning
Respondent 6	Material Specialist	22 years	Supplier	Infrastructure
Respondent 7	General director	30 years	Supplier	Taxi
Respondent 8	Strategic procurer	2 years	Semi-government	Waste processor

5. RESULTS

This chapter presents the findings from the conducted interviews. The interview data was analyzed through thematic coding. Patterns in the responses led to the identification of codes, which were then organized into themes. These resulting themes and codes can be found in tables in appendixes B and C. A total of 7 themes were identified and are listed in table 2. The themes emerged from the data analysis, particularly from the patterns observed in the responses. The interviews provided insight into the effect of tender specifications on the selection of companies and their innovation potential. Certain sections of the results address broader topics than the initial research question. However, these sections were included because they provide valuable and interesting insights from interviewees.

Table 2 Themes

Quote	Theme
"Functional specifications always allow more room for innovation than technical specifications." R3	Specifications
“Let the supplier come with their current solution, and if we need to renovate in a few years, they can do it with their innovative technical advancements of that time." R2	Contracts
"A procurement process is already complex, making it difficult for new entrants and new companies often involved in new developments to navigate, especially if it is filled with revision clauses." R4	SME involvement
"If you want to innovate, you need to engage with the market early in the process." R1	Communication
"I think that the government plays a crucial role in many cases because if the government does not have a specific demand, the market will not develop accordingly." R4	Open innovation
"Look, such a procurement process is already very complex. As a project leader, keeping a handle on a process with a start and end, dates, politics, budgets, and residents who have various opinions, is already challenging enough. We want to know what we are getting into with our procurement." R2	Barriers
"Abandon strict budgeting to give innovation the space to thrive." R5	Budget

5.1 Tender specifications and their effects

During the interviews, the specifications of a PP tender were discussed with all of the interviewees. Both the government and suppliers side expressed their perspectives on tender specifications and the possible improvements to the specifications. The results of these interviews can be read below.

5.1.1 Functional specifications

During the interviews, all 8 of the interviewees emphasized the necessity of using a functional approach to tender specifications. The functional approach to tender specifications means that the specifications should be focused on the functionality of the procured service or product. By indicating the required functions

rather than the required technical specifications, innovation can be stimulated. As said by R3: "Functional specifications always allow more room for innovation than technical specifications." If the specifications of a tender are formulated in such a way that leaves no room for innovation, the innovation potential of the companies is limited. The solution to this could be formulating a problem in the tender rather than a solution. The need for a more output-focused approach to tender specifications is further emphasized and confirmed by R5 and R6 representing the suppliers' side. R5 expressed this need as follows "I would advocate for a more output-oriented approach." Therefore a functional approach to the formulation of PP tenders is crucial. It invites companies to provide their innovative solutions to the government's needs and problems. If technical specifications were to be used these innovative solutions might have been ruled out before they were even proposed and evaluated. Furthermore, through the functional approach, public entities can be challenged in their way of thinking about a certain issue. This will help public entities to take novel approaches to problems that they face. Through an approach that is focused on functionalities rather than technicalities, the market is invited to use its expertise. Furthermore, through a technical approach to specifications, an undesirable limiting effect on innovation can be created. Both of these effects will be expanded on below.

5.1.2 Utilizing market expertise

Through specifying the functional requirements in a tender, rather than the technical requirements, the market is enabled to apply its expertise. If the PP tender includes technical specifications on the required solution, the market is limited in providing the available innovative solutions. As underscored by R2 "For example, you can say, 'I have 2 million over a contract period of 5 years, and I want to achieve a certain objective. You figure out how to do it." By not including technical specifications the possible solutions are left open. This invited the market to utilize their expertise and networks. This can result in more innovative solutions than a technical approach to specifications. A problem that is experienced from both sides is a lack of knowledge at the government level. This lack of knowledge of the government on developments in the market and the available innovations could limit the innovation potential of the PP tender. R6 indicated that a lack of knowledge among government officials is experienced. Meanwhile, the infrastructure company at which R6 is active has extensive knowledge of current developments and innovative solutions that could be used to fulfill the government's needs. Furthermore, they possess an extensive network of suppliers and other organizations which should be leveraged by the government. Considering the above-mentioned factors, all interviewees expressed the need for PP to utilize market expertise while procuring innovative solutions.

5.1.3 Limiting effect of specifications

The specifications of a PP tender can have a limiting effect on a company's ability to innovate. When public entities are drafting the specifications of a tender, they should realize that these specifications can have a limiting effect on the innovation that companies can create. By specifying certain requirements that indicate a certain route of development, the government shuts the door to all other routes of development. This could potentially mean that innovative and effective solutions are ruled out from the outset. R2 further emphasizes this need "The government must realize that by writing detailed specifications and dictating requirements, they can work in a restrictive manner." By believing that the government knows what it wants, it can exclude innovations in areas that it might not expect. Therefore, public entities should think about the role that innovation has in their tender from the beginning. By realizing that with every requirement that is added, innovation could be further limited, the innovation potential of companies could be aided. Both the interviewees from the supplier's side and the government's side indicated that the specifications of a tender can have a limiting effect. R6 elaborated on the experiences he has had with PP and diffusing innovation. R6 has a wide range of experiences in which innovative solutions were proposed, however, due to a lack of required certifications these innovations could not be applied. The firm at which R6 works specializes in the reusing of used materials. Often these materials are of no less quality than their firsthand alternatives. However, since they are reused products, they lack the certification that is required by government officials and therefore the government often foregoes these innovative solutions. R1 further elaborates on this effect from the government's perspective. In a project in which innovation was attempted to be stimulated, a requirement for certain certification was included in the specifications. This requirement meant that new and innovative solutions could not be applied as they often lacked certification. Therefore the specifications of a tender can limit the innovation potential it creates.

5.1.4 Award criteria

While conducting the interviews, it became clear that incorporating innovation as a reward criterion can help to foster innovation. The importance was indicated by both the supplier's and government's side by R2, R4, R5 and R7. By including innovation as a concrete reward criterion in the tender, potential suppliers understand that a need for innovation exists. By explicitly stating this need suppliers can be challenged to provide innovative solutions. Additionally, by including innovation as a reward criterion, more innovative companies can be selected. Through the inclusion of company-wide innovativeness criteria, more innovative suppliers could be selected. This could help to incentivize companies to start innovative projects so they are better able to bid on these tenders when they are more innovative. Furthermore, by specifying a need for further development and innovation during the span of the agreement in the reward criteria, further innovation can be stimulated. However, both R2 and R4 emphasize that the inclusion of innovation as a reward criterion cannot be the only tool used to stimulate innovation. From the beginning, innovation should be considered in every decision. The tender should consider innovation from beginning to end. Innovation should both be included in the specifications and the reward criteria. This will lead to a comprehensive and coherent tender that effectively stimulates innovation. In the interview, R2 explicitly stated the importance of this combination: "Yes, I think that using innovation as an award criterion can help because it makes it very explicit, but it should not be the only tool." R5 further emphasizes the need to include reward criteria that stimulate innovation from the suppliers' perspective. According to R5 "You must always consider the social return on investment of an innovation; otherwise, it will always seem too expensive." R5 advocates for an alternative approach to reward criteria that goes beyond innovativeness. For an innovative approach to be effectively evaluated the true cost should be taken into account. This implies that in addition to the out-of-pocket costs of an innovation, the externalities of an innovation should be considered. If an innovation can reduce CO2 emissions or improve social welfare this should be considered when evaluating the bid. After this comprehensive analysis of the bids has taken place the bid that has the lowest true cost should be selected. This could help to stimulate innovation and other social objectives. However, a comprehensive analysis of a bid requires a significant time commitment from government officials. Analyzing the true cost of a bid can be very complex as the externalities of a bid are potentially hard to quantify. As indicated by interviewees R2,

R3, and R4 a lack of knowledge and time at government entities are a source of issues in stimulating innovation. These barriers will be elaborated on in 5.6. The need to use reward criteria to stimulate and reward innovation is expressed by both the supplier's and the government's side.

5.1.5 The benefits of smaller projects

Reducing the size of projects could aid the innovation potential that they create. By reducing the scope of the projects the ability of small firms to put in a bid is aided. This helps to increase competitiveness on the tenders as an increased number of firms is responding. This could increase the pressure on innovation, causing firms to further emphasize innovation. Furthermore according to R1 "Innovation often resides with small companies; in my experience, large companies are often less adept at innovating." This is further emphasized by R4. By reducing the size of the projects the risks are reduced with it. As a result, the costs of a failed innovation are smaller. which reduces risk and allows companies to pursue more innovative ideas. Furthermore, governments are enabled to reduce the amount of required certification as the risks are limited. Additionally, by reducing the size of a project, it can be kept below the threshold at which European tender regulations apply. According to R3 "Competitive dialogues, price competitions, and projects below the European procurement threshold are opportunities where you can select parties yourself, enabling you to try something innovative." If European tender regulations do not apply government entities can select and invite participants at their discretion. Through this method, a collaborative effort to innovate is enhanced. By avoiding European tender regulations complexity is reduced which can further aid the innovation capacity of participating companies. Through the reduction of complexity, the participation of smaller firms is further aided. By creating these smaller pilot projects a collaboration can be established between the supplier and the government entity in which an innovative project is tested. This can lead to more innovative projects as a greater degree of collaboration and communication can be achieved. However, an issue with this approach is that if the project is successful and applied on a bigger scale, it increases the value of the contract thereby making it subject to European tender regulations. This view is supported by the suppliers' side, according to R5 "I would advocate for awarding more contracts through direct negotiations."

5.1.6 Company selection

Through the use of specifications and criteria in a PP tender, the type of companies that are selected can be influenced. If criteria are included that require experience in developing and applying innovations more innovative companies can be selected. As stated by R4 "In the selection phase, you can guide the type of companies you are looking for. Therefore, you could include criteria for demonstrable experience with innovations and developments." This should be used in combination with the reward criteria to stimulate the participation of innovative companies. However, the risk in applying this method is that it might prevent startups and new companies from participating in the PP tender. Since these companies can struggle to prove their experience in innovating the inclusion of these criteria could exclude them.

5.2 Innovative contracts

Innovation in PP is not limited to the specifications of the physical dimension. Through the application of innovative contracts, further innovation can be achieved. According to R4 "Your current needs are rarely the same as your needs in 4 or 6 years." The unpredictable nature of the needs in the future calls for an innovative approach to contracts. This entails that contracts should be designed to accommodate future developments. Contracts should leave room for suppliers to apply their innovative solutions of the time. According to R2 "Let the supplier come with their current solution, and if we need to renovate in a few years, they can do it with their innovative technical advancements of that time." This could be done through revision clauses that outline the steps and procedures if a certain development or disruption were to take place. Furthermore, issues concerning maintenance and replacements should be considered. If the supplied product were to break, would the entire product be replaced or will it be repaired and reused? If it will be thrown out, what is the procedure for dealing with the resulting waste? These factors should be included in the contract as they can be used to further stimulate innovation. The risks associated with the application of innovations should be identified and well-defined in the contracts. By identifying these risks and the resulting consequences the risks of innovation implementation are limited. This can help to stimulate innovation as the consequences of a failed innovation are limited thereby increasing the willingness to innovate. However, these contracts should be formulated so that there is no fundamental change to the nature of the project. As stated by R3 "Innovation that fundamentally changes the core of the assignment is very difficult to incorporate in this regard, as the legislator has essentially closed the door to such possibilities." If the nature or value of the contract were to fundamentally change, alternative suppliers could have been eligible for the contract. If the nature of the contract changes the selected supplier might not be the best party to execute the changed project. Therefore, if the value of the contract changes by more than 10% or there is a fundamental change to the nature of the contract a new tender procedure has to be started. Therefore the possibility of incorporating innovation in contracts is limited.

5.3 The involvement of SMEs

As indicated by both the interviewees from the government's side and the interviewees from the supplier's side there are several problems with the involvement of SMEs in PP tenders. The factors that cause problems with SME involvement in PP tenders are two-fold. Firstly, the complexity of the PP tenders is perceived as an issue. Both the government and the suppliers expressed this issue. According to R4 "A procurement process is already complex, making it difficult for new entrants and new companies often involved in new developments to navigate, especially if it is filled with revision clauses." This is further confirmed by R5: "Yes, companies shut down when they see the documentation; they become discouraged. The average tender takes 40 to 80 hours, and small companies don't have that time." The complexity is an inherent trait of PP tenders. However, when procuring innovation this complexity can be amplified according to R4. The complexity of PP tenders discourages SMEs from participating. Furthermore, the lack of participation is caused by a lack of knowledge and visibility. Government entities are unaware of the existence of startups or struggle to get them to participate in PP tenders. As stated by R4 "Those companies, the startups, and those engaged in innovation are simply not yet visible to us." A combination of complexity and the conviction that they are unable to compete causes startups and small firms to not engage with PP tenders. The lack of engagement is confirmed by the supplier's side, as stated by R6 "Small companies are not focused on how to best respond to a tender; they are busy working." Adding to the lack of knowledge of the existence of these PP tenders, SMEs often lack knowledge of the PP process. Additionally, the size of tender contracts can rule out SMEs as they do not possess the capacity to meet the demand. As stated by R1 "We design the procurement process to be as accessible as possible to allow small businesses to apply. However, we still observe that they often ignore the tender

because they have too much work or lack the manpower to participate." The lack of participation of SMEs in PP is a problem due to the innovative power they possess. According to R1 “Innovation often resides with small companies; in my experience, large companies are often less adept at innovating." Therefore if the engagement with PP tenders solely stems from larger firms innovation potential is lost. However, during the interviews, interviewees indicated factors that could aid the participation of SMEs. Firstly, the application of a functional approach to tender specification can enable SMEs to participate. According to R2 "By specifying functionally, we enable companies, especially SMEs, to make a strong offer." If tenders are specified at a functional level SMEs can organize their supply chain to cater to the needs of the public entity. By using this specialized approach SMEs can outcompete larger firms. Furthermore, the functional approach allows SMEs to propose innovative solutions that could have otherwise been ruled out by technical specifications. The second factor that could increase SME participation is the use of specialized programs to support SMEs and startups through the tender process as well as in other areas of their business. According to R1 "The most important aspects are functional specifications, low barriers to entry, a support program, and a small-scale approach." By utilizing a support program in which startups and SMEs are guided through the PP process their participation can be aided. Furthermore, by reducing the size of the contracts SMEs are in a position from which they can meet the demand, further aiding their participation. Additionally, R4 indicated that projects through which SMEs are contacted and motivated to participate can further aid their participation. By starting projects through which SMEs are contacted, supported and motivated to participate in PP tenders, the participation of SMEs can be aided. However as indicated by R1, these projects are accompanied by significant costs for the public entities. Therefore, these projects are not widespread and the participation of SMEs remains low.

5.4 Open innovation

During the interviews, interviewees indicated the value of PP in an open innovation context. R1, R2 and R4 expressed the role the government can play in open innovation. This is emphasized by R4: "I think that the government plays a crucial role in many cases because if the government does not have a specific demand, the market will not develop accordingly." The government can take on an essential role in stimulating innovation through demand formulation. According to R1 "If you don't present a problem to the market, parties will never find out about it." R1 further elaborated on projects that are being set up in the municipality in which R1 works that utilize the open innovation approach. If a certain solution is needed which is not currently available. The need for this solution would be formulated. Along with this, a subsidy would be made available which incentivizes companies to develop a certain solution. According to R1 "We have explicitly paid to develop an innovation for us." This subsidy would intend to foster an innovation, after which the municipality would be in the position to procure the resulting innovation. Through this approach, the municipality explicitly provided funds to stimulate innovation. After this, the municipality could capitalize on the novel solution to the problem at hand. Furthermore, the supplier that received this subsidy was able to develop an innovation that can now be marketed in a broader context. Through leveraging the open innovation approach innovation can be stimulated through PP.

5.5 Communication

During the interviews the importance of communication became clear. In this context, communication is regarded as the communication between government entities and market parties. All interviewees indicated that in innovation in PP all parties should be involved in the PP process as soon as possible. This allows market parties to inform the government of the developments in the market. By being aware of the current innovations the government is informed in what it can expect from the market. According to R1 "If you want to innovate, you need to engage with the market early in the process” By being aware of the current developments the government can include these developments in their tender. If the government is not informed of the current innovations in the market, certain specifications could be included in the tender which could have the undesirable effect of excluding innovations. Additionally, if the government is aware of all market developments early in the PP process, the government is more equipped to include these in the tender. The capability of the government to account for innovation diminishes as the PP process progresses. This is further emphasized by R6 "It is important to involve everyone right from the beginning." Furthermore, the early inclusion of market parties enables the market parties to develop solutions to cater to the government's demand. This stimulates innovation and can foster more effective solutions to government issues. Furthermore, both the government’s and the supplier’s sides emphasized the need for trust. R6 emphasized the need for total transparency and trust between parties. According to R6 “the most important thing is trust”. If trust and transparency are absent a long-term relationship between supplier and government will be unlikely according to R6. However, the government is not able to always provide consistency in their attitude. R4 stated “I have also noticed that sometimes, as a municipality, we engage in discussions with the market and make grand promises, but then the market parties hear nothing from us, and we put out a traditional call for tenders. This affects trust as well”. Therefore market parties could be hesitant to engage in long-term innovative projects as the government’s objectives could change. This is due to a combination of factors which will be elaborated on in 5.6. The need for a wide application of market consultations is indicated by interviewees from the government’s side as well as the supplier’s side. Both sides point to a lack of knowledge of market developments and innovation. This lack of knowledge could be reduced by leveraging market expertise through market consultations. However, market consultations have drawbacks. According to R5 “I think market consultations should be used much more often. However, I also understand the buyer's perspective, as it takes an incredible amount of time.” Additionally, R3 points to market consultation drawbacks: "The market consultation is open-ended, which results in responses that are also open-ended." Market consultations can be valuable tools in PP. Through market consultations, the knowledge of market developments can be increased. However, due to their open-ended nature, these market consultations require a great time commitment by government officials.

5.6 Barriers to innovation through tender specifications

Several barriers to innovation-fostering specifications were found. These barriers are twofold. Interviewees indicated that tender specifications can form a barrier to the effective application of an innovation. Secondly, barriers related to the effective formulation of innovation-fostering specifications were indicated. These barriers will be discussed in the text below.

5.6.1 Barriers through specifications

In the interviews, the complexity of PP tenders came forward as a barrier to innovation. As stated by R4 “A procurement process is already complex, making it difficult for new entrants and new companies often involved in new developments to navigate, especially if it is filled with revision clauses." R4 further elaborates on the complexity of tenders as follows: “I am

convinced that the procurement regulations provide enough flexibility to include innovations in your tenders, but it does make the process more complex." The complexity of PP tenders forms a barrier to innovation as the complexity of tenders causes problems. The complexity can discourage firms from participating, especially the smaller firms. As indicated by R1 these firms can provide the greatest innovation potential, therefore the lost innovation can be significant. Furthermore, complex specifications can hinder innovation hindering the clarity of the project's objective. As through complex specification clarity might be lost. Therefore, making it harder for firms to provide an effective innovation that meets the needs of the government. Taking a technical approach to specification can further hinder a company's ability to innovate. According to R3 "If you close it off by setting very strict requirements or drafting the assignment so narrowly that there is no room for flexibility, you will not foster any innovation." Through the technical approach to tender formulation, the room for innovation is limited. If there are strict technical requirements for the provided solution, there is less room for the market to provide innovative solutions, thereby limiting innovation. However, these technical specifications can not always be avoided. If applied correctly, technical specifications do not hinder innovation. However, if there is an overspecification of the required solution it forms a barrier to innovation. According to R5 "If you impose such a long list of requirements, how can I innovate? Additionally, they have a cost-ceiling that is unrealistic for achieving innovations." According to R1, the overspecification is caused by government procedures: "The municipality is very focused on planning such projects, designing a road down to the level of individual bricks, and then putting it out to tender." Applying a functional approach to the tender formulation can stimulate innovation. However, if the objective of the tender is unclear, a wrong direction in innovation development could be taken. As indicated by R4 "At a certain point, they concluded that they were not going to achieve what they had envisioned because they had not clearly defined the end goal.". The potential cost of an unclear objective formulation is great. R4 elaborated on an innovation development process between a government entity and a supplier. However, after years of development, the conclusion was reached that the intended innovation was unachievable. In this case, an unclear objective formulation resulted in years of wasted development and high costs for the government.

5.6.2 Barriers to effective tender formulation

Multiple barriers to effective tender formulation were indicated in the interviews. One of these barriers is knowledge. A lack of knowledge of PP procedures was indicated by interviewees. As indicated by R4 "Because that knowledge simply isn't available in-house. Someone who needs to prepare and lead a procurement process often lacks sufficient familiarity with it, not to mention how to consider innovations and developments. This already presents a significant challenge." However, the lack of knowledge is not limited to the government's side. The knowledge of PP procedures is found to be lacking at suppliers, especially at SMEs. Furthermore, the lack of knowledge is not limited to the PP procurers. R3 indicated that government entities lack the practical knowledge to effectively judge the bids on tenders. As stated by R3 "Truly effective functional procurement operates at a different level of abstraction, requiring competent organizations capable of making such assessments." Interviewees R3 and R4 indicated that practical knowledge of market developments is missing at government entities. Especially smaller government entities lack knowledge of market developments. The lack of knowledge of public entities is confirmed by the suppliers with R6 stating that "knowledge at the municipality is quite limited." The lack of knowledge of market conditions harms innovation. If the PP officers do not possess the knowledge this harms their ability to effectively judge and compare the bids on the tender. Not comparing the bids effectively could lead to a situation where a sub-optimal bid wins the tender, thereby harming innovation. Additionally, if the PP officer does not possess knowledge of market developments, ineffective requirements could be included in the tender. By creating requirements and specifications the PP officer dictates the content of the bids on the tender. Therefore, if the PP officer lacks knowledge of market development the requirements and specifications could be ineffective. By including requirements that rule out recent developments. This can harm innovation. As indicated by R2 there are multiple barriers to formulating innovation fostering tender specifications: "Habits, time pressure, and the political agenda." Due to time constraints at the government innovation potential is lost. The PP officers can be responsible for multiple complex PP tenders, which limits the time per tender. Therefore, these officers could overlook the innovation potential a tender has. According to R2 "Look, such a procurement process is already very complex. As a project leader, keeping a handle on a process with a start and end, dates, politics, budgets, and residents who have various opinions, is already challenging enough. We want to know what we are getting into with our procurement." As indicated by R5 the lack of knowledge on market developments at the government could be mediated through the application of market consultations. However according to R5 "I think market consultations should be used much more often. However, I also understand the buyer's perspective, as it takes an incredible amount of time." As indicated by R2 the complexity of tenders can limit the innovation that it fosters. This is due to the factors mentioned above, such as politics, stakeholder opinions and deadlines. According to R4 laws and regulations are a further source of complexity "I am convinced that the procurement regulations provide enough flexibility to include innovations in your tenders, but it does make the process more complex." Furthermore, the risk of lawsuits being filed after a PP tender deters PP officials from integrating innovation in the tenders. As stated by R2 "Such a procurement process is already challenging enough; how often do we see lawsuits following a tender?" According to the interviewees representing the government's side one of the factors hindering innovation is risk. According to R3 "That is the trade-off: if you incorporate innovations, you risk the problem not being solved and potentially wasting money." Innovations are new technologies and therefore unproven. These innovations can add a layer of risk that could hinder innovation. As stated by R4 "From a procurement perspective, we focus on development and innovation, while we often see that the principal has a current need and does not look further ahead than 2 to 4 years." R5 supports this view as R5 states that "The problem lies with the budget holder." The principal is the one who decides the need. Therefore if the principal is not focused on innovation, innovation potential can be lost. These effects are amplified at smaller government entities. At these entities the knowledge of the market is limited. Furthermore, these entities cannot afford to take on an innovation-focused perspective. Due to limited budgets, the application of an innovation brings an unjustifiable level of risk. If this innovation were to fail in a smaller municipality, the resulting costs would be too great. The lack of time is another factor that is amplified at smaller entities. These entities do not possess the same amount of officials. Therefore, they experience an even greater degree of time pressure. The combination of these factors results in a limited focus on innovation. As stated by R3 "In larger municipalities, there is an effort to integrate innovation and sustainability into every aspect

of procurement and public purchasing. In smaller municipalities, frankly speaking, little to nothing is being done in this regard."

5.7 The effect of PP budgets on innovation

During the interviews interviewees representing the suppliers side indicated that the PP budgets have a limiting effect on their company's ability to innovate. The PP budgets affect the company's ability to innovate in the following ways:

5.7.1 Limiting effects of budget-caps

The limiting effect of low budgets on a company's ability to innovate has been indicated by R5 and R6. Both participants highlighted that a lack of funds provided by the government through PP had a limiting effect on their ability to innovate. R5 explained that in the cleaning industry, subcontractors are used by larger contractors to fulfill contracts. These subcontractors would often provide innovative solutions that can be used to improve the quality of the provided cleaning service. However, these solutions could come at a greater cost than the previously used methods. Therefore, R5 can not allow its subcontractors to apply these innovative solutions as there is no possibility to pass on the higher costs of the proposed solution. Meanwhile, the tender would call for innovative solutions to be proposed. However, the budget caps that are implemented in the tender prevent the application of these innovative solutions. Therefore R5 thinks that in PP the government should "Abandon strict budgeting to give innovation the space to thrive". When the expressed need for innovation is accompanied by tight and rigid budget restrictions the parties that put in a bid for the tender perceive a contradiction. The need for innovation is expressed however, it is accompanied by budget requirements that are unrealistic to realize innovative solutions. R6 indicated a similar limiting effect of the budget caps on the diffusion of innovation. The company at which R6 works is active in the infrastructure sector. This company has a product that improves the water drainage capabilities of roads. This technology comes with a multitude of benefits. This technology can reduce the number of disruptions on this road. Especially with the increase in extreme rainfall caused by climate change, this technology can be invaluable. However, this technology adds costs to the construction of a road. As the costs are greater than the alternatives and the budgets can be tight, the government often chooses to not apply this technology. The long-term benefits of this technology can be valuable however due to tight budgets the technology is not widely applied.

5.7.2 Profitability and innovation

During the interview, R6 indicated that to develop innovations, profitability is a prerequisite. The infrastructure company by which R6 is employed is constantly developing new technologies and innovative solutions for the infrastructure sector. However, developing these technologies is costly. The development of these innovative technologies requires an initial investment into R&D. After the initial investment the innovation often remains unprofitable for a considerable amount of time. Some innovations fail and never turn profitable. However, the desired outcome is that after some years the innovation can be widely applied and create profits. The initial investment that is required is sourced from the profits that the company produces. However, if the profits are not sufficiently high there are no funds available for the development of these innovations. Furthermore, if the profitability potential of these innovations remains low, there is less of an incentive to initiate these R&D projects. Therefore, R6 believes that "The returns in our sector are simply too low, which stifles innovation. Low returns mean fewer opportunities for development." For innovations to be stimulated through PP the profits of the suppliers have to be taken into account. If the profitability of the suppliers is too low the supplier cannot support extensive R&D projects. Additionally, there is less of an incentive to engage in innovative projects.

5.7.3 The need for integrated value procurement

While conducting the interviews R5 indicated the need for a different approach to the spending of government budgets. As R5 is active in the cleaning sector, R5 interacts with the facility management departments of public entities. However, since innovative solutions are demanded in the PP tender, R5 expressed the need for a novel approach to government spending. R5 provides cleaning services, however the impact of the provided services is not limited to cleaning. Through the employment of individuals with a distance to the labor market, R5 could realize a wider social impact. By employing these individuals R5 can reduce the need for the social care provided by the government. Furthermore, if the cleaning services provided have a reduced emission of CO2 compared to competitors, his services provide value for the environmental department of the government. Therefore, R5 thinks that the government should "Remove the barriers between budgets, creating a single pool of funds to cover expenses." Given that the impact of the service extends beyond facility management, pooling multiple budgets is essential. By involving the social and environmental departments in the discussion, the true value of the service can be fully recognized. If R5 can demonstrate value across various government departments, then the budgets from these departments should be combined.

6. DISCUSSION

Through conducting interviews this research set out to answer the following research question.

"How does the specification of PP tenders influence the selection of companies and their ability to innovate?"

The specifications of a PP tender have been found to have a significant influence on the selection of companies and their ability to innovate in several ways. Including selection criteria that focus on the innovativeness of the proposed solution or company-wide KPI, innovative companies can be selected. Moreover, the complexity of the tender specifications significantly impacts the selection of companies. Complex specifications can discourage SMEs from participating in the tender process due to a lack of time or expertise. As a result, larger firms, that have greater capabilities to submit effective bids, are more likely to be selected for the tenders. Additionally, the size of tenders affects the selection of companies as smaller firms may not possess the capability to meet a tender's demands. Furthermore, a firm's innovation potential is impacted by the tender specifications through several factors. An over-specified PP tender can limit the innovation potential of firms. When specifications do not allow for sufficient flexibility for firms to propose diverse and innovative solutions, their ability to innovate is restricted. This effect can be mitigated through a functional approach to tender formulation. The functional approach entails that the functional requirements are specified rather than the technical requirements. Thereby ensuring the effectiveness of the proposed solutions while providing ample opportunity for innovations. Firms can offer innovative solutions if a tender specifies a problem rather than a solution. Moreover, the formulation and application of PP contracts should be future-proof. Contracts should provide space for future opportunities and developments. The reduction of the size of tenders can aid a firm's innovation ability. Smaller tenders have smaller consequences of failure which reduces risk and allows companies to pursue more innovative ideas. Furthermore, reducing size creates the opportunity to adopt a one-on-one approach with a firm as European tender regulations can be avoided. Tender specifications should be formulated in a manner

that allows firms to introduce innovative solutions. However, while taking an open approach these specifications should specify a clear objective. If the objective of a tender is not clear the developed solutions could be ineffective. As a result, a significant amount of funds could be wasted and the innovation potential could be lost. In addition to formulating a clear objective, the specifications must focus on the appropriate areas. Suppliers indicated that the need for innovation would be specified, however, in inappropriate areas. This was found to be due to a lack of knowledge of market developments at government entities. This lack of knowledge could be mitigated through the application of market consultations. Innovation limiting demand formulation was further found to be caused by a lack of focus on innovation at the principals of government agencies. This lack of focus on innovation could be due to risks associated with innovation implementation. Furthermore, complexity and time constraints formed barriers to the effective formulation of tender specifications. These barriers are amplified at smaller government entities. Additionally, tight budgets were found to limit a company's innovation ability. If budgets are tight the implementation of innovations might be hindered, as they can be more expensive than traditional solutions.

6.1 Theoretical implications

This research found factors that were not covered in the literature review. Inappropriate demand formulation was found to be one of the factors through which the specifications of a PP tender influence a company's ability to innovate. Through an ineffective demand formulation, the ability of a firm to effectively apply an innovation is harmed. Another factor was the importance of market consultation. These consultations form an opportunity for the market and the government to exchange knowledge thereby enhancing the effectiveness of PP. This mitigates the lack of knowledge at the procurement official. Therefore, this can be linked to the findings by Askfors (2018) as the procurement official's lack of knowledge was found to be a barrier. Furthermore, the application of innovative contracts was found to aid innovation through PP. When a contract allows for the adaptation to future developments the innovation potential is aided. Additionally, this research found that through the application of pilot projects the innovation potential of firms was aided.

This research's finding adds to the existing literature by adding to the understanding of the effect of tender specifications on the selection of companies and their ability to innovate. Furthermore, this research attempts to address the need for further research into the barriers to innovation as identified by (Rejeb, 2023). This research's findings are in line with the literature highlighted in the literature review. Time was identified as a significant limiting factor for innovation in PP, corroborating Uyarra's (2014) findings. The time constraints stemming from the government's side limit the development of innovation. Furthermore, overcomplicated tender specifications were found to hinder innovation and deter SME participation (Uyarra, 2014). Adding to this, the complexity and time consumption of a PP tender was found to further hinder SME participation (Amann, 2015). One of the main barriers that were identified was a lack of knowledge among government officials, thereby limiting the effectiveness of the tender specifications. This confirms the findings of Askfors (2018). Adding innovation as a reward criterion was found to stimulate innovation, confirming the findings of Krieger (2024) and Czarnitzki (2020). Furthermore, the standardization of certain PP procedures was indicated to aid the PP process by interviewees, thereby adding to Rainville (2017). This research supports the findings by Liu (2016). As an output focus was found to aid tender effectiveness.

6.2 Practical implications

This research has identified several practices that aid the innovation potential that PP creates. The lack of knowledge among government officials has been identified as a major obstacle to developing effective tenders. By engaging in market consultations, the knowledge gap among procurement officials can be reduced. However, time constraints present a significant challenge to the widespread use of market consultations. Nonetheless, by fostering collaboration among government entities and preserving newly acquired knowledge, the long-term advantages of overcoming this knowledge gap may outweigh the time investment. Furthermore, by applying a functional approach to tender formulation the innovation potential is enhanced. Innovation should be considered throughout the PP process to maximize the innovation potential. The early inclusion of innovation in the PP tender maximizes the degree to which it can be included. To ensure that innovation is not limited every step and procedure should keep innovation in consideration. Additionally, the market should be involved in a PP procedure as early as possible. Through the early inclusion of the market, any suggestions from market parties can be incorporated. If this were to happen later in the process the inclusion of market suggestions could be complicated. PP contracts should be formulated in a way that enables the adaptation to future developments in the contract. This enhances the long-term innovation potential of the tender by enabling the inclusion of future innovations. This research highlights the need for incorporating innovation as a reward criterion of the PP tender. These findings are supported by the side of the public entity as well as on the side of the suppliers. To aid SME participation, SMEs should be supported throughout the complicated PP process. Additionally, through the downsizing of tender contracts, this participation could be further aided.

6.3 Limitations and future research

As this research only focuses on PP practices in the Netherlands, it lacks universality. Due to the limited scope, the results of this research were influenced by regulatory, economic, and political factors specific to the Netherlands. Therefore, further research in other contexts is needed for this research to be applied in an international context. Research in an international context could help to distill the universal PP phenomenon and exclude region-specific factors. Furthermore, this research does not incorporate the perspectives of the end users of the procured products as it solely includes the views of PP officials and suppliers. Future research should incorporate a multi-level stakeholder approach. The inclusion of end-users and other stakeholders could help to effectively judge the effectiveness of the procured solutions. Furthermore, future research should investigate a different approach to budgeting. The suggested combination of budgets to aid innovation and social return could be interesting topics of research. Additionally, this research has a small sample size of 8 interviewees due to time constraints. Therefore the collected data may not be representative of the total picture. As a result, the generalizability of the collected data is limited. Future research should include a greater number of interviewees to improve the reliability of the results. This research relies on qualitative data as interviews were conducted. To increase the reliability of the findings a mix of data collection methods could be used in further research.

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8. APPENDIX A

Before every interview, respondents were first asked for their consent regarding the processing of data and the recording of the interview.

At the start of the interview, the researcher started by introducing themselves and the purpose and context of the research. After this, the interviewee introduced themselves, their function and their years of experience.

As the interviews were semi-structured, the formulated questions were used as a guide during the interview to ensure all topics were addressed. However, additional questions were asked based on the interviewee's answers.

Government

Question 1: How does procuring innovation differ from regular public procurement?

Question 2: What are the barriers to stimulating innovation through public procurement?

Question 3: How do you experience the effects of specifications on the innovativeness of the bids?

Question 4: How can an open formulation of the tender specifications help to stimulate innovation?

Question 5: How do you experience the limiting effect of rigid specifications on innovation?

Question 6: What hinders the effective formulation of tender specifications?

Question 7: How do the specifications of a tender influence the selection of firms, for example, big or small firms?

Question 8: Would the standardization of the procurement process aid the stimulation of innovation?

Question 9: What is an example of a successful procurement of innovation?

Additional question: What made it successful?

Question 10: How could specifications be formulated so they stimulate more innovation?

Supplier

Question 1: What is your experience with innovating for the public sector?

Question 2: How does the government help to stimulate innovation through public procurement?

Question 3: Does the government stimulate innovation through providing ideas or through formulating demands?

Question 4: How does the public procurement procedure make it difficult for small businesses to put in a bid?

Question 5: How do the specifications of the tender affect your ability to develop an innovative solution?

Question 6: How do you deal with the complex specifications of a tender when developing an innovation?

Question 7: Do you experience rigid specifications as a barrier to developing innovations?

Question 8: What are factors in the public procurement process that limit your ability to innovate or provide alternative solutions?

Question 9: How does the lack of knowledge of a procurement official influence your ability to innovate?

Question 10: Would the inclusion of innovativeness as a reward criterion aid the stimulation of innovation through public procurement?

Question 11: How can the government formulate tender specifications in a way that stimulates innovation?

Question 12: What could the government do differently considering the stimulation of innovation through public procurement?

Every interview concludes with an extra explanation of the handling of the collected data. Furthermore, the interviewees were thanked for their participation and asked whether they would like to receive the completed thesis.

9. APPENDIX B

Table 3 Government Interviewees

Quote	Code	Theme
"Truly effective functional procurement operates at a different level of abstraction, requiring competent organizations capable of making such assessments." R3	Knowledge	Barriers
"In larger municipalities, there is an effort to integrate innovation and sustainability into every aspect of procurement and public purchasing. In smaller municipalities, frankly speaking, little to nothing is being done in this regard." R3	Entity size	Barriers
"Innovation that fundamentally changes the core of the assignment is very difficult to incorporate in this regard, as the legislator has essentially closed the door to such possibilities." R3	Contract	Barrier
"Look, such a procurement process is already very complex. As a project leader, keeping a handle on a process with a start and end, dates, politics, budgets, and residents who have various opinions, is already challenging enough. We want to know what we are getting into with our procurement." R2	External complexity	Barriers
"I am convinced that the procurement regulations provide enough flexibility to include innovations in your tenders, but it does make the process more complex." R4	Regulatory complexity	Barriers
"The drawback of innovation is that it often involves unproven techniques."R2	Risk	Barriers
"Such a procurement process is already challenging enough; how often do we see lawsuits following a tender?" R2	Legal	Barriers
"The municipality is very focused on planning such projects, designing a road down to the level of individual bricks, and then putting it out to tender." R1	Over specification	Barriers
"At a certain point, they concluded that they were not going to achieve what they had envisioned because they had not clearly defined the end goal." R4	Unclear objective	Barriers
"From a procurement perspective, we focus on development and innovation, while we often see that the principal has a current need and	Principal	Barriers

does not look further ahead than 2 to 4 years." R4		
“I can always do that, but it all takes time. You have to prepare everything again, you have to review everything.” R8	Time	Barrier
"The government must realize that by writing detailed specifications and dictating requirements, they can work in a restrictive manner." R2	Limiting	Specifications
"Functional specifications always allow more room for innovation than technical specifications." R3	Functional/open	Specifications
"For example, you can say, 'I have 2 million over a contract period of 5 years, and I want to achieve a certain objective. You figure out how to do it.'" R1	Utilizing market expertise	Specifications
"Competitive dialogues, price competitions, and projects below the European procurement threshold are opportunities where you can select parties yourself, enabling you to try something innovative." R3	Pilot	Specifications
"Yes, I think that using innovation as an award criterion can help because it makes it very explicit, but it should not be the only criterion."R2	Award criterion	Specifications
"In the selection phase, you can guide the type of companies you are looking for. Therefore, you could include criteria for demonstrable experience with innovations and developments." R4	Selection	Specifications
"Let the supplier come with their current solution, and if we need to renovate in a few years, they can do it with their innovative technical advancements of that time." R2	Leaving space for innovation	Contracts
"Your current needs are almost never the same as your needs in 4 or 6 years." R4	Future proof	Contracts
“You put a lot of time in a contract, and then you want to continue with each other, and not do it all over again.” R8	Length	Contracts
"By specifying functionally, we enable companies, especially SMEs, to make a strong offer." R2	Functional specifications	SME involvement
"The most important aspects are functional specifications, low barriers to entry, a support program, and a small-scale approach." R1	Enabling factors	SME involvement
"A procurement process is already complex, making it difficult for new entrants and new companies often involved in new	Complexity	SME involvement

developments to navigate, especially if it is filled with revision clauses." R4		
"Innovation often resides with small companies; in my experience, large companies are often less adept at innovating." R1	Added value	SME involvement
"Those companies, the startups, and those engaged in innovation are simply not yet visible to us." R4	Visibility	SME involvement
"We design the procurement process to be as accessible as possible to allow small businesses to apply. However, we still observe that they often ignore the tender because they have too much work or lack the manpower to participate." R1	Capacity	SME involvement
"If you want to innovate, you need to engage with the market early in the process." R1	Early market involvement	Communication
"I have also noticed that sometimes, as a municipality, we engage in discussions with the market and make grand promises, but then the market parties hear nothing from us, and we put out a traditional call for tenders. This affects trust as well."R4	Trust	Communication
"If you don't present a problem to the market, parties will never find out about it." R1	Need formulation	Open innovation
"I think that the government plays a crucial role in many cases because if the government does not have a specific demand, the market will not develop accordingly." R4	Innovation stimulation	Open innovation

10. APPENDIX C

Table 4 Supplier Interviewees

Quote	Code	Theme
"If you impose such a long list of requirements, how can I innovate? Additionally, they have a cost-ceiling that is unrealistic for achieving innovations." R5	Specifications	Barriers
"If you enforce the cost-ceiling, I cannot pass on the cost of my innovations. This kills the innovation demand and prevents the application of those innovations." R5	Budget	Barriers
"The problem lies with the budget holder." R5	Principal	Barriers
"I think market consultations should be used much more often. However, I also understand the buyer's perspective, as it takes an incredible amount of time." R5	Time	Barriers
“knowledge at the municipality is quite limited” R6	Knowledge	Barrier
"The government only says 'but, but, but'—certainty, etc. But you also need to show a bit of courage." R6	Willingness to take risks	Barrier
“Because we really want to change or get to work, but that is then hindered by the bureaucracy at such a municipality.” R7	Bureaucracy	Barrier
"Abandon strict budgeting to give innovation the space to thrive." R5	Budget-caps	Budget
"Remove the barriers between budgets, creating a single pool of funds to cover expenses." R5	Budget allocation	Budget
"The returns in our sector are simply too low, which stifles innovation. Low returns mean fewer opportunities for development." R6	Need for profitability	Budget
"I would advocate for a more output-oriented approach." R5	Output focus	Specifications
"You must always consider the social return on investment of an innovation; otherwise, it will always seem too expensive." R5	Award criteria	Specifications
"But sometimes I do think that what you are asking there is actually not relevant at all. Ask something important instead." R7	Question formulation	Specifications
"I would advocate for awarding more contracts through direct negotiations." R5	Contract size	Specifications
“They give you a certain amount of room to come up with more yourself. That is often minimal.” R7	Room for innovation	Specifications

"Yes, companies shut down when they see the documentation; they become discouraged. The average tender takes 40 to 80 hours, and small companies don't have that time." R5	Complexity	SME involvement
"Small companies are not focused on how to best respond to a tender; they are busy working." R6	Market inefficiencies	SME involvement
"It is important to involve everyone right from the beginning." R6	Involve all parties from the beginning	Communication
“And then you get another one. And they know nothing about the entire tender process, what happened the year before.” R7	Relations	Communication