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Innovation co-development forms in adapted, technological and experimental public procurement

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Abstract: As public procurement increasingly promotes innovation, the importance of innovation co-development as part of the procurement process is growing. By examining public procurement cases involving co-development, the study identified the forms of innovation co-development in different types of public procurement (adapted, technological, and experimental). The findings provide insights into the stimulation of innovation through co-development practices and procurement procedures and phases specific to the public sector. Additionally, the study highlights the importance of procurement strategy and planning in public procurement of innovation. Thus, in addition to our academic contribution, our study aims to discuss and highlight the possibilities of co-development in public procurement, rather than focusing on its limitations.

Keywords: co-development; public procurement of innovation; public procurement; public procurement phases; procurement strategy.

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1 Introduction

Public procurement is widely recognised as a strategy implementation activity (Merisalo et al., 2024; Plantinga et al., 2020; Selviaridis and Uyarra, 2025), and public organisations are strongly encouraged to promote innovation through demand (European Commission, 2021). However, although Patrucco et al. (2017) suggest aligning procurement strategies with political strategies, such as innovation strategies, concerns remain about the implementation of strategic public procurement management, with a focus on low prices and regulatory compliance rather than on promoting innovation (Taheriruh and Moshtari, 2023). Moreover, achieving innovation-promotion objectives requires not only strategic planning for public procurement but also its implementation in buyers' day-to-day activities (Plantinga et al., 2020; Tammi et al., 2025; Uyarra et al., 2020). In these activities, the public sector is increasingly interacting and collaborating with suppliers (Sloot et al., 2025; Bizri and Stegare, 2024; Torfing et al., 2021; Uyarra et al., 2020), particularly in the pre-procurement phase when no ready-made solution is available. In addition, public organisations utilise intermediaries and network capabilities to implement procurement strategies involving innovation (Selviaridis and Uyarra, 2025; Taheriruh et al., 2025).

The National Public Procurement Strategy (Ministry of Finance, 2020) supports local procurement strategies and strategic procurement management in our research environment in Finland, providing strong government support for the public procurement of innovation (PPoI) and collaboration between the public and private sectors. Similar calls for strategic procurement and innovation have been issued in many other European countries. In Finland, PPoI has been defined as the procurement of a new or significantly improved product or service, with an emphasis on the solution's potential to improve public services rather than on novelty per se (Valovirta et al., 2017). In our study, we adopt the following definition of PPoI: 'the commissioning and procuring of goods or services that are new to the purchasing organisation, and enable a novel service to citizens, or enable a more efficient or effective delivery of that service' (Yeow and Edler, 2012). Furthermore, we broadly consider the scope of PPoI (European Commission, 2021) to cover both radical and incremental innovation. Finally, we explore innovation stimulation through collaboration between public buyers and private suppliers via the

concept of co-development. However, due to the previous conceptual and partly overlapping use of the concepts 'co-development' and 'co-creation', we also acknowledge previous literature on co-creation insofar as it discusses collaboration between suppliers and buyers to develop solutions (Torfing et al., 2021).

The strategic approach to public procurement involves dividing the procurement process into three phases: pre-procurement, contracting, and the contract period (Guarnieri and Gomes, 2019). In addition, the need for co-development and/or innovation has shifted the focus to the early stages of the procurement process (Sloot et al., 2025; Toukola et al., 2023). Moreover, by classifying public procurement according to the nature of the demand and the offering, four types of public procurement have been identified (adapted, technological, experimental, and efficient), each responding to different demands and opportunities for innovation (Uyarra and Flanagan, 2010). Furthermore, the importance of collaboration between buyers and suppliers has also been recognised, particularly in the context of experimental public procurement (Uyarra and Flanagan, 2010). In addition, co-development – defined as a collaborative approach in which the parties' resources are used to develop services, products, or innovations – has been studied (Holma et al., 2020; Oinonen and Jalkala, 2015). However, the current literature does not clearly indicate how these different types of procurement, procurement process phases, and co-development relate to each other in public procurement aimed at innovation and addressing societal challenges. Therefore, we explored these relationships, as well as the co-development practices of practitioners, (e.g., meetings and workshops) and public procurement procedures, (e.g., open procedure, competitive procedure with negotiation, and innovation partnership) and created a synthesising concept that we refer to as 'forms of innovation co-development'.

Previous studies have emphasised the need for further discussion on approaches to promote innovation objectives through public procurement (Lenderink et al., 2022). Torfing et al. (2019) call for studies on institutional collaboration models within the public sector. In addition, co-development between a public buyer and a private supplier remains an understudied topic (Guarnieri and Gomes, 2019). This lack of research is surprising, given that previous research in the private sector context has identified a relationship between innovation performance and inter-organisational collaboration, (e.g., Wang et al., 2011), and a similar relationship has been proposed in the context of public procurement (Carbonara and Pellegrino, 2018). Although Holma et al. (2020) have examined co-development practices in service specifications during the pre-procurement phase; they also called for more comprehensive studies on collaborative practices across different types of public procurement and tendering procedures. To address these research gaps and elaborate on collaboration between buyers and suppliers in the context of public procurement, this study explores the implementation of co-development in different types of public procurement. To achieve this objective, the following research question has been formulated:

RQ1 How is innovation co-development between public buyer and private supplier reflected in different types of public procurement?

As co-development in public procurement has not yet been widely studied or implemented, we conducted our research as a qualitative multi-case study. Our findings revealed various forms of innovation co-development across different types of procurement, which can support the achievement of innovation objectives. Based on our findings, we emphasise the importance of identifying the type of procurement and

designing procurement on a case-by-case basis as the most effective way to use co-development to achieve the innovation objective. In addition to the theoretical contribution, our research's concrete and practice-oriented descriptions of co-development practices, procurement procedures and public procurement phases may be of high interest to public procurement managers. As an additional finding, we discuss the role of procurement strategy in implementing PPoI in its full scope and in the appropriate use of co-development.

2 Literature review

2.1 From procurement strategy to stimulating innovation in public procurement

Public procurement has traditionally been characterised by an administrative and reactive nature (Matthews, 2005). In addition, public procurement objectives have traditionally focused on the lowest price and on ensuring public services (Pihlajamaa and Merisalo, 2021). However, procurement activities have increasingly focused on fostering collaborative partnerships (Bizri and Stegare, 2024), and public procurement has evolved towards a more strategic role (Guarnieri and Gomes, 2019; Patrucco et al., 2017). The strategic role of public procurement has led to an increasing focus on aligning procurement strategies with government priorities (OECD, 2019), including promoting innovation. One approach to achieving innovation through public procurement is the concept of PPoI, which follows the research stream on procurement to support public policy (Obwegeser and Müller, 2018).

2.1.1 Public procurement strategy

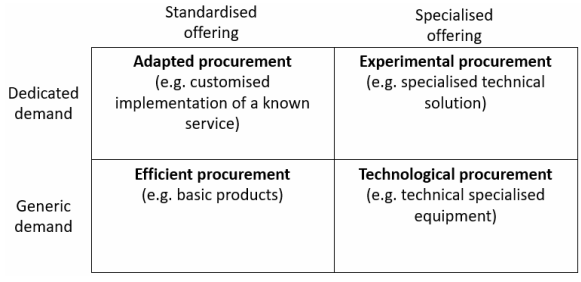
Public procurement is expected to achieve the organisation's strategic goals to address societal challenges (Taheriruh et al., 2025). However, the public procurement strategy needs to be prepared to meet both the organisation's goals and political objectives (Patrucco et al., 2017). The existing literature recognises the crucial role of strategy in fostering innovation (Tammi et al., 2025). However, if the public procurement strategy is not carefully crafted, it may hinder public procurement from stimulating innovation due to the absence of a triggering factor (Cammarano et al., 2025). On the other hand, public organisations have started collaborating with intermediaries to implement PPoI, aligning their activities with their strategies by addressing capability gaps, thus fulfilling their goals of promoting innovation (Selviaridis and Uyarra, 2025; Taheriruh et al., 2025). It is important to note that a public procurement strategy should also include more detailed levels, such as processes and a strategy for managing different types of procurement (Patrucco et al., 2017).

2.1.2 Fourfold typology of public procurement

Understanding the type of procurement is relevant because if the procurement strategy involves innovation, the type of procurement is typically related to the type of innovation being pursued (Uyarra and Flanagan, 2010). Uyarra and Flanagan (2010) present a fourfold typology of public procurement (Figure 1) that classifies public procurement

according to whether the demand is generic or dedicated and whether the supplier's offering is standardised or specialised.

Figure 1 Types of public procurement according to the fourfold typology of public procurement



Source: Modified from Uyarra and Flanagan (2010)

In *technological procurement*, where demand is generic, and suppliers have specialised offering, innovations are often sought by adapting and applying latent or existing technologies to new user needs and markets. A typical object in technological procurement is specialised technical equipment. In *adapted procurement*, where a standardised service is customised to meet dedicated demand, innovations are often sought by leveraging existing expertise and customising the service to different market segments. The customisation of a known service offering to a specific customer's needs represents a typical adapted procurement. In *efficient procurement*, where both demand is generic, and offering is standardised, the innovations can be pursued by focusing on economies of scale, in which case radical innovations may be appropriate. For example, all procurement of basic products, such as cleaning supplies or office supplies, is efficient procurement. In *experimental procurement*, where both demand is dedicated and offering is specialised, the innovations sought may aim to address a new need or societal problem, in which case radical innovations often come into question. Experimental procurement usually involves a customised technical solution that has not yet been fully specified at the time of procurement planning.

According to Uyarra and Flanagan (2010), for example, some technological and adapted procurement may be related to incremental innovations, minor improvements, or new applications of solutions, while experimental procurement may be related to radical innovations aimed at a completely novel solution to a societal problem. However, the type of innovation pursued will affect how innovation-oriented the public organisation should be, what capabilities it should have, and which approach to public procurement it should adopt (Uyarra et al., 2020). Furthermore, the design of the procurement approach should consider not only the type of innovation but also the time and resources required/available, and the rationale for stimulating innovation (Lenderink et al., 2022). The rationale for stimulating innovation is relevant to the supply side, where private suppliers may not see public procurement as a relevant customer, and to the public sector itself, where innovation can be challenging due to the public sector's risk-averse culture (OECD, 2011).

2.1.3 Stimulating innovation in public procurement

At a minimum, public procurement that stimulates innovation can be conducted through *innovation-friendly procurement*, aiming for the best value for money while maintaining arm's-length interactions with suppliers (OECD, 2011). According to Lenderink et al. (2022), in the pursuit of *quality improvements* through innovation-friendly procurement, common practical methods to stimulate innovation include market dialogue, functional specifications and high-quality requirements in tender documents, often using non-negotiated procurement procedures (such as open procedure). Taking innovation stimulation one step further, *strategic procurement of innovation* refers to procuring a product, service, or solution that does not yet exist (OECD, 2011). According to Lenderink et al. (2022), strategic procurement of innovation is typically driven by specific needs and interactions with suppliers are either recurrent or partnership-based, often using procurement procedures that allow for negotiation. The stimulation of innovation goes even further in the *procurement of R&D services* for the public sector (OECD, 2011). According to Lenderink et al. (2022), the procurement of R&D services to stimulate innovation is based on the *development of a solution* to a specific need or societal problem, or on a significant quality improvement, to optimise feasibility, quality and cost. In the procurement of R&D services, interactions with suppliers often take the form of partnerships, and pre-commercial procurement activities or innovation partnerships are standard public procurement procedures (Lenderink et al., 2022).

Although the co-development practices and the extent of collaboration and innovation stimulation vary, all approaches involving innovation require the procuring organisation to interact with suppliers (Lenderink et al., 2022; Uyarra and Flanagan, 2010). Depending on the procurement approach and procedure, the procurement phase (pre-procurement, contracting and/or contract period) in which the buying organisation collaborates with the supplier to develop the innovation – i.e., co-develops – may also vary (Guarnieri and Gomes, 2019). For example, in an open procedure, market dialogue may be used in the pre-procurement phase to create new specifications (Holma et al., 2020; Lenderink et al., 2022). In negotiated procedures, collaboration and interaction with suppliers may take place during the contracting phase (Lenderink et al., 2022). In innovation partnerships, innovation is developed in collaboration with the supplier during a specified contract period (Lenderink et al., 2022).

2.2 Co-development of innovation

Procurement of innovation often requires more sophisticated processes than procurement of conventional goods and services. The solution is often too complex to determine at the time of supplier selection or contracting (Jääskeläinen et al., 2020). The private sector literature has found that buyers often face challenges in describing their needs and specifying detailed requirements for novel solutions, leading to the crucial role of suppliers in supporting buyers with these tasks (Aarikka-Stenroos and Jaakkola, 2012; Tuli et al., 2010). This may require intensive interaction between the two parties (Aarikka-Stenroos and Jaakkola, 2012; Jääskeläinen et al., 2020), but it may be challenging to implement within the widely used public procurement approaches such as open procedure tendering. It is important to acknowledge that offering a solution includes not only the object of delivery but also the means of delivery, the latter often being

closely related to the buyer's processes and requiring suppliers to have a good knowledge of their customers' operations (Hakanen and Jaakkola, 2012).

At the turn of the 21st century, co-development was explored in the context of inter-firm product development, and discussions emphasised the two-way flow of ideas between organisations (Evans and Jukes, 2000). Subsequently, Chesbrough and Schwartz (2007) found benefits, such as lower product development costs and increased innovation from collaborating with others to develop new products or services, provided that co-development is carefully planned and implemented. In addition, Chesbrough and Schwartz (2007) found that co-development is an effective means of improving the effectiveness of innovation. Furthermore, Oinonen and Jalkala (2015) took the importance of innovation co-development to a new level by presenting a dyadic framework, arguing that co-development provides an opportunity to match supply with buyer preferences. In this dyadic framework, co-development involves not only matching supply with buyer needs but also seeking governance consensus, interactive ideation, iterative co-development, and the testing and commercialisation of the outcome (Oinonen and Jalkala, 2015). In recent years, the concept of co-development has been introduced into service specification development in the context of public procurement (Holma et al., 2020), and the role of digital platforms in co-development has been discussed (Chen et al., 2024). In addition, recent literature shows that co-development tends to focus on the early stages of the public procurement process (Toukola et al., 2023) and that early interaction with suppliers appears meaningful (Sloot et al., 2025; Bizri and Stegare, 2024). Moreover, co-development capabilities are considered essential in procurement with a focus on innovation and performance in the long-term (Delke et al., 2023; Karttunen et al., 2023; Taheriruh et al., 2025).

However, other concepts also appear in studies on buyer-supplier collaboration for development, innovation, or value creation and their use may overlap. Solution co-development and value co-creation have both been presented in the literature as means of addressing the collaborative needs for delivering innovative solutions. Co-creation has long been studied in the private-sector literature (Aarikka-Stenroos and Jaakkola, 2012; Vargo and Lusch, 2004; Vargo et al., 2008), particularly in marketing.

Cross-organisational co-development to develop products and solutions has long been one of the R&D approaches in industry (Deck and Strom, 2002). In addition, according to Chen et al. (2024), strategic learning helps identify opportunities, while co-creation ensures their capture. This is supported by the argument of Loijas et al. (2024) on the importance of solution co-creation capabilities for seizing, (i.e., capturing) opportunities in the dyadic context of strategic public procurement. In addition, value co-creation has been studied from a dyadic perspective, specifying the various co-creation activities from the supplier and customer perspectives (Aarikka-Stenroos and Jaakkola, 2012).

The concept of co-creation, as the use of parties' resources to collaborate in the co-creation/co-development of innovations, has been gradually applied to the public sector as societal demands have become so complex that the public sector cannot address them alone (Torfing et al., 2021; 2019). Torfing et al. (2021) have even described co-creation as 'a shorthand for collaborative innovation'. However, recent research on the concept of co-creation in the public sector context has evolved towards citizen/user participation (Ansell and Torfing, 2021; Torfing et al., 2021, 2019), with limited attention to the supplier market as a collaborative actor. Therefore, we chose the concept of co-development for our study, which encompasses the joint efforts of the buyer and the supplier to achieve the desired innovation, regardless of the procedure used or the

intensity of involvement (Holma et al., 2020). On the other hand, by using the concept of co-development in this study, we emphasise that innovation need not be radical or highly novel, but incremental innovations resulting from collaborative development are also relevant outcomes of public procurement. However, the practical manifestations of co-development, or co-creation, in this specific context are still not well known. Co-development has only been used in a few studies in the context of public procurement (Holma et al., 2020).

Research in the public sector context is needed because the public sector objectives for collaborative approaches often differ from those of the private sector, as the development of a solution/innovation is typically not driven by competitive advantage, and the outcome objective may also be a much broader societal issue (Ansell and Torfing, 2021). Similarly, the practice of collaborative approaches in the public sector differs from that in the private sector due to the strict constraints and limitations imposed by public procurement laws and regulations (Holma et al., 2020). In addition, the competent use of public procurement procedures (such as open procedure, competitive dialogue, competitive procedure with negotiation and innovation partnership) is essential, as different procedures allow for different uses of co-development at different phases of procurement to stimulate innovation (Lenderink et al., 2022; Uyarra et al., 2020). For example, market dialogue in the pre-procurement phase has been found useful for co-developing service specifications when using an open procedure (Holma et al., 2020), but co-development during the procurement process through a competitive procedure with negotiation, or in a contractual relationship through an innovation partnership, allows for solution development and even piloting in collaboration between the parties (Lenderink et al., 2022). However, procurement management has to consider that co-development and collaborative processes cannot only rely on traditional forms, but require new collaborative forms, practices and platforms (Torfing et al., 2019), even digital platforms (Holma et al., 2020; Chen et al., 2024), which should also be considered in the strategic management of public procurement.

3 Methodology

3.1 Research design

We chose a qualitative research approach because there are only a few studies on co-development in the context of public procurement, and a more in-depth exploration was needed. The study was originally designed as an interview study. However, at a very early stage, significant differences between types of procurement emerged from the data, and it was decided to conduct a multi-case study instead. The study uses an abductive approach, consisting of exploring the empirical field and linking the findings to the theoretical framework (Dubois and Gadde, 2002). This approach was considered useful for the theory elaboration (Ketokivi and Choi, 2014) of co-development in different types of public procurement, a new area of research. The empirical part of the study was designed to collect and analyse data on:

1 the types of public procurement

2 the types of innovation sought (radical/incremental)

3 the procurement procedures used

4 the co-development practices implemented

5 the public procurement phase in which co-development was involved.

As the importance of procurement strategy for the implementation of co-development began to emerge from the interview data in a potentially meaningful way, the strategic support for supplier collaboration of the case organisations was included in the data collection.

3.2 Data collection

We conducted purposive sampling of public organisations in Finland that had already implemented PPoI and co-development, as well as some organisations that appeared to be evolving in this direction. Informants from these organisations were asked to identify one or more PPoI cases involving co-development that they would like to discuss in more detail. Because the size of the procurement cases and the number of active participants varied, the number of informants differed across cases. Since the number of informants with knowledge of specific cases was limited, complementary informants were accepted if they provided valuable information on the relatively rare phenomenon of co-development in public procurement, even if the informants did not identify a specific case for discussion. We also accepted representatives from intermediaries, as their use in supporting PPoI is common in Finland, and they have good visibility into collaboration practices in the PPoI process. A total of 13 cases resulted from the interviews for the study, representing infrastructure, healthcare, information technology and food services in the Finnish public sector. Finland was an appropriate choice as a research setting because PPoI is already high on the agenda of many Finnish public organisations (Valovirta et al., 2017). In addition, the Nordic countries are characterised by collaboration between the public sector and society, which research suggests is a prerequisite for collaborative approaches (Torfing et al., 2019).

Seventeen people were interviewed for this study using semi-structured theme interviews. Of these, 12 people were directly involved in the reported cases, and five people provided more general insights that supported the findings of the multiple case study. Of all the interviewees, 14 worked in procurement organisations, and three worked in national advisory organisations, intermediaries that support public organisations in procurement. The main themes of the interviews included the interviewees' practical experiences and perceptions of co-development with suppliers, and how co-development occurs across procurement phases. Except for one live interview, the interviews were conducted in individual sessions via TEAMS. The interviews were conducted in May and June 2023. All interviews were audio-recorded and manually transcribed. The data were supplemented and verified using secondary data collected from publicly available sources. The secondary data included procurement strategies, guidelines, procurement notifications, procurement toolkits and case reports. Table 1 presents the co-development cases, their objectives and the informants directly involved. In addition, Table 2 presents the complementary informants who shared their perceptions of the role of the procurement strategy, their insights on co-development and/or their organisation's co-development practices, without going into the details of any case.

Table 1 Overview of the cases and informants

Case	*Organisation, industry of the case*	*Desired innovation*	*Informants (interview duration, min)*
CONSTRUCTION	Large municipality 1, infrastructure	Novel selection criteria for tendering	Project manager 1 (58) Procurement Director (62)
CARE	Large municipality 1, health care	Novel effective healthcare service model	Development manager 1 (61) Procurement planner (90) Specialist 1 (66)
WELLBEING	Large municipality 1, social and health care	Novel partnership model for the social and health care services	Development manager 1 (61)
APP	Large municipality 1, information technology	Novel two-way application	Project manager 2 (54) Specialist 1 (66)
ADD-ON	Large municipality 1, information technology	Adding existing technology solution to APP application	Project manager 2 (54)
CONTROL	Large municipality 1, infrastructure	Sustainable solution to a societal challenge	Project manager 2 (54) Specialist 1 (66)
MAINTENANCE	State enterprise 1, infrastructure	Novel infrastructure service commissioning	Procurement director 2 (73)
DESIGN	State enterprise 1, infrastructure	Infrastructure solution to improve usability	Project manager 3 (72)
RECYCLE	State enterprise 1, infrastructure	Solution for utilising recycled material and improving safety	Project manager 4 (64)
INVOICE	Local public enterprise 1, information technology	IT solution into a new operation environment	Procurement manager 1 (58)
MIX	State enterprise 2, information technology	System customisation from generic elements	Specialist 2 (59)
BOT	Middle municipality 1, health care	Digital solution for a specific need	Specialist 3 (63)
SCALE	Middle municipality 1, food service	Digital equipment for a new user community	Specialist 3 (63)

Table 2 Complementary informants

Organisation	*Informants (interview duration, min)*
State enterprise 3	Procurement director 3 (47)
Middle municipality 2	Procurement director 4 (74)
National advisory organisation 1	Lead specialist 1 (79)
National advisory organisation 2	Specialist 4 (51)
National advisory organisation 3	Development director 1 (77)

3.3 Data analysis

The data analysis began with a manual qualitative content analysis. First, an overview of the case was gathered from each point in the interview data, publicly available case reports and public procurement notifications. Following the initial data analysis, the observations were tabulated in an Excel spreadsheet for each respondent. The corresponding author did the coding. The first coding included codes for the case, the type of procurement, the type of innovation, the procurement procedure used, and observations on co-development practices and related procurement phases. Information on the procurement procedures used in the cases, the co-development practices, and the related procurement phases was primarily collected from interview data and supplemented and refined using documentary data. The type of procurement, the type of innovation, and how innovation was stimulated in each case were interpreted using all the gathered data. As the importance of procurement strategy emerged from interviews, additional secondary data sources were explored to examine strategic support for supplier collaboration, and this information was added to the coding.

At the beginning of the within-case analysis, the case data were combined, and the interview and documentary data were revisited several times to fill gaps. Then other authors checked the coding for logic and consistency. Next, similar descriptive meanings were identified using manual open coding and merged into a summary table, presented in Appendix. Next, each case was analysed separately, and the results were reviewed in the light of previous literature.

For the cross-case analysis, the cases were organised by type of procurement. Data from each type of procurement were examined for patterns and compared with data from the other types of procurement. After the cross-case analysis, a conceptual framework was created. Finally, the results were discussed in terms of co-development practices for different types of public procurement.

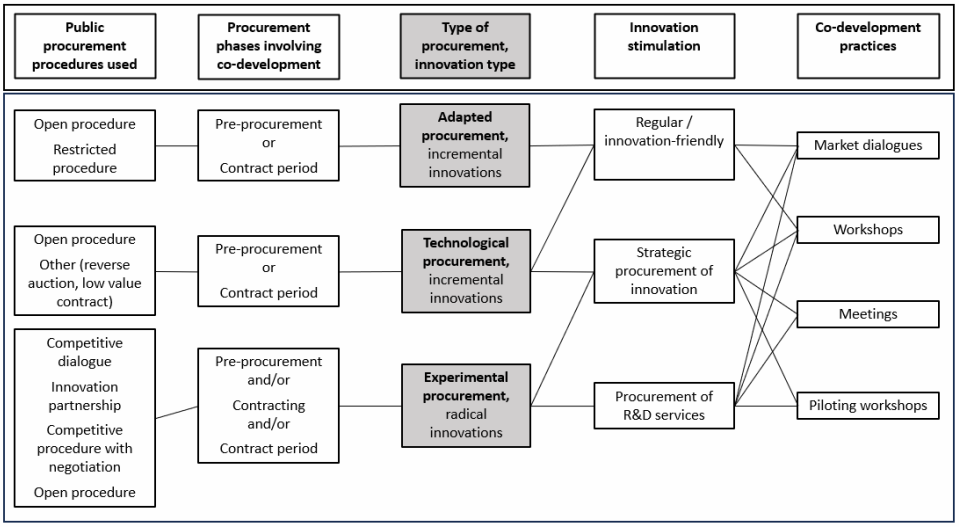
4 Results

4.1 Case findings

The results show that co-development varies across types of procurement. Experimental procurement aimed at radical innovation differs significantly from technological and adapted procurement in terms of co-development. Efficient procurement was not identified in any of the studied cases. Figure 2 presents the results of the analysis as a coding chart. In the coding chart, the type of procurement is placed in the middle. The

procurement phases and procedures related to the types of procurement are on the left, and the innovation stimulation types and practices are on the right.

Figure 2 Coding chart



Source: Authors' own work

In our analysis, we found that in the *adapted procurement* cases, the objective of the procurement was incremental innovation: a solution that meets buyer/user needs with high quality and usability by utilising the supplier's existing expertise and offerings to customise the solution. In addition, innovation stimulation was interpreted as innovation-friendly, and co-development also appeared to be primarily related to usability and quality improvements. No procurement procedures involving negotiation were identified, but the open procedure appeared typical. Differences between the adapted procurement cases were particularly evident in the procurement process phase and in the use of co-development to achieve the objective. In the adapted procurement cases, co-development typically took place in the pre-procurement phase or during the contract period. In the CONSTRUCTION case, co-development with suppliers was conducted only through market dialogues with potential suppliers in the pre-procurement phase to develop the best possible tender criteria. In the MIX case, the desired usability was achieved by co-developing the solution through dialogue with the selected supplier under the contract. However, as an exception, in the DESIGN case, first workshops for potential suppliers were organised during the pre-procurement phase. Then, the final content of the future delivery and the metrics were co-developed during the contract period of a separate development-phase contract for the subsequent implementation phase.

In the *technological procurement* cases, the procurement objective was also incremental innovation: a solution to a need that could be met by bringing existing technologies into a new operating environment through co-development. The procurement procedure used, like the adapted procurement, still seemed to be an open procedure, which is the mainstream of public procurement. The use of procurement procedures involving negotiation was not observed. However, there were also differences

between the cases. In the INVOICE case, where the objective of the co-development was to improve usability, the stimulation of innovation was of an innovation-friendly nature. On the other hand, the ADD-ON and SCALE cases were clearly aimed at buying a solution to a new need, and represented strategic procurement of innovation in terms of innovation stimulation. However, the INVOICE case was the only technological procurement case studied in which a co-development workshop was organised not only in the contract phase but also in the pre-procurement phase to define the need and the will. In contrast, in the ADD-ON and SCALE cases, all co-development took place only during the contract period. In addition, in technological procurement, co-development occurred through dialogues, meetings, workshops and, in the SCALE case, piloting workshops.

In the *experimental procurement* cases, the objective of the procurement was radical innovation: a novel solution to a specific need or societal problem. The cases showed innovation being stimulated either through strategic procurement of innovation or through procurement of R&D services. In the case of experimental procurement, a clear link was found between the implementation of co-development and the procurement process. In cases where an innovation partnership was chosen as the procurement procedure at the time of the procurement design, in the APP and BOT cases, co-development with the supplier took place only during the contract period. On the other hand, in cases where the procurement procedure involved negotiation, in the CARE, WELLBEING, CONTROL, and MAINTENANCE cases, co-development with the supplier(s) was implemented across all phases of the procurement process: pre-procurement, contracting and contract period. An exception to this, and therefore an interesting finding, was the RECYCLE case, where the stimulation of innovation clearly followed the procurement of R&D services approach, and co-development with the supplier was extensive and long-term. However, the tendering was conducted through an open procedure. This exception may indicate that the open procedure also allows extensive co-development when tendering is competently implemented.

In addition, several procurements used a two-part contract, with separate contracts for the development and subsequent implementation phases, to allow for extensive co-development and to leave open the possibility of terminating the contract after the development phase if the conditions for the implementation phase were deemed inadequate. Furthermore, it appeared typical of experimental procurements that the development was not expected to be completed in a short period, but that the possibility of continuing the development during the implementation phase of the contract was also provided for. Findings show that most cases with the two-part contract were experimental procurements.

The exception to this is the DESIGN case, which represents an adapted procurement and was tendered using a restricted procurement. The DESIGN case was conducted by an organisation that strongly supports collaboration and co-development with suppliers, has widely encouraged the use of procurement models that include a development phase where appropriate, and has documented processes for procurement models that go beyond the procurement procedures and tendering. Thus, this exception may indicate that in organisations where co-development with suppliers is already well established, it can be systematically implemented for both incremental and radical innovation.

In addition, in seven cases, observations were made of co-development with other stakeholders, such as other functions of the organisation or end users of the service. However, these findings were excluded from the results as the study was explicitly

limited to co-development between a public buyer and a private supplier. In addition, there was a significant process innovation in the CONSTRUCTION case, which was also excluded from the results because it was co-developed with stakeholders other than suppliers. However, these observations may indicate extensive co-development in public organisations that have adopted co-development as part of their procurement activities.

As an *additional finding*, we found that the full benefit of innovation co-development in all its forms and at all phases of procurement requires that the procuring organisation has a procurement strategy and/or guidelines that support both PPoI and collaboration with suppliers. In the cases of experimental procurement, the implementing organisation invariably had a procurement strategy and/or guidelines that supported both PPoI and co-development with suppliers. Small-scale co-development occurred in some technological/adapted procurements in organisations where no strategy support was evident. Furthermore, organisations that manage procurement to promote PPoI and co-development with suppliers appear to be creating tools, processes and practical guidelines to support and formalise procurement activities. In these organisations, procurement procedures seem more like a toolbox, from which the organisation selects and uses what best supports the achievement of the procurement objective, while considering the limitations and regulations associated with public procurement procedures. In contrast, in organisations where the procurement strategy and/or guidelines do not prominently address the pursuit of innovation or co-development with suppliers, the procurement procedure(s) are not so clearly seen as just a part of the process or a tool.

The interviews revealed the evident importance of having a strategy and guidelines in place for innovation activities. Informants from organisations that have adopted the PPoI and co-development with suppliers emphasised the importance of strategy:

> "We have a procurement strategy in the city that follows the national procurement strategy. – The strategic principles create a requirement for procurement to not only make economic decisions, but also to consider the innovation potential and the various sustainable aspects." (Procurement director 1)

> "I emphasise the strategic management of procurement, the understanding of it and the competence of it. – Identifying strategic procurements for our organisation that we want to influence. Identifying procurements with innovation potential. – and in that strategy, identifying that this is one of the approaches, co-development, that can be used to produce better services and procure better products." (Lead specialist 1)

In turn, informants from organisations that did not mention PPoI or co-development in their publicly available procurement strategy or guidelines describe their organisations' co-development activities as such:

> "Market dialogue is quite typical. And it is also an area that needs to be developed so that, in the future, we will conduct market dialogue more systematically. – we aim to start arranging general supplier events, where we innovate together on how we can work smarter, how we should approach tendering, and how we can find more meaningful solutions in terms of sustainability objectives." (Procurement director 4)

> "In terms of setting criteria, I remember some reflection that was done during the market research and market dialogue phase. However, it was nothing very far-reaching. Co-development, which would have taken place during the contract period with a partner, is something I have not been involved in. –

When you do something that is perhaps a little bit new or innovative, the risks often increase with the procedure." (Specialist 4)

4.2 Conceptual framework

Based on the case findings, we developed a conceptual framework for the forms of innovation co-development in adapted, technological and experimental public procurement. The framework is presented in Figure 3.

As the figure shows, the forms of innovation co-development in public procurement involve more than just co-development practices, such as meetings and workshops. Instead, co-development always involves understanding of what kind of innovation is being co-developed, what co-development practices (such as meetings and workshops) are being used to stimulate innovation, and at what phase of the procurement process. In our study, experimental procurement emerged as a type of procurement that employs co-development across phases, depending on the procurement case, and that uses various practical implementations to stimulate innovation. In adapted and technological procurements, the implementation of co-development is more limited, with innovation stimulation typically occurring in market dialogues during the pre-procurement phase. However, there seems to be no single correct approach to implementing co-development. Consequently, based on our study, even within procurement types, forms of innovation co-development are reflected in combinations that need to be carefully designed for each procurement. The results of our research may motivate public procurement management to identify the types of public procurement, design procurement on a case-by-case basis, and ensure the organisation's capability to implement co-development.

Figure 3 Conceptual framework

Adapted procurement Co-development of specifications or criteria in a market dialogue, ***or*** light customisation of the solution through co-development during the contract period.	**Experimental procurement** Co-development of specifications, criteria, and objectives through market dialogue and development workshops ***and/or*** meetings during the procurement procedures that enable co-development of a novel solution ***and/or*** co-development of radical innovation during the development phase under a specific contract.
Efficient procurement [N/A, not studied]	**Technological procurement** Co-development of specifications or criteria in a market dialogue, ***or*** adaptation of the solution to a new use case/market through co-development during the contract period.

Note: Forms of innovation co-development in different types of public procurement.

Source: Authors' own work, typology adapted from Uyarra and Flanagan (2010)

5 Discussion

Previous studies show that all approaches to stimulate innovation require interaction between procuring public organisations and suppliers (Lenderink et al., 2022; Uyarra and Flanagan, 2010). In this study, we accessed a diverse range of PPoI cases, which contributes to elaborating the understanding of this interaction.

As a theoretical contribution, we explain the forms of innovation co-development in adapted, technological and experimental public procurement. In line with Oinonen and Jalkala (2015), our study identifies opportunities for need and supply matching, interactive ideation, and iterative co-development. In addition, as noted by Sloot et al. (2025), Bizri and Stegare (2024), and Loijas et al. (2024), we recognise the need for supplier collaboration and extend the current knowledge in public procurement that aims to address complex societal challenges. Moreover, in line with Holma et al. (2020), we also identify opportunities for co-development of product or service specifications in the pre-procurement phase, as well as in the tendering/contracting and contract period phases of public procurement. Furthermore, although our study did not focus on the platform used to implement the co-development practices, and our analysis and results do not consider this aspect, some cases were in process at the time of the COVID-19 restrictions. Therefore, our study also supports Chen et al. (2024) in their view that digital platforms may enable co-development. However, our study extends this debate by finding variation in forms of innovation co-development across, and even within, the different types of public procurement.

The type of public procurement affects the extent to which radical or incremental innovation can be pursued (Uyarra and Flanagan, 2010). Our study confirms the argument of Uyarra and Flanagan (2010) that adapted and technological procurement typically pursue only incremental innovation, while experimental procurement is appropriate for pursuing radical innovation. However, we did not find any effective procurement pursuing innovation in the cases of our study, which was expected in light of the previous research that efficient procurement is mainly carried out in arm's length relationships and development efforts are oriented towards the efficient implementation of the delivery process (Uyarra and Flanagan, 2010), referring to day-to-day procurement (such as office or care supplies). Another explanation may be that the pursuit of innovation in public procurement is novel, and radical innovation is thus more easily associated with solving complex societal challenges than with basic supplies.

In addition, the type of innovation being pursued affects the appropriateness of stimulating it, both in terms of the procurement process and the procurement procedure (Lenderink et al., 2022). Our study is consistent with Lenderink et al. (2022), although we also identified exceptions to the use of procurement procedures. One interesting deviation was related to the experimental procurement, where the approach to stimulate innovation was the procurement of R&D services, the co-development of which lasted months and aimed to innovate both new recycled materials and novel ways of reusing old materials. However, this procurement was tendered using an open procedure. One explanation for this may be that the procuring organisation in question does not define its entire procurement process through a procurement procedure but instead uses the procurement procedure as a tool for tendering as part of a broader procurement model.

While the literature on strategic public procurement identifies the phases of procurement (Guarnieri and Gomes, 2019; Sloot et al., 2025; Toukola et al., 2023), links the stimulation of innovation to procurement procedures (Lenderink et al., 2022), and

identifies the need for co-development capabilities (Delke et al., 2023; Karttunen et al., 2023; Taheriruh et al., 2025), especially in the pre-procurement phase of strategic public procurement (Loijas et al., 2024), there is little, if any, previous literature on forms of innovation co-development as part of the procurement process of different types of public procurement. Given that co-development ensures the capture of opportunities (Chen et al., 2024), and that societal demands have become so complex that it is difficult for the public sector to respond to them alone (Torfing et al., 2021, 2019), we addressed this research gap by providing further understanding of the forms of innovation co-development in different types of public procurement in order to consider the opportunities that co-development opens up in the strategic planning of public procurement. We demonstrated how different forms of innovation co-development between public buyers and private suppliers are reflected across adapted, technological and experimental procurement. In addition, we proposed a conceptual framework for forms of innovation co-development. Moreover, based on our findings, we suggest that the decision to adopt a particular co-development approach should be treated as a strategic decision aligned with the procurement case, such as the procurement procedure, to achieve desired innovation outcomes.

In addition, the existing literature recognises the crucial role of strategy in fostering innovation (Tammi et al., 2025). To discuss this in greater detail, our additional findings suggest that if a public organisation wants to use experimental procurement to pursue radical innovation and realise the full potential of co-development, the procurement strategy and guidelines must support this ambition. This finding supports the study by Patrucco et al. (2017), which argues that a public procurement strategy should also include a category strategy that considers different types of procurement, as well as a process strategy. In turn, based on our findings, it seems that a public organisation will not be able to fully exploit the development potential of the supplier market through co-development unless it develops a strategy that encourages innovation and supports collaboration with suppliers, and sees procurement procedures as a tool rather than a guide or constraint. This conclusion supports the argument of Holma et al. (2020) that it is not appropriate to mix contractual and value-creation issues in the pre-procurement phase, (i.e., not to focus on risk avoidance in stimulating innovation), but rather to innovate freely and then ensure legal compliance in the contracting phase. On the other hand, if a procurement strategy encourages an organisation to innovate and collaborate, this may be reflected in daily work, fostering the development of practices and taking advantage of opportunities offered by different procurement procedures and forms of innovation co-development.

6 Conclusions

6.1 Theoretical implications

The academic contribution of this study is twofold. First, the study contributes to the co-development debate by addressing forms of innovation co-development in adapted, technological and experimental public procurement aimed at innovation. Gaining understanding, we found that different types of public procurement involve different forms of innovation co-development, including different co-development practices at different phases of the procurement process. Our findings on forms of innovation

co-development highlight the importance of identifying the type of procurement and designing procurement on a case-by-case basis to determine how best to use co-development to achieve the innovation objective.

Second, the study contributes to the PPoI debate by emphasising the role of procurement strategy in implementing co-development within PPoI. We found the importance of adopting a public procurement strategy in the context of co-development and PPoI, as Patrucco et al. (2017) have generally found. Complementing previous research, we found that public procurement strategy and guidelines are crucial for the full exploitation of innovation co-development with suppliers.

6.2 Managerial implications

The focus of our study on daily practices and procedures of public procurement provides several implications for practitioners and policymakers. Public procurement is seen as a driver of innovation (European Commission, 2021) and the co-development as a way to address even complex societal needs (Torfing et al., 2021, 2019). By presenting examples of combinations of co-development practices and procurement procedures, we provide public procurement managers with a deeper understanding. Understanding what is possible and how is particularly important for public practitioners due to the strict requirements of public procurement laws and regulations (Holma et al., 2020). Thus, in addition to our academic contribution, our study discusses the practical possibilities of co-development in public procurement, rather than focusing on its limitations. For example, the findings of our study show that no procurement procedure directly prevents co-development. However, the procurement procedure must be chosen to serve the overall purpose of the procurement and comply with laws and regulations. The same applies to the choice of co-development. Co-development should never be an end in itself, but a means to an end. Therefore, public sector organisations can benefit from understanding the forms of innovation co-development and utilise this understanding to allocate their time, resources and efforts.

6.3 Limitations of the research

Our research is limited to co-development between a public buyer and its supplier(s). On the other hand, the study was conducted in only one country, Finland, which should be acknowledged when considering the results in different locational settings. However, the results of our study are likely to be applicable to all EU countries.

6.4 Future research directions

Future research on co-development is expected to be important, as more and more national public procurement strategies, such as the National Public Procurement Strategy of Finland (Ministry of Finance, 2020), increasingly encourage public organisations to collaborate with private companies. Therefore, future research could test the applicability of our findings in other countries and public procurement contexts, as well as over time. In addition, future studies could continue to respond to the call for public-private co-development studies by Holma et al. (2020), as there are still very few studies on co-development in the public sector. Future public sector studies could continue exploring co-development from a dyadic perspective or co-development with other

stakeholders. In addition, a survey on the classification of public procurement and its use in practice could be of interest, as the classification of public procurement does not appear to be widely represented in public procurement research. Furthermore, the co-development maturity of public organisations could be an interesting research topic, as our findings suggest very different levels of implementation of co-development across organisations.

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Declarations

All authors declare that they have no conflicts of interest.

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Appendix

Table A1 Table of the main observations

Case (type of procurement, innovation)	*Strategic support for supplier collaboration (yes/no)*	*Procurement procedure*	*Ways to stimulate innovation*	*Co-development practices and the associated procurement phase synthesised from interviews and documentary data*
CONSTRUCTION (adapted, incremental)	Yes	Open procedure	Innovation-friendly procurement	One-to-one market dialogues (10) and comment rounds on circular economy criteria for this case and for future applications in the pre-procurement phase.
CARE (experimental, radical)	Yes	Competitive dialogue	Strategic procurement of innovation	Various market dialogues to bring customer focus and effectiveness to procurement in the pre-procurement phase. Co-development of solution, metrics with target levels and the procurement model in the meetings during the competitive dialogue. Continuous co-development through meetings during the contract period as specified in the contract.
WELLBEING (experimental, radical)	Yes	Competitive dialogue	Strategic procurement of innovation	Market dialogues (5) in the pre-procurement phase. Co-development workshops to simulate operations and develop a commercial model during the competitive dialogue. Two-part procurement contract (separate contract for development phase and implementation phase). Co-development of the service package, approaches, objectives, effectiveness metrics, finalisation of the commercial model and a plan for the development of the implementation phase through meetings/workshops during the development contract period.
APP (experimental, radical)	Yes	Innovation partnership	Procurement of R&D services	Co-development only under contract with a partner selected through an innovation competition. Initially, in the development phase, through meetings and piloting of the best solutions. After piloting, further co-development towards implementation.
ADD-ON (technological, incremental)	Yes	Other (reverse auction, low-value contract)	Strategic procurement of innovation	Co-development under contract only. Co-development of algorithms after supplier selection.
CONTROL (experimental, radical)	Yes	Competitive procedure with negotiation	Strategic procurement of innovation	Several market dialogues and workshops in the pre-procurement phase. Co-development of the potential solution through meetings with the suppliers admitted to the procurement procedure. Further co-development of the solution in the implementation phase, following the piloting as specified in the contract.

Table A1 Table of the main observations (continued)

Case (type of procurement, innovation)	*Strategic support for supplier collaboration (yes/no)*	*Procurement procedure*	*Ways to stimulate innovation*	*Co-development practices and the associated procurement phase synthesised from interviews and documentary data*
MAINTENANCE (experimental, radical)	Yes	Competitive dialogue	Procurement of R&D services	Market dialogues on objectives and criteria in the pre-procurement phase. Two-part procurement contract (separate contracts for the development and implementation phases, with the possibility to change suppliers for the implementation phase) with co-development of the solution/innovation and shared objectives through meetings during the development contract period.
DESIGN (adapted, incremental)	Yes	Restricted procedure	Innovation-friendly procurement	Co-development workshops in the pre-procurement phase. Two-part procurement contract (separate contract for development phase and implementation phase). Co-development dialogues on scope, cost and metrics during the development contract period.
RECYCLE (experimental, radical)	Yes	Open procedure	Procurement of R&D services	Brainstorming workshop for interested competing companies in the pre-procurement phase. Two-part procurement contract (separate contract for development phase and implementation phase). Months of co-development with different working approaches during the development contract period to find recycled materials and reuse old materials.
INVOICE (technological, incremental)	No	Open procedure	Innovation-friendly procurement	Workshops to define needs and intentions in the pre-procurement phase. Co-development to bring systems used elsewhere into this operating environment during the contract period, as defined in the contract.
MIX (adapted, incremental)	No	Open procedure	Innovation-friendly procurement	Co-development of a customised mix of offerings during the contract period as defined in the contract.
BOT (experimental, radical)	Yes	Innovation partnership	Procurement of R&D services	Co-development only under contract, with separate development and pilot phases. First, a development phase to develop the solution, and then, after piloting, further development towards implementation.
SCALE (technological, incremental)	Yes	Other (low-value contract)	Innovation-friendly procurement	Co-development and piloting under the contract to apply existing technology to this specific operating environment.