Public procurement as an attractive customer: a supplier perspective

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Abstract

Purpose – Buyer–supplier relationships in public procurement have garnered increasing attention in research, yet studies on the perspective of suppliers on public procurement have remained limited. This research takes the perspective of suppliers and aims to investigate the innovativeness of suppliers and the impact of supply chain ambidexterity strategies on their perceptions about public procurement in terms of innovation enablers and customer attractiveness.

Design/methodology/approach – This research draws from a survey of 137 suppliers to the public sector in Finland and applies PLS-path modeling to test its hypotheses.

Findings – The findings reveal that the ambidexterity strategy of suppliers in the supply chain influences how they perceive the innovation enablers and customer attractiveness of public organizations since processes of public procurement do not support these strategies fully. Supplier innovativeness has an influence on the perceived innovation enablers of public procurement, which, in turn, influences customer attractiveness.

Practical implications – The innovativeness and strategies of suppliers for the supply chain have an impact on how attractive they perceive public procurement. The findings of this research provide insights on why the customer attractiveness of public procurement may not be high enough to secure the competition in their bidding processes.

Originality/value – The study's contribution adds to the field of buyer–supplier relationships and customer attractiveness in public procurement by showing the importance of innovation enablers and highlighting the impact of supplier's ambidexterity in the supply chain on their perceptions about public procurement.

Keywords Public procurement, Social exchange theory, Ambidexterity, Customer attractiveness

Paper type Research paper

Introduction

Public procurement is often conceived as a clerical function that focuses on transparency and accountability while neglecting more strategic approaches such as supplier relationship management and attraction (Patrucco *et al.*, 2016; Vecchi *et al.*, 2020; Schiele, 2020). Attraction is a fundamental construct of social exchange theory (SET), which sees relationships as a series of social exchanges. In practice, when a supplier has a positive expectation of future exchanges from its relationship with a public organization, it perceives that customer as attractive. Public procurement functions should also strive to explain factors of attractiveness to their suppliers because attractive customers are expected to draw innovative and high-performing suppliers (Schiele, 2020). In response to previous studies, this article aims to investigate how innovativeness and the strategic intentions of suppliers impact their perceptions about the customer attractiveness of public procurement. A theoretical research gap exists; as Uyarra *et al.* (2014) highlighted, research must explore the supplier's point of view to strengthen the theory behind public procurement. Schiele (2020) likewise emphasized the need for further research on customer attractiveness and

relationships in public procurement, as these research endeavors will clarify ways in which public procurement can increase supplier satisfaction. This article approaches the antecedent of attractiveness from an ambidexterity perspective for supplier relationships in the public sector. This perspective connects SET to supplier strategies in the context of public procurement and suppliers' preferences regarding customer relations (Gieske *et al.*, 2020; Tammi *et al.*, 2017).

Customer attractiveness and its antecedents are important from a managerial perspective because public tendering has suffered from a lack of bids from suppliers [1]. The citizens expect a fair return on their taxes in the form of high-quality public services, but a lack of bidders hinders the achievement of this aim. A lack of competition in public procurement does not encourage suppliers to innovate or develop their offerings, which may decrease quality and increase costs. In recent years, such a lack of competition has been a common problem in European Union (EU) countries. For instance, in almost all EU countries (except Liechtenstein, Sweden and Iceland), more than 10% of the contracts awarded in 2019 were to single bidders [1]. In addition, the single-bidder indicator was at an unsatisfactory level (more than 20% of the proportion of contracts) that same year in 17 EU countries. These statistics clearly indicate that public procurement should increase its attractiveness to suppliers to reduce single-bidder cases and foster real competition.

SET proposes that suppliers' attraction judgments are subjective and depend on organization-specific standards, which are influenced by suppliers' strategic intentions in supply chains, such as exploitation (leveraging current knowledge to improve existing processes) or exploration (involving new methods and experimentation to change processes and technologies) (Tanskanen and Aminoff, 2015). Public organizations and ambidexterity is an emerging field (Cannaerts *et al.*, 2020; Magnusson *et al.*, 2021), and it is being studied in the context of collaboration (Page *et al.*, 2021; Alcalde Heras *et al.*, 2020), meaning it still lacks suppliers' perspectives. Existing research has vaguely explained the varying strategies suppliers use to approach public procurement (Page *et al.*, 2021; McKevitt and Davis, 2013). Furthermore, evidence of the influence of suppliers' innovativeness levels and its antecedents' to affect perceptions of public procurement is not completely consistent (Uyarra *et al.*, 2014). To address recognized gaps in the literature, the research question is framed as follows: "How do innovativeness and ambidexterity of suppliers in the supply chain impact their perceived customer attractiveness of public organization in the context of public procurement?"

This study contributes to the emerging theory of attraction in buyer–supplier relationships (Schiele, 2020) and ambidexterity (Page *et al.*, 2021) in the context of public procurement. We propose that the innovativeness and ambidexterity of suppliers in the supply chain augmented by the exploitation and exploration strategies influence their judgments regarding innovation enablers and the attractiveness of public organizations. The empirical part of this study is grounded on a survey of 137 companies that are suppliers for the public sector in Finland. Partial least squares (PLS)-path modeling was applied to test the hypotheses. The results show that the self-reflected innovativeness of suppliers influences their ambidexterity in the supply chain and perceived innovation enablers of public organizations. Moreover, innovation enablers have a strong positive influence on the perceived customer attractiveness of public organizations. The supplier's ambidexterity strategy in the supply chain is found to have a direct impact on perceived customer attractiveness, given that the operational process of public procurement provides differing conditions for these strategies.

Theoretical background and hypotheses
Conceptual framework
The SET frames the conceptual research model by explaining the role of actors' preferences in relation to exchange, rules of reciprocal relationships and selection between competing

relationships (Cropanzano and Mitchell, 2005; Dwyer *et al.*, 1987; Emerson, 1976). The conceptual model of the research framework with the hypotheses is presented in Figure 1. *Customer attractiveness* is the result of value perceptions of suppliers in a reciprocal exchange where actors maximize the amount of net value gain in their relations (Calhoun *et al.*, 2012; Homans, 1958; Schiele *et al.*, 2012). The model hypothesizes a relationship between supplier innovativeness, ambidexterity and the expected amount of net value gain in social exchanges from the supplier's perspective. The model also posits a chain of interactions to explain antecedents to customer attractiveness in public procurement where perceived innovation enablers have a mediating role (Uyarra *et al.*, 2014; Schiele, 2020). *Innovation enablers in tendering* (i.e. innovation enablers) are suppliers' judgment of the ability of buyers to deal with the delivery history of suppliers, adopt ideas from the market, give feedback and share information for tendering (Uyarra *et al.*, 2014).

The model is grounded in three major theoretical assumptions from SET, which explains the level of customer attractiveness from the supplier's perspective. First, suppliers' preferences vary since resources are seen as rewards only if the receiving party perceives a certain value; this emphasizes the subjectivity of assessments and organizations' strategies (Emerson, 1976). Evaluation standards depend on the supplier's deliberate choices, where, for example, trust, economic rewards or creativity can be biased (Lambe *et al.*, 2001; Thibaut and Kelley, 1959). Second, social exchanges evolve due to factors such as reciprocity or formally negotiated rules (Cropanzano and Mitchell, 2005; Emerson, 1976). "The receiving party should repay in kind" is the rule of reciprocity in social exchanges (Thibaut and Kelley, 1959). In the context of public procurement, formal contracts and other negotiated rules are more stressed than rule of reciprocity by default. However, trust and commitment as traits of successful relationships emerge more strongly from reciprocity than from negotiated rules (Molm *et al.*, 2000). Third, available alternatives for relationships influence attractiveness as opportunity costs which are expenses that result from lost opportunities (Dwyer *et al.*, 1987). Therefore, each party in a relationship compares alternatives in which costs can emerge from the diversion of goal attainment between the buyer and supplier (Griffith *et al.*, 2006) or the non-fulfillment of expectations (Kelly *et al.*, 2021).

Thus, the research model hypothesizes that attractiveness is contingent on the strategic intentions of a supplier in the context of a public organization, which is similar to research on
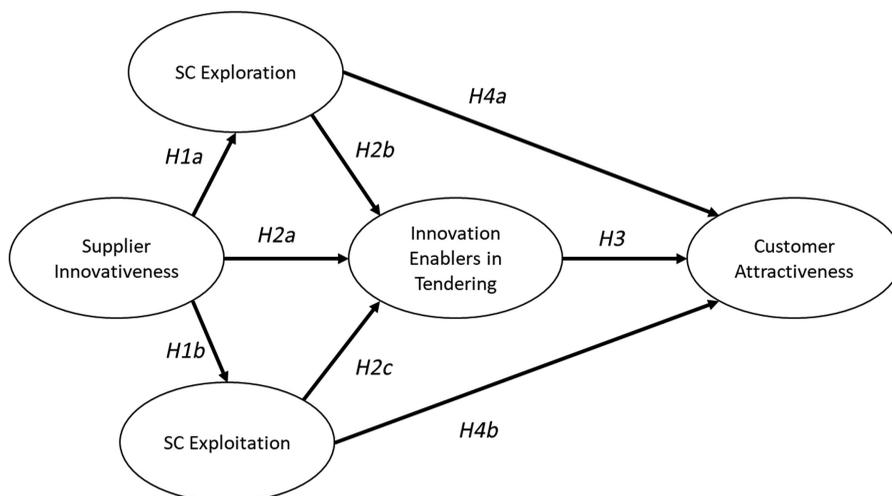
Figure 1.
Conceptual model of
the study

private business relationships (Tanskanen and Aminoff, 2015). Based on the literature, suppliers' evaluation standards define the value of customer relationships via balanced rewards and costs, which depend on supplier's strategic intentions determined by innovativeness and ambidexterity (Emerson, 1976). The evaluation standards of relationships also influence tendering because perceived innovation enablers and customer attractiveness depend on strategic intentions.

Self-reflected supplier innovativeness and supply chain ambidexterity

In the supply chain context, ambidexterity is the ability to perform exploration and exploitation in structurally separated organizational units that differ by their strategy (O'Reilly and Tushman, 2013; Tushman and O'Reilly, 1996; Kauppila, 2010; Sohani and Singh, 2017). *Supply chain exploration* strategy utilizes novel approaches to problem-solving, risk-taking and experimentation, thus enabling new forms of buyer–supplier engagement and collaboration (Sanders, 2008; Kristal *et al.*, 2010, p. 418). *Supply chain exploitation* focuses on leveraging supply chain processes and technologies in an incremental manner, which refines old and established patterns (Kristal *et al.*, 2010, p. 418; Sanders, 2008).

In the private sector, exploration and exploitation in the supply network have proven to result in social exchanges that have a positive impact on the supplier's product innovation (Gualandris *et al.*, 2018). *Supplier innovativeness* is "the ability of a supplier firm to generate and implement new ideas, new methods of operation as well as investments in new products, processes, and technologies" (Inemek and Matthyssens, 2013, p. 581). Supplier innovativeness enhances the willingness of other members of the supply chain to share information that enables further exploration activities (Schiele, 2006; Kim and Chai, 2017; Sohani and Singh, 2017). Supply chain exploration requires existing relevant knowledge for the reconfiguration of supply chain resources, which innovative suppliers may have, and enables joint learning in the supply chain (Sáenz *et al.*, 2014). Exploration with government units, universities and research institutions is linked to innovation, but the use of existing knowledge in collaboration with other customers and suppliers has an even stronger positive linkage to innovation (Cui *et al.*, 2021). Exploration in the supply chain reinforces the effects of collaboration with customers to renew relationships because it challenges existing internal knowledge and encourages flexibility in adopting alternative ideas (Heirati and Siahtiri, 2019; Tamayo-Torres *et al.*, 2017). According to the discussion, the following hypothesis is set:

H1a. Supplier innovativeness influences supply chain exploration.

The supply chain exploitation strategy aims to achieve a competitive advantage from innovations by incrementally and continuously acquiring and applying useful market knowledge from customers and suppliers (Cui *et al.*, 2021). The ability of the supplier to excel simultaneously in quality, delivery, flexibility and low costs (which we interpret as signals of innovativeness) supports ambidextrous supply chain strategies (Kristal *et al.*, 2010). In addition, interactions between suppliers' learning capacity and relation-specific innovation are stronger due to exploitation in which there are value gains from shared knowledge (Choi *et al.*, 2019). Therefore, supply chain exploitation is linked to innovativeness via established learning networks that provide access to critical data and context understanding (Sáenz *et al.*, 2014). For instance, if a supplier needs to access and interpret external new knowledge, then it must already possess some existing knowledge on which to build on. A supplier may have such knowledge if the innovation efforts of the firm are strong enough to increase its awareness of ways to exploit the knowledge accessible in the supply chain and to understand how different pieces of knowledge interact (Narasimhan and Narayanan, 2013). Thus, we propose the following:

H1b. Supplier innovativeness influences supply chain exploitation.

Innovation enablers in tendering
SET proposes that social exchanges, such as innovation-enabling behaviors of buyers, are rewarding for suppliers, but each supplier has its own standard for evaluating these behaviors. The perceptions of suppliers regarding the behavior of public organizations depend on innovativeness, market orientation and strategies in the supply chain (Uyarra *et al.*, 2014; Tammi *et al.*, 2017; Saastamoinen *et al.*, 2020). Supplier innovativeness promotes information sharing with public procurers, especially where the communication of future needs in the early phases of procurement processes should be encouraged in interactions (Georghiou *et al.*, 2014). Furthermore, product category influences the perceptions of innovation enablers. Suppliers engaging in the innovation of products have been found to be less likely to be influenced by public organizations in their activities compared to suppliers engaged in the innovation of services (Uyarra *et al.* (2014).

Public procurement has an impact on innovation goals because it shapes the valuation of goods and markets through which offerings are exchanged and the responsiveness of the supplier to actual needs by using technological specifications rather than functional requirements (Miller and Lehoux, 2020; Uyarra *et al.*, 2014; Meehan and Bryde, 2015). Functional requirements are more beneficial for innovators than strict specifications (Edquist and Zabala-Iturriagagoitia, 2012). Demand articulation of a public organization has a facilitating impact on the innovation process of small firms (Selviaridis, 2021). However, a remarkable share of the supply base of the public sector perceives interactions with procuring organizations as barriers to innovation, a view that emerges from a lack of interaction, unsuitable feedback and too descriptive specifications of public procurement (Georghiou *et al.*, 2014). According to the discussion, the following hypothesis is set:

H2a. Supplier innovativeness influences innovation enablers in tendering.

The explorative strategy in supply chains requires the sharing of information and knowledge at a deep level, joint problem-solving and iterative discussion (Aoki and Wilhelm, 2017). Relationships in public procurement are based on negotiated rules, and there are often fewer possibilities for extempore reciprocity during the fulfillment of a contract. A lack of reciprocity is a challenge for suppliers engaged in exploration since they cannot articulate their social exchange needs to be included in the negotiated rules explicitly beforehand. Specifically, the lack of interaction with the procuring organization from the perspective of the supplier limits opportunities to explore new approaches in supply chains and thus creates barriers to innovation (Uyarra *et al.*, 2014).

From the suppliers' side, explorative activities demand more autonomy and trust from public buyers in goal setting, which is influenced by the level of details in specifications during tendering (Aoki and Wilhelm, 2017). According to the assumptions of SET, a requirement of openness to unsolicited ideas and interaction is necessary to lead different perceptions in innovation enablers depending on the level of exploration of supply chains. The autonomy of the supplier is better enabled when the buyer allows ambiguity in goal formulation, and autonomy supports explorative activities, such as experimentation, risk-taking and novel methods (Aoki and Wilhelm, 2017). In the public tendering, suppliers engaged in supply chain exploration may perceive there to be opportunity costs when their intended strategy is not supported by social exchanges with a public organization. According to the discussion, the following hypothesis is set:

H2b. Supply chain exploration influences innovation enablers in tendering.

Suppliers are usually not afforded a high level of autonomy in their relationships with public organizations in public procurement efforts, as relations are based on negotiated rules rather than reciprocity, causing exploitation to be more favorable. According to SET, perceived rewards for the supplier emerge from social exchanges. These rewards include contact

stability, feedback, receptiveness to supplier ideas and information sharing in a timely manner, all of which increase positive expectations of future exchanges (Ramsay and Wagner, 2009; Ramsay, 2005). In such circumstances, the interest of the supplier in engaging in a relationship with the buyer increases, which promotes dialogue between the supplier and public buyer (Schiele *et al.*, 2012; Caldwell *et al.*, 2009; Uyarra *et al.*, 2014). When the governance of the relationship between the buyer and supplier is more about promoting coherence among goals and activities and the efficient utilization of resources, the relationship then supports the exploitative activities of the supplier (Im and Rai, 2008). Explicitness in goal formulation from the buyer's side encourages suppliers to improve their existing activities and capabilities in an exploitative manner if the core activities are already routinized (Aoki and Wilhelm, 2017). In accordance with the discussion, the following hypothesis is set:

H2c. Supply chain exploitation influences innovation enablers in tendering.

Influence of innovation enablers on customer attractiveness
The customer attractiveness and antecedents of suppliers' perceptions about customers have been covered mostly from the private sector aspect, with a few exceptions from the public sector (Schiele, 2020; Uyarra *et al.*, 2014; Kelly *et al.*, 2021). The customer attractiveness perceived by suppliers is founded on positive expectations from the relationship, which leads to supplier satisfaction to give buyers preferential access to suppliers' resources (Pulles *et al.*, 2016; Schiele *et al.*, 2012). These supplier resources include the allocation of the best employees, sharing of the most innovative ideas and prioritizing the needs of buyers when resources are scarce (Pulles *et al.*, 2016). According to SET, the rewarding behavior of public organizations adds to suppliers' expectations of future rewards and attraction. Innovation enablers in tendering are rewarding social exchanges, so we expect a positive relationship between innovation enablers and customer attractiveness.

In the private sector, communication quality has been found to be the strongest antecedent to supplier satisfaction (Glas, 2018). The contact accessibility and relational behavior of buyers impact supplier satisfaction (Vos *et al.*, 2016). In the field of public procurement, Schiele (2020) found that the relational behavior of public organizations is a decisive factor in supplier satisfaction. According to Schiele (2020), growth opportunity, profitability, relational behavior and operative excellence explain supplier satisfaction toward private and public customers. Relational behavior is seen in the manner in which the buyer treats the supplier, the support practices and the reliability of acting in a fair manner. Buyer behavior appears to be even more important in the public sector than in the private sector, given that typical short-term relationships in public procurement reduce long-term social bonds, which could, in turn, increase supplier satisfaction (Schiele, 2020; Shanka and Buvik, 2019). According to the discussion, the following hypothesis is set:

H3. Innovation enablers in tendering influence customer attractiveness.

Influence of ambidexterity in the supply chain on customer attractiveness
Evidence from private sector has shown that judgment of attractiveness is contingent on supplier's strategic intention in terms of exploration and exploitation (Tanskanen and Aminoff, 2015). By literature, the capacity to reconfigure activities quickly in the business unit to meet changing demands in the task environment, that is, reconfiguration in both the supplier's and buyer's side, supports explorative activities which public procurement often lacks (Im and Rai, 2008). An insufficient interaction between public buyers and potential suppliers due to the public procurement manager's lack of skills, risk avoidance or strict application of procurement policies and practices decreases suppliers' positive evaluations (Erridge and Greer, 2002; Uyarra *et al.*, 2014).

Giving autonomy to suppliers is a risk that requires risk management skills from public procurement, which is rather risk averse in its actions compared to the private sector (Georghiou *et al.*, 2014; Erridge and Greer, 2002; Edler *et al.*, 2015). Despite the widespread rhetoric on novel methods in public procurement, R&D-intensive suppliers have also complained that these intentions are not implemented in processes and procedures (Uyarra *et al.*, 2014). Public organizations might have difficulties to changing their established way of working and budgets to promote the diffusion of novel offerings (Rolfstam *et al.*, 2011). In project-based public organizations, innovative procurement contracts, contract award criteria and performance measurement are more likely to support exploitation than exploration (Plantinga *et al.*, 2019; Eriksson, 2017). Response to political pressure and lack of competitive pressure can mitigate public organizations' support for exploration (Choi and Chandler, 2015). Risk aversion of the public organization, rigid processes that reduce the possibilities of novel methods, lack of interaction and lack of supplier autonomy are characteristics that do not support the explorative activities of the supplier but might be present when conducting business with a public organization. According to the discussion, the following hypothesis is set:

H4a. Supply chain exploration influences customer attractiveness.

One component of operational excellence is the quality of interaction processes as well as the planning and accessibility of efficient processes. The operational excellence of a public organization allows the supplier's agents to concentrate on productive work instead of solving problems in operations and information processes which increase the customer's attractiveness (Schiele, 2020; Schiele *et al.*, 2012). It is stated that the organizational structure of public organizations stimulates exploitative activities rather than explorative because of (1) centralization of decision-making, (2) formalization of rules and procedures and (3) specialization to specific tasks instead of breadth task division (Cannaerts *et al.*, 2016; Edler *et al.*, 2015; Boukamel and Emery, 2017). In line with specialization, the processes and operational frameworks of public procurement often emphasize the explicitness of goal formulation (Eriksson, 2017). Exploitative activities can often be divided into short-term goals, which in many cases match better with the goals of public procurement and negotiated rules, thereby increasing goal alignment in the relationship (Aoki and Wilhelm, 2017; Rolfstam *et al.*, 2011). In this context, exploitative strategies of suppliers are promoted by establishing standards for representation and transfer of data, facilitating the interpretation of information and promoting the mutual discovery of knowledge (Aoki and Wilhelm, 2017; Eriksson, 2017). Public organizations and policy makers feel pressure to reach predefined results and face accountability requirements, which reinforce them to support exploitation rather than exploration (Alcalde Heras *et al.*, 2020; Magnusson *et al.*, 2021). In accordance with the discussion, the following hypothesis is set:

H4b. Supply chain exploitation influences customer attractiveness.

Research method
Sample and data collection
The study was conducted as a survey of public sector suppliers in various fields in Finland. With the help of the supplier survey, we had the opportunity to obtain important information about cooperation and its functionality with public procurement. Finland was selected as a target because it has an open portal on public procurement invoices. The list of suppliers for public procurement was compiled from data consisting of the procurement spending of the Finnish government in 2017 [2]. Renting of premises and confidential purchasing invoices were excluded. We contacted potential respondents whose purchase invoice for the public

sector in 2017 was more than EUR 20,000. Respondents had a contract with the national government in 2017. Data were collected in spring 2019. A total of $N = 810$ suppliers of different sizes were selected for the survey, and $n = 137$ responses were received for the survey, giving a response rate of 17%. Respondents from the job profile represented CEOs, sales managers and sales staff of the companies. The share of sales to public sector customers in the sample was 42.5% on average (standard deviation was 28.2). A fairly good sample of all suppliers of different sizes was obtained, and the sample could be considered representative in this respect. Respondent characteristics are shown in Table 1.

Survey instrument
The survey included questions about suppliers' background information and further cross-cutting areas, as measured by a Likert-based scale (1–5). The questions in the survey instrument were related to customer attractiveness (Pulles *et al.*, 2016), innovation enablers in tendering (Uyarra *et al.*, 2014), supply chain exploration (Kristal *et al.*, 2010), supply chain exploitation (Kristal *et al.*, 2010) and supplier innovativeness (Inemek and Matthyssens, 2013). The indicators used in the survey are presented in Appendix 1. All responding suppliers had at least one public buyer in the form of a national government as a customer, and a portion of these suppliers might also have had local government customers when they responded to the survey. The survey instrument does not differentiate between national or local public buyers but refers to a customer as one with whom a supplier has had a contract. The customer attractiveness construct has not been applied before to suppliers who judge public organizations. However, Schiele (2020) found that suppliers were satisfied with similar things (relational behavior, profitability, operational excellence, etc.) in both public

Group	%
Company size (by personnel)	
Large (over 250)	14
Medium (51–250)	27
Small (11–50)	34
Micro (less than 10)	25
	100
Position	
Top management	65.5
Middle management	16.9
Expert	16.8
Other	1.5
	100
Supply category	
Facilities	7
ICT	18
Administrational services	2
Expert and research services	31
Machines and devices	6
Raw materials and consumables	10
Personnel services	2
Traveling services	2
Infrastructure projects	7
Defense	1
Other	14
	100

Table 1.
Respondent characteristics

and private cases. Hence, we also justify the use of this customer attractiveness measure in the context of public procurement. As such, we changed the wording "this customer" to "this public buyer." The first item of customer attractiveness is about information sharing which public buyers can engage in when treating all potential suppliers equally. The second item considers creating win-win situations, and the third considers the monetary size of businesses. The loadings of the third item were different from those of the other items, so we excluded it. The fourth item of customer attractiveness measures suppliers' perceptions of how contracts with public buyers consider risks. The fifth item measures how suppliers perceive the trustworthiness and fairness of a public buyer with whom they have had a contract. The sixth item of customer attractiveness did not fit this context because of the process delays caused by appeals. The seventh item of customer attractiveness was excluded because it would be affected too much by the supplier's supply category.

Innovation enablers in tendering (cf. procurement process-related barriers in Uyarra *et al.* (2014)) are based on concrete barriers that suppliers have reported in the context of public procurement. This increased the validity of the items for our study. We applied this variable as a Likert-based scale instead of a binary scale because we found that the phenomenon is not discrete in empirical observations but is a continuum. The scale of innovation enablers in tendering was adapted in this research and leveraged as a latent construct that differs from those previously used (Uyarra *et al.*, 2014). We excluded the prequalification condition item because our sample consisted of firms that had passed the prequalification evaluation. Similarly, we excluded the consistent procurement item because it asked about different areas of the public sector, whereas our focus was on national governments only. During the assessment of the research instrument, the loadings of the large contract participation item were different from those of the other items of the IE construct; thus, we excluded it.

We applied the scale used by Kristal *et al.* (2010) for ambidexterity because it models both exploration and exploitation strategies within a supply chain rather than within firm boundaries such as those in the study by He and Wong (2004). Supplier innovativeness was operationalized on the basis of Inemek and Matthyssens' (2013) scale because it was especially developed for suppliers' self-assessment and was founded on previous works (Nassimbeni, 2003; Hult *et al.*, 2004).

Data analysis and empirical findings

PLS-path modeling was applied for testing the hypothesis in order to reach robust results because of some level of nonnormality, slight collinearity and relatively low sample size (Hair *et al.*, 2014, 2019a; Henseler *et al.*, 2014). Indeed, the complexity of the research mode in terms of tested paths supports the use of the PLS-estimator for the structural model. The nonnormality of the data can also be tackled in the covariance-based SEM, which requires larger samples for achieving reliable results (Flora and Curran, 2004; Olsson *et al.*, 2000). We applied SmartPLS 3.0 software package for data analysis (Ringle *et al.*, 2015).

Construct reliability and validity

The research instrument was assessed by (1) reliability using the construct reliability (CR), (2) construct validity using the average variance extracted (AVE) and (3) discriminant validity (Fornell and Larcker, 1981; Gefen and Straub, 2005; Henseler *et al.*, 2009) (Table 2). The CR coefficient should exceed 0.50 if the validity of the model is acceptable; otherwise it is good (Kline, 2011; Little *et al.*, 2002). The reliabilities of the measurements are presented in Table 2, which shows good reliability for all latent variables. The CRs of the latent variables were

	Loading	t-value	p-value[a]	Mean	SD	CR	AVE
CA (customer attractiveness)						0.886	0.661
CA1	0.799	7.111	***	2.664	0.98		
CA2	0.855	8.264	***	2.723	1.235		
CA4	0.839	9.251	***	2.482	1.189		
CA5	0.754	6.434	***	3.504	1.099		
EA (SC exploration)						0.896	0.684
EA1	0.861	8.287	***	3.445	0.977		
EA2	0.890	9.977	***	3.489	0.993		
EA3	0.938	14.463	***	3.635	0.962		
EA4	0.896	9.675	***	3.686	0.881		
EXPLO (SC exploitation)						0.942	0.804
EXPLO1	0.687	2.232	*	3.496	1.037		
EXPLO2	0.816	2.108	*	3.854	0.951		
EXPLO3	0.894	4.580	***	3.818	0.972		
EXPLO4	0.894	3.663	***	3.81	0.944		
IE (innovation enablers)						0.820	0.533
IE1	0.720	5.035	***	2.898	1.171		
IE2	0.741	6.411	***	2.715	1.124		
IE3	0.733	5.633	***	2.402	1.179		
IE4	0.726	6.297	***	2.927	1.109		
TIN (supplier innovativeness)						0.929	0.723
TIN1	0.876	9.559	***	3.971	0.882		
TIN2	0.871	9.953	***	4.088	0.836		
TIN3	0.913	12.171	***	3.993	0.879		
TIN4	0.791	6.746	***	4.007	0.927		
TIN5	0.795	8.507	***	4.197	0.847		

Note(s): n: not significant; *statistically significant at $p < 0.05$; **statistically significant at $p < 0.01$; ***statistically significant at $p < 0.001$
[a]. All p-values are two-tailed

Table 2.
Measurement
reliabilities

acceptable, ranging from 0.820 to 0.942 (very high). The factor structure of the measurement model was analyzed using significance, the weight of loadings and cross-loadings between the latent factors. All the loadings in the measurement model were significant at $p < 0.05$ and acceptable, ranging from 0.686 to 0.913. The convergent validity of all the latent factors was acceptable, and the AVE was greater than 0.50 for all the latent concepts, ranging from 0.533. to 0.958 (Fornell and Larcker, 1981). The discriminant validity of the measurement model was assessed by (1) the cross-loadings of the measurement items, (2) the square root of AVE and (3) the heterotrait-monotrait (HTMT) criterion (i.e. the Fornell–Larcker criterion) (Gefen and Straub, 2005; Hair *et al.*, 2019a; Henseler *et al.*, 2009). All the measurement items were highly loaded to the latent factors, and the cross-loadings varied from −0.224 to 0.609. The square roots of AVE were higher than the correlations between any of the latent factors, demonstrating the acceptable discriminant validity of the measurement model. Lastly, the HTMT ratio between latent factors did not exceed the critical value for HTMT <0.90, varying from 0.077 to 0.683.

PLS main path estimates and indirect effects
The main effects were analyzed as defined by the hypotheses. The parameters for estimating the PLS model were bootstrap sample $n = 137$ (equals the original sample) and resampling rate of 5000 repetitions, which is adequate for estimating the parameters in the model (Henseler *et al.*, 2009). The default model (Table 3) shows that supplier innovativeness (TIN)

Hypothesis	Path	β	T Statistics	p-values[a]
H1a	TIN → EA	0.468	5.106	***
H1b	TIN → EXPLO	0.341	3.216	**
H2a	TIN → IE	0.258	2.366	*
H2b	EA → IE	−0.293	2.349	*
H2c	EXPLO → IE	0.078	0.535	n
H3	IE → CA	0.501	5.506	***
H4a	EA → CA	−0.238	2.403	*
H4b	EXPLO → CA	0.176	1.756	n
Post hoc tests: indirect effect				
Explicit indirect effects	TIN → EA → CA	−0.111	2.134	*
	TIN → EXPLO → CA	0.06	1.479	n
	TIN → IE → CA	0.129	2.059	*
	TIN → EA → IE → CA	−0.069	1.978	*
	TIN → EXPLO → IE → CA	0.013	0.498	n
Total effect	TIN → CA	0.02	0.345	n

Note(s): n: not significant; * statistically significant at $p < 0.05$; ** statistically significant at $p < 0.01$; *** statistically significant at $p < 0.001$
[a]) All p-values are two-tailed

Table 3.
Direct effects in the default model to test the hypotheses

has a positive statistically significant influence on exploration (EA) and exploitation (EXPLO), thus confirming H1a and H1b. The influences on perceptions regarding the innovation enablers of public organizations vary between supplier innovativeness and exploration and exploitation strategies. Based on the findings, supplier innovativeness has a statistically significant positive influence on perceived innovation enablers of a public organization, which confirms H2a. Exploration was found to have a statistically significant negative influence on perceived innovation enablers, which confirms H2b. In the tested model, exploitation did not have any influence on the perceptions of suppliers regarding the public organization's innovation enablers. Therefore, H2c is rejected. The tested model shows that a statistically significant relation exists between innovation enablers and customer attractiveness, which confirms H3. Finally, the model provides partial support for the hypothesis describing the relation between supply chain ambidexterity of the firm and perceptions on the attractiveness of the public customer. The model confirms the negative influence of exploration on customer attractiveness in H4a, whereas the influence of exploitation in H4b does not receive support from the model. The influence of exploration on attractiveness was negative, indicating reduced customer attractiveness among firms that are involving new methods to problem-solving, risk-taking and experimentation in a supply chain. The post hoc tests confirmed that the indirect effects of supplier innovativeness on customer attractiveness and innovation enablers are negative when the exploration strategy is a mediator. Supplier innovativeness has a positive indirect effect on customer attractiveness when the mediator is innovation enablers.

PLS model quality, endogeneity and robustness
The quality of the structural model was tested and validated using the following steps: (1) collinearity issues and overall fit, (2) explanatory power, (3) path significances and (4) assessment of potential endogeneity of the model. The collinearity and goodness of the model were assessed in order to validate the structural model. The variance inflation factor (VIF) of the latent constructs did not indicate any serious collinearity issues when the highest value of the inner-VIF = 1.817 remained below the critical value of VIF = 5 (Hair *et al.*, 2019a). The explanatory power and goodness of the model can be assessed by the proportion of the

variance explained for an endogenous variable (R^2), the predictive relevance of the model for an endogenous variable (Q^2) and the sizes and significances of the path coefficients in the structural model (Astrachan *et al.*, 2014). In practice, the R^2 is an indicator for the proportion of the variance captured into the endogenous constructs, and the Q^2 provides an indicator of whether the endogenous construct can be accurately predicted by the structural model (Hair *et al.*, 2019a; Sarstedt *et al.*, 2014). The Q^2 for the endogenous constructs must be positive to signal any predictive relevance where other critical values are at 0.25 and 0.50, depicting the medium and large accuracy, respectively, of the structural model (Hair *et al.*, 2019a). A remarkably high level of R^2 can also signal existing collinearity issues in the model, which should be considered with the VIF before the results are interpreted. The R^2 for the latent variables in the path model were CA = 0.314, EA = 0.219, EXPLO = 0.116 and IE = 0.073, while the Q^2 for the endogenous were CA = 0.168, EA = 0.067, EXPLO = 0.161 and IE = 0.027. The explanatory power and predictive accuracy of the model are acceptable but rather low because of the relatively low sample size and complexity of the phenomenon, which definitely includes multiple influences outside the tested model (Abelson, 1985; Prentice and Miller, 1992). However, the model has some out-of-sample generalizability potential.

Endogeneity of empirical models is the result of omitted variables, simultaneity, measurement error, selection bias or social desirability of the responses which potentially leads to faulty conclusions (Busenbark *et al.*, 2022; Hill *et al.*, 2021). The presented empirical model is grounded on established concepts that are tied to a theoretically rationalized framework. The relationships between the concepts have also received reasonable support from earlier studies by which bias by omitted variables is expected to be relatively low. Simultaneity is the result of relatedness of the measured dimension, common method bias or shared contextual factors among respondents, which creates the risk of contamination of the model in terms of dependency inflation and endogeneity (Baumgartner *et al.*, 2021). In this study, the full collinearity test procedure was applied to assess common method bias because of the selected PLS-SEM approach and achieving reliable results (Kock, 2017; Baumgartner *et al.*, 2021). The test procedure compares construct-to-construct VIFs to the critical value of VIF < 3.3 for not serious common method bias (Kock, 2017). The full collinearity test shows that VIF varies between $VIF_{min} > 1.048$ and $VIF_{max} < 1.685$, indicating no common method bias in the model. Finally, the model was evaluated using a Gaussian copula procedure to address potential identification issues in the empirical model to test the hypothesis (Hair *et al.*, 2019b; Hult *et al.*, 2018). Through the assessment (see Appendix 2), none of the copulas showed significant effects at $p < 0.05$, which indicates low risks of pathological endogeneity.

Sample size requirements and nonresponse and selection bias define the quality of sample in the PLS-modeling. The "10-times rule" provides a widely used rule of thumb for model-configuration-based sample size by which the minimum count of observations equals 10 times the maximum number of paths pointing to the latent in the inner or outer model (Hair *et al.*, 2011). By following the rule, the requirement for sample size is 50 at a minimum. Furthermore, the statistical power of the sample is assessed by effect sizes (i.e. f2) of significant paths in the inner model which has critical values of 0.02, 0.15 and 0.35 termed as small, medium and large effect, respectively (Hair *et al.*, 2017; Haverila *et al.*, 2021; Sullivan and Feinn, 2012). The test statistics show that effect sizes vary from small to large effect (f2min > 0.028, f2min > 0.358), indicating meaningful relations and enough potential of the sample to provide enough statistical power.

Assessment of the nonresponse bias is based on a comparison of the early and late responses using the ANOVA test as an estimator (Armstrong and Overton, 1977). The tests statistics indicate that nonresponse bias is not on the issue by mean comparison of the latent factors scores at $p < 0.01$. Overall, the sample size is valid in technical terms. Finally, slight selection bias is probable in the data because of the non-probabilistic sample, which was

drawn from registers leading to the possibility of self-selection and coverage bias (Li *et al.*, 2008; Lehdonvirta *et al.*, 2021). Regarding the selection bias, it is likely that data are emphasized to represent suppliers that have had a contract with government-level administration. However, suppliers that have had contracts only with local administration units (e.g. municipality) are not represented in our sample at all. Secondly, suppliers whose contracts have been below EUR 20,000 per year are not represented by this study. We assured the anonymity of supplier respondents during research, and there were no customer organizations involved in this study to increase the pressure of social desirability. Respondents also commented on the open text box both positive and critical insights about public organizations, which indicate a paucity of social desirability bias.

The CA was controlled for company size, product category and share of sales to the public sector of the represented organization by respondents using dichotomous variables. The control variables did not show statistically significant influences on the dependent variable at a p-value of < 0.05. Finally, the robustness of the model was validated using PLS multigroup analysis of company size according to the number of staff, company share of sales to the public sector and product category. The analysis did not indicate differences in path coefficients between small and large companies at $p < 0.05$. Similarly, the share of sales to the public sector did not have an influence on the model, which was compared between the low share group (sales less than 20% of total turnover) and the high share group (over 20% of total turnover). Last, the effect of the firm supply category, services or other was tested, by which supplier innovativeness does not explain ambidexterity in the supply chain (H1a and H1b) in the service provider group.

Discussion

Supplier relationships in public procurement need more attention because new approaches to gain attractiveness of public procurement from the perspective of suppliers are needed (Obwegeser and Müller, 2018; Schiele, 2020; Wontner *et al.*, 2020). Public procurement is under pressure to appear as an attractive customer in order to get the best suppliers from supply markets, which have intentions to build strategic supplier relationships. We contribute to the discussions of ambidexterity (Page *et al.*, 2021; Eriksson, 2017) as well as the emerging theory of attraction in buyer–supplier relationships (Schiele, 2020) in the public sector by showing that the ambidexterity strategy of the supplier in the supply chain explains perceived innovation enablers and customer attractiveness of public procurement (Table 4).

Theoretical implications

Innovative suppliers are more aware of ways to exploit the knowledge accessible in the supply chain and to understand how different pieces of knowledge interact (Narasimhan and Narayanan, 2013). Building on this, we showed that during social exchanges with public buyers, innovative suppliers are more likely to perceive innovation enablers in the tendering process positively because of their capabilities to exploit knowledge. If innovation enablers are judged positively, then customer attractiveness is also perceived more highly by suppliers. This contribution supports the previous finding that public buyers' relational behaviors are even more imperative in the context of public procurement in which social relationships often have limitations to develop because of tendering laws (Schiele, 2020).

Similarly to previous studies, this study shows that the innovativeness of suppliers is positively connected to their ambidexterity in the supply chain, both in their exploration and exploitation strategies (He and Wong, 2004; Zacharias, 2017). These strategies are necessary for understanding suppliers' varying judgments on innovation enablers in tendering. Recent studies have provided contradictory evidence regarding the perceptions of innovative

Hypothesis		Implications
H1a Supplier innovativeness influences supply chain exploration	Accepted	The innovativeness of suppliers is positively connected to their supply chain ambidexterity. The public buyer can expect that innovative suppliers will likely select an ambidexterity strategy for managing the supply chain, which influences customer attractiveness via exploration
H1b Supplier innovativeness influences supply chain exploitation	Accepted	
H2a Supplier innovativeness influences innovation enablers in tendering	Accepted	Innovative suppliers are more likely to perceive innovation enablers in the tendering process positively because of their capabilities to exploit knowledge
H2b Supply chain exploration influences innovation enablers in tendering	Accepted	
H2c Supply chain exploitation influences innovation enablers in tendering	Rejected	In the case of relationships requiring iterations and autonomy, suppliers' biases in favor of supply chain exploration may negatively affect perceived enablers of innovation in tendering. To attract innovative suppliers, a public buyer should ensure dialogue and openness to unsolicited ideas to support suppliers' exploration
H3 Innovation enablers in tendering influences customer attractiveness	Accepted	Positive expectations of the innovation enablers and provided innovation enabling actions in the tendering process increase the customer attractiveness of the public buyer
H4a Supply chain exploration influences customer attractiveness	Accepted	Supply chain exploration negatively impacts customer attractiveness. Public buyers should notice that rigid procedures and agreements are less adaptable for exploration purposes, which, in turn, reduce customer attractiveness
H4b Supply chain exploitation influences customer attractiveness	Rejected	

Table 4.
Summary of theoretical implications

suppliers regarding the innovation enablers of public organizations, which also vary between product and service categories (Uyarra *et al.*, 2014; Georghiou *et al.*, 2014). Even if innovativeness appears to have a positive influence on innovation enablers in tendering, the mediation effect of exploration strategy changes this to a negative influence. Supplier innovativeness does not explain the negative perceptions of innovation enablers and customer attractiveness, but exploration in the supply chain does. Interestingly, supplier innovativeness does not directly explain customer attractiveness, as robustness tests have shown.

Exploration in the supply chain has a negative influence on the perceived customer attractiveness of a public organization, whereas exploitation strategy in the supply chain does not have a statistically significant impact. This is a similar finding to SET literature from the private sector, that is, customer attractiveness is contingent on the strategic intentions of a supplier (Tanskanen and Aminoff, 2015). The risk aversion of the public organization, rigid processes that reduce the possibilities of novel methods, lack of interaction and lack of supplier autonomy are greater hindrances to exploration than to the exploitation strategy in the supply chain. But exploration in supply chain often requires reconfiguration of resources and plans (Im and Rai, 2008). Public organizations must ensure accountability through rules and procedures, which may limit their adaptability to the needs of exploration activities in terms of interorganizational structures and resources (Gieske *et al.*, 2020; Page *et al.*, 2021). Suppliers who strongly apply the exploration strategy in their supply chains find that public procurement is a less attractive customer for them. If the supplier cannot implement its exploration strategy with public procurement, then the supplier and public procurement will have conflicting aims. This can be reflected in SET, which states that

conflicting aims cause opportunity costs to suppliers and reduce expected rewards from the relationship (Griffith *et al.*, 2006). By contrast, our results show an insignificant relationship between the supplier's exploitation strategy and perceived customer attractiveness. The same reasons that hinder the supplier's exploration might be neutral for exploitation, such as the explicitness of goal formulation and the aim for efficiency in public procurement (Eriksson, 2017; Magnusson *et al.*, 2021).

We have explained the positive relationship between supplier innovativeness and innovation enablers because of the supplier's ability to exploit knowledge. There is also an alternative explanation. The innovative suppliers serving both private and public sectors are aware of the public procurement processes with few needs. This is because pitfalls are not necessarily highly relevant for them, and their needs for customer information inputs to R&D or other operations are fulfilled elsewhere than in public relations (Uyarra *et al.*, 2014). Suppliers mobilize other partners in their supply chain when public procurement is restricted in terms of interaction (Melander and Arvidsson, 2020). On the other hand, less innovative suppliers with limited access to external information externally may perceive the pitfalls of the public purchasers' innovation enablers to be more serious.

Similarly, as SET proposes, rewards from social exchanges (behavior for innovation enabling) are contingent on supplier's own standards which, in turn, depend on their exploration or exploitation strategy. The results show that suppliers focusing on exploration strategy in the supply chain have a negative rating on innovation enablers of the public organization, indicating their incapability to engage public organizations and users in a dialog to search for alternative solutions. Similarly, R&D-intensive suppliers who had both public and private customers perceive that the openness of public organizations to unsolicited ideas from the market is insufficient (Uyarra *et al.*, 2014; Georghiou *et al.*, 2014). However, compared to the exploration strategy, the exploitation strategy of the supplier in the supply chain has no impact on either innovation enablers or customer attractiveness, as it is less vulnerable to current rigid process frameworks of public procurement. While there might be some public procurement practices that do not support suppliers' exploitation in the supply chain, these do not seem to significantly influence the perceptions of the supplier about innovation enablers or customer attractiveness in this research. This is in line with previous findings that public organizations are often more oriented to support exploitative activities in their structure and processes, but nowadays increasingly aim toward ambidexterity (Cannaerts *et al.*, 2020).

Managerial implications
Contemporary public procurement should aim to attract suppliers to ensure sufficient competition and avoid single-bidder cases. This study helps public procurement increase in customer attractiveness by elucidating suppliers' perspectives, contributing valuable knowledge to this field, considering the need to establish innovative solutions for public sector problems (Obwegeser and Müller, 2018). A public buyer could consider suppliers to be collaborators who should be treated well in social relationships. This means that customer attractiveness could be increased within the limits of the law by providing sufficient information about tender opportunities, feedback and recognition of the supplier's previous private sector delivery history. Public sector organizations could also improve their communication with suppliers, either by using market dialogue more often, public competitive tendering, and supplier events or by practicing the wider use of openly published procurement programs.

The customer attractiveness can be improved also by considering support for the exploration strategy of suppliers in the supply chain. The study results indicate that suppliers that are explorative in their supply chain activities do not consider getting

sufficient support from the procuring organization. The public buyer could support this strategy by allowing more risk-taking (e.g. by allowing suppliers to experiment and pilot more), continuous development efforts and openness to unsolicited ideas. The public sector is often seen as risk averse (Erridge and Greer, 2002), so there is a need to evaluate risk management practices to allow more autonomy for suppliers during purchase contract periods.

Politicians have an essential role in enabling public organizations to create conditions that support exploration activities (Choi and Chandler, 2015) and support innovation enabling practices. The structure of the procurement unit in terms of centralization, formalization and specification might be better suited for exploitation, but these conditions could probably be slightly adapted for exploration (Cannaerts *et al.*, 2016, 2020). The implications of this study may be particularly applicable to procurement that targets supplier innovativeness and purchasing innovations rather than conventional services and products. A public organization can evaluate its own purchasing policies on how interactive strategic relationships can be built via public competitive tendering, which can support explorative supply chain strategies (Roldán Bravo *et al.*, 2018). Dialog with explorative and exploitative suppliers is necessary to improve public organizations' own ambidexterity, which means raised value for citizens (Palm and Lilja, 2017).

Conclusion

This study presents novel empirical research in the field of supplier perceptions on public procurement by showing how the ambidexterity strategy of the supplier in the supply chain impacts these perceptions. The lack of bidders continuously hampers competition, and public procurement should allow more room for the strategies of different suppliers to address this matter. This research provides three explicit contributions to literature related to supplier perceptions on public procurement (Uyarra *et al.*, 2014; Schiele, 2020). First, the study shows that from the viewpoint of suppliers, innovation enablers influence customer attractiveness of the public organization. This view complements previous research on the dependence of operational excellence on the satisfaction of public organization suppliers (Schiele, 2020). Second, the study links the literature on the ambidexterity of suppliers to supplier perceptions on public procurement. Thus, we respond to a call to explore an ambidexterity perspective on the supplier relationships of public procurement (Gieske *et al.*, 2020). Third, contribution considers the interaction of supplier satisfaction and innovativeness with the level of dialog with the public organization and user engagement (Uyarra *et al.*, 2014). In conclusion, the attractiveness of public procurement from the supplier perspective requires adopting novel approaches from the market, giving feedback, sharing information for tendering and paying attention to the relationship and delivery history with the supplier to improve the organization's status as a customer and the success of tendering.

Future research and limitations

The sample in this study concentrated only on suppliers who had contracts with national governments. As such, the sample is not representative of suppliers contracting only with local governments. A further limitation of this study is that the type of public organization was not fully controlled since some respondents might have had both types in their customer base. Future research could control the type of public organization and could study to what extent the present results are applicable to suppliers that have only local government customers. The perceptions of the public procurement of firms that have not engaged in any contracts with public procurement could be a fruitful area of future research. The sample did not include firms that rent premises or whose annual sales to the public sector were below

EUR 20,000. Therefore, our results are not applicable to these groups. Future research could investigate more reasons why suppliers with exploration strategy in the supply chain perceive the public sector as less attractive and how public procurement could attract these suppliers more in the future. The measure of customer attractiveness applied in this study is from the private sector, and further studies could modify it for the public case to add its accuracy. Similarly, the measure of innovation enablers in tendering has not been used as latent construct previously, and future studies can develop more valid and reliable alternatives. Survey designs should investigate dyads if focusing on relationship quality between a public organization and its supplier. This study was conducted in Finland, and similar studies should be replicated in other countries with larger samples to increase generalizability of the results.

Notes

1. European Commission, "EU public procurement performance indicators," Single Market Scoreboard, available at: https://ec.europa.eu/internal_market/scoreboard/performance_per_policy_area/public_procurement/index_en.htm (accessed 13 November 2020)

2. Hansel 2020, "Data from the OpenProcurement.fi service," available at: https://www.avoindata.fi/data/en_GB/dataset/tutkihankintoja-data (accessed 14 September 2020).

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Appendix 1
Research instrument

Customer attractiveness   Pulles *et al.* (2016)
How well the following statements describe the activities of the customer (1 = not
implemented at all, 5 = Realized very well)
This customer is known for its open and quick information sharing
This customer is known to create win–win situations
This customer is of substantial size.*
This customer compensates suppliers for taking risks
This customer has a good reputation for trustworthiness and fairness
This customer is known for the short time between offer to actual sale.*
This customer is present in growth markets.*
Innovation enablers in tendering   Uyarra *et al.* (2014)
How do the following areas of innovation materialize in your industry in terms of
public procurement? (1 = not implemented at all, 5 = Realized very well)
Public bodies sufficiently recognise private sector delivery history when
assessing bids
The public sector is generally open to unsolicited ideas from the market
When unsuccessful in a bid, we tend to receive useful feedback
There is sufficient information available about tender opportunities
Different parts of the public sector procure similar products and services
consistently. *
Large contracts make it difficult for us to participate in tenders. *
Pre-qualification conditions discourage us from participating in tenders.*
Exploration in supply chain   Kristal *et al.* (2010)
How do the following factors materialize in your operations? (1 = not
implemented at all, 5 = Very much implemented)
We proactively pursue new supply chain solutions
We continually experiment to find new solutions that will improve our supply
chain
To improve our supply chain, we continually explore for new opportunities
We are constantly seeking novel approaches in order to solve supply chain
problems
Exploitation in supply chain   Kristal *et al.* (2010)
How do the following factors materialize in your operations? (1 = not
implemented at all, 5 = Very much implemented)
In order to stay competitive, our supply chain managers focus on reducing
operational redundancies in our existing processes
Leveraging of our current supply chain technologies is important to our firm's
strategy
In order to stay competitive, our supply chain managers focus on improving our
existing technologies
Our managers focus on developing stronger competencies in our existing supply
chain processes
Supplier Innovativeness   Inemek and Matthyssens
How do the following claims related to innovation materialize in our operations?   (2013)
(1 = not implemented at all, 5 = Very much implemented)
Trying new ideas
Seeking out new way of doing things
Implementing new methods of operation
New product and process investment
Adoption of new technology

Note(s): * Please note that starred items are not included in the final research instrument

Appendix 2
Results of the Gaussian copula procedure for testing endogeneity

Model 1: Copula for "EXPLO"	b	p-value
EXPLO	0.187	0.202
EA	−0.249	0.021
IE	0.494	0
TIN	0.027	0.752
EXPLO*	−0.01	0.918^n
MODEL 2: Copula for "EA"		
EXPLO	0.173	0.079
EA	−0.21	0.167
IE	0.498	0
TIN	0.027	0.765
EA*	−0.03	0.717^n
MODEL 3: Copula for "IE"		
EXPLO	0.181	0.069
EA	−0.22	0.041
IE	0.044	0.87
TIN	−0.002	0.98
IE*	0.399	0.08^n
MODEL 4: Copula for "TIN"		
EXPLO	0.17	0.093
EA	−0.248	0.021
IE	0.496	0
TIN	0.069	0.565
TIN*	−0.025	0.695^n
MODEL 5: Copula for "EXPLO" and "IE"		
EXPLO	0.211	0.144
EA	−0.219	0.04
IE	0.035	0.896
TIN	0.001	0.993
EXPLO*	−0.023	0.811^n
IE*	0.405	0.072^n
MODEL 6: Copula for "EA" and "IE"		
EXPLO	0.179	0.07
EA	−0.154	0.297
IE	0.032	0.907
TIN	−0.002	0.983
EA*	−0.049	0.55^n
IE*	0.414	0.06^n
MODEL 7: Copula for "TIN" and "IE"		
EXPLO	0.172	0.094
EA	−0.214	0.045
IE	−0.009	0.974
TIN	0.08	0.505
IE*	0.448	0.065^n
TIN*	−0.05	0.436^n

Note(s): *) Gaussian copula for latent variable in the default model
n) Not significant at $p < 0.05$