



# Improving public purchaser attitudes towards public procurement of innovations

Deodat Mwesiumo<sup>a,\*</sup>, Richard Glavee-Geo<sup>b</sup>, Kjetil Magnus Olsen<sup>a</sup>, Geir Arne Svenning<sup>a</sup>

<sup>a</sup> Department of Logistics, Molde University College, P.O. Box 2110, 6402, Molde, Norway

<sup>b</sup> Norwegian University of Science and Technology, P.O. Box 1517, 6025, Aalesund, Norway

## ARTICLE INFO

### Keywords:

Innovations  
Public procurement  
Public purchaser  
Organizational support  
Perceived usefulness  
Support schemes  
Attitudes

## ABSTRACT

This study investigates the effect of organizational support, perceived usefulness, and perceived availability of support schemes on public purchaser attitudes towards public procurement of innovations (PPI). Through a self-administered questionnaire, data were collected from a sample of public purchasers working in the Norwegian municipalities. The dataset was analysed through partial least squares structural equation modelling. The results show that organizational support is significantly associated with increased perceived usefulness of PPI, which in turn is positively associated with attitudes towards PPI. Contrary to our expectation, perceived availability of PPI support schemes is negatively associated with attitude towards PPI. Indeed, rather than strengthening the effect of public purchasers' perceived usefulness of PPI on attitude it significantly weakens it. Although the results show that experience with PPI and the presence of a PPI strategy positively affect attitude towards PPI, their effects are not as strong as we expected. Further analysis showed that the most important factor in our model is the perceived usefulness of PPI, followed by organizational support. The study provides several managerial and policy implications. For instance, schemes for supporting PPI should be scaled up along with the dissemination of information about their mode of operation and the associated benefits.

## 1. Introduction

The potential for public procurement to promote innovation is no longer breaking news. The link between public procurement and innovation is well documented (e.g. Edler and Georghiou, 2007; Edquist and Zabala-Iturriagoitia, 2012; Uyarra et al., 2020) and a broad range of initiatives have been implemented to stimulate innovations through public procurement (Georghiou et al., 2014). The European Commission promotes two complementary types of innovation procurement, pre-commercial procurement (PCP) and public procurement of innovations (PPI) (European Commission, 2014). Under pre-commercial procurement, public sector organizations would procure research and development services, up to the prototype or first test production stages. According to Edquist and Zabala-Iturriagoitia (2015), the introduction of PCP was a response to the need to reinforce the innovation capabilities of the European Union while improving the quality and efficiency of public services. PPI occurs when public sector organizations serve as a launch customer for an innovative good, work or service. Although PPI can complement PCP by enabling larger scale deployment of solutions developed in a preceding PCP, it can also be implemented

independently to acquire innovative solutions that result, for example, from organizational or process innovation (European Commission, 2018).

Given its nature, PPI has been noted to have the potential to address grand societal challenges, such as climate change and public health (Edquist and Zabala-Iturriagoitia, 2012). For example, in a study that analysed firm-level data collected from 28 Member States of the European Union, Switzerland and the USA, Ghisetti (2017) found that public procurement plays a key role in stimulating environmental-related innovations. Likewise, following the outbreak of COVID-19, Sykehusinnkjøp HF, a central organization responsible for procurement of specialized medical supplies in Norway, embarked on PPI in order to acquire innovative supplies needed in the fight against the pandemic (Hovland, 2020). Besides the potential to address grand societal challenges, PPI provides other benefits such as cost savings in the short, medium or long term, higher levels of staff and user satisfaction, better public services and infrastructure, creation of skilled jobs and investment, smarter use of taxpayer money, enhanced international competitiveness, and opportunity to develop new industries (Edler and Yeow, 2016; Kattel and Lember, 2010; Lember et al., 2011; Timmermans

\* Corresponding author.

E-mail address: [Deodat.E.Mwesiumo@himolde.no](mailto:Deodat.E.Mwesiumo@himolde.no) (D. Mwesiumo).

and Zabala-Iturriagoitia, 2013).

The extant body of literature has addressed various issues regarding PPI, both conceptually and empirically. Generally, conceptual papers focus on explicating concepts and developing frameworks for guiding the implementation of PPI (e.g. Chicot and Matt, 2018) while empirical papers have addressed aspects such as the importance of the public sector as a launch customer for innovations (e.g. Dalpé et al., 1992), factors and mechanisms related to the implementation of PPI (e.g. Dale-Clough, 2015; Guerzoni and Raiteri, 2015; Landoni, 2017; van Winden and Carvalho, 2019), trends related to PPI (e.g. Georghiouet et al., 2014) and the impact of PPI (e.g. Sánchez-Carreira et al., 2018). Nevertheless, some studies have addressed multiple aspects related to PPI. Examples of such studies include Mwesiuno et al. (2019), who have explored the drivers, enablers, barriers, key success factors, pitfalls and benefits of implementing PPI in an organization. Overall, studies on PPI mostly focus on identifying measures that can increase the implementation of PPI. This makes sense because, as Lember et al. (2015) noted, a change towards PPI is difficult. Examples of challenges that may hinder the implementation of PPI include lack of adequate knowledge about PPI, fear of failure, time and financial constraints, management challenges, and institutional set-ups (Obwegeser and Müller, 2018).

While the extant literature provides useful insights, further research is required in order to facilitate the wider implementation of PPI. Through a systematic literature review, Obwegeser and Müller (2018) identify three research themes on public procurement and innovation. The themes include: (1) procurement for innovation, which refers to the use of public demand as an engine for innovation; (2) innovative public procurement, which refers to the innovation of the procurement process; and (3) public procurement of innovations, which refers to the innovation of public services by means of procurement. Among these three themes, they found that public procurement of innovations had received the least attention. A possible explanation for the low frequency of articles on public procurement of innovations could be that scholars were initially more concerned with laying the foundation of the research domain. Clearly, such foundation would be built by exploring issues related to driving innovation through public demand and how to innovate the procurement process. Moreover, Obwegeser and Müller (2018, p.13) found that most innovative public procurement and public procurement of innovations articles “lack a theoretical backbone and present primarily descriptive analyses of cases with little or no theoretical contribution”.

To fill part of the prevailing knowledge gap, the present study uses the theory of planned behaviour (TPB) (Ajzen, 1991) and the technology adoption model (TAM) (Davis, 1989) to explore the drivers of public purchaser attitudes towards PPI by highlighting the role of organizational support and PPI support schemes. Specifically, the study attempts to answer the following research questions: (1) How can public purchaser attitudes towards PPI be improved? (2) What role does perceived usefulness, organizational support and support schemes play in the public procurement of innovations? By addressing these questions, this study contributes to the theory on PPI and provides managerial and policy implications relevant to the practice of PPI. The findings of the study will inform policymaking as well as managerial decision-making in public and private organizations on issues related to PPI. While we know that public procurement plays a significant role in stimulating innovations, the literature is silent on the role that can be played by the public purchaser. Hence, the rationale for our focus on public purchaser attitudes is due to the overwhelming evidence that suggests a positive attitude towards something often translates into corresponding actions. For instance, employees' attitude towards a new practice in an organization often determines whether they will support it or not (Elias, 2009). Likewise, Shah et al. (2017) identify both job attitude and individual attitude as elements that determine employees' readiness for change. In the context of public procurement, therefore, positive attitude towards PPI is likely to increase public purchasers' willingness to implement it. Conversely, a negative attitude towards PPI is likely to reduce public

purchasers' willingness to implement PPI and its related procedures. From a qualitative study, Mwesiuno et al. (2019) found that positive attitude of the public purchasers is a critical factor in the implementation of PPI, while negative attitude towards PPI was found to be detrimental to its successful implementation. This suggests that a positive attitude towards PPI will engender behaviours that are supportive of it. Mwesiuno et al. (2019) and the present study are different. While the former identified attitude as a critical factor for the implementation of PPI, the latter goes a step further to test a theory-driven conceptual model that explains variations in public purchaser attitudes. By focusing on factors that drive attitude, the study responds to calls for an investigation into the various attitudinal and behavioural factors related to public procurement personnel's engagement with PPI activities (Lember et al., 2015).

In terms of methodology, this study applied survey design whereby a self-administered questionnaire was used to collect data that were subsequently analysed by using partial least squares structural equation modelling (PLS-SEM). The respondents were a sample of public purchasers working in the Norwegian municipalities. The focus on public purchasers as a level of analysis is useful because they constitute a key element of the public procurement system and perform two important responsibilities (Thai, 2001). Firstly, they directly handle the activities involved in the procurement of goods, services and works as authorized and funded. Secondly, they ensure that public organizations comply with relevant laws, regulations and policies. The rest of the article is structured as follows: we present the literature review and hypotheses in Section 2, followed by the methodology and analysis in Sections 3 and 4 respectively. Section 5 reports the results of the study, followed by discussion in Section 6. We conclude the paper in Section 7.

## 2. Literature review and hypotheses

This section presents a review of literature related to the focal constructs considered in this study. The constructs include public purchaser attitudes towards PPI, perceived usefulness of PPI, organizational support of PPI and availability of PPI support schemes. The reviewed literature provides the basis for the tentative relationships between these constructs.

### 2.1. Public purchaser attitudes towards PPI

Attitude refers to the extent to which someone likes or dislikes something, usually expressed as either positive or negative (Wayne et al., 2013). According to TPB, attitude is among the factors that determine an individual's intention and subsequently actual behaviour. In other words, an individual's positive or negative evaluation of a behaviour determines their intention to engage in that behaviour and eventually their actual engagement with the behaviour (Chen et al., 2013). This occurs because attitude tends to prejudice search and processing towards attitude congruent information, attaching more attention, higher importance and positive understandings to congruent than incongruent information (Bohner and Dickel, 2011). Considering the definition of attitude, the present study defines attitude towards PPI as an evaluative judgement that predisposes a public purchaser to respond to PPI either positively or negatively.

Numerous studies have reported a significant relationship between attitude and behaviour. In a meta-analysis that included 83 attitude-behaviour studies, Kraus (1995) established that attitudes significantly predict future behaviour. Since the subject matter of attitude can be an object, a person or an abstract idea (Albarracín and Shavitt, 2018), research confirming the relationship between attitude and behaviour has extended from the field of psychology to many other fields. For example, in the context of innovation, Yu and Tao (2009) found that attitude significantly influences the adoption of innovation and/or technology at the business-level, while Burcharth et al. (2014) found that employees' attitude towards knowledge is associated with openness

to innovation. In the context of public procurement, Mwesiuo et al. (2019) found that negative attitude of the public purchasers towards PPI is one of the barriers towards its implementation, and thus they recommend that more effort is required to raise awareness and to instil positive attitudes towards PPI.

Given the impact that attitude has on behaviour, an intriguing question is what factors can improve attitude towards a given phenomenon? Previous research has established that attitudes are socially and culturally constructed, and in most cases interrelate with many other factors such as socio-demographics, religion, cultural, laws and regulations, and media coverage (Duerden and Witt, 2010). Embracing the constructionist view of attitude, scholars have attempted to investigate the effect of various factors on attitude. Recent examples of such studies include Chapman and Hewitt-Dundas (2018) who explored the effect of public support on senior manager attitudes towards innovation, and Liu and Xu (2020), who examined the effect of direct experience on public attitude towards self-driving vehicles on public roads. Consistent with this research stream, the present study investigates the effect of perceived usefulness, organizational support, and perceived availability of PPI support schemes on public purchaser attitudes towards PPI.

## 2.2. Perceived usefulness of PPI and public purchaser attitudes

As the implementation of PPI in an organization involves the introduction of more innovation-friendly procurement practices and organizational culture, it essentially constitutes an organizational-wide change (Lember et al., 2015; Mwesiuo et al., 2019). Such a change is likely to affect public purchasers by challenging their routines and habitual practices. As such, it is understandable that public purchasers may find adopting PPI difficult, which may result in a negative attitude towards it. One of the factors that have been widely linked to positive attitude is perceived usefulness (e.g. Chen and Chan, 2014; Chuah et al., 2016; Purnawirawan et al., 2012; Renny et al., 2013). Perceived usefulness is an overall assessment of the utility or worthiness of something (for example, idea, technology or a practice). Jamal and Shariffuddin (2015) note that perceived usefulness is capable of influencing individual's attitude because it is essentially a reflection of cognitive beliefs held by an individual, which according to the theory of reasoned action is one of the determinants of attitude.

Most of the studies related to the effect of usefulness are based on TAM, which identifies perceived usefulness as one of the primary factors that explain an individual's intention to use new technology. Although perceived usefulness has mostly been used in studies related to technology acceptance, some scholars have used it in other contexts. For example, Marsh and Poepsel (2008) examine the effect of perceived usefulness of student learning outcomes on the department's perceived helpfulness in students' skill development, while Johnsen, (in press) and George et al. (2018) examine the perceived usefulness of strategic planning. Like these studies, the present study deploys the concept of perceived usefulness in a context other than technology acceptance, namely PPI. We define public purchaser's perceived usefulness of PPI as public purchaser's assessment of the utility or worthiness of PPI. In other words, the perceived usefulness of PPI represents cognitive beliefs held by a public purchaser about the potential benefits of PPI. Conceivably, since PPI is a new practice, particularly for some countries, its adoption will partly require public purchasers' belief that the practice is worth pursuing. Such a belief could come from various sources. For example, Mwesiuo et al. (2019) found that success stories of PPI implementation in other organizations were among key drivers that inspired organizations that had not yet embarked on this practice. Stories about benefits attained after implementing PPI tend to exemplify its usefulness.

Accordingly, we argue that perceived usefulness of PPI triggers public purchasers' positive cognition and satisfaction with PPI, which in turn should lead to a positive attitude towards PPI. Formally, the following hypothesis is proposed:

**H1.** Perceived usefulness is positively associated with public purchaser attitudes towards PPI.

## 2.3. Organizational support and public purchaser attitudes towards PPI

Neves (2009) argues that when a new practice is a result of external forces, such as laws and regulations, organizations must motivate their members to support and work towards the successful implementation of the practice. To that end, organizational support of the practice is critical. Organizational support is defined as 'employees' global impressions of the extent to which their organization provides adequate resources and values them as individuals, including the likelihood that the organization will reward their performance and help them during difficult times' (Cullen et al., 2014, p. 270). Consistent with this definition, this study defines organizational support of PPI as the extent to which an organization provides moral and material resources necessary for its implementation. Such resources could be encouragement from the top management, training in PPI, and financial resources.

Previous studies have shown that organizational support is one of the critical factors that lead to several positive outcomes related to the implementation of new practices in an organization (Cullen et al., 2014; Fuchs and Prouska, 2014; Gigliotti et al., 2019). Examples of such outcomes include teamwork cohesion, organizational learning, and technical and administrative innovation (Montes et al., 2005). Ming-Chu and Meng-Hsiu (2015) went one step further and explored the mechanism that links organizational support and resistance to change. They found that organizational support has a significant direct effect on positive psychological capital, which in turn directly affects resistance to change. They argue that positive psychological capital can mediate organizational support and resistance to change because it is a positive psychological state comprised of four dimensions, namely self-efficacy, optimism, hope and resilience. Taken together, these four elements induce employees to embrace the desired change.

In the context of procurement, Dooley and Purchase (2006) found that organizational support was one of the key factors that affected procurement professionals' intention to adopt e-procurement. They argued that organizational support served as a key internal force that boosted the adoption rate. Likewise, Brammer and Walker (2011) investigated the adoption of sustainable procurement and found that organizational support is a significant factor in sustainable procurement being implemented by public sector organizations. They observed that purchasing teams were more likely to implement sustainable procurement when senior managers supported the practice. In this study, we argue that just like e-procurement or sustainable procurement, PPI also requires organizational support to boost its implementation. Considering that implementing PPI involves changing procurement procedures and practices (Mwesiuo et al., 2019), we argue that organizational support of PPI will trigger optimism and self-efficacy among public purchasers and subsequently should lead to a positive attitude towards PPI. Thus, the following hypothesis is proposed:

**H2.** Organizational support is positively associated with public purchaser attitudes towards PPI.

Furthermore, it is clear that organizational support of PPI signals commitment of the organization to implement PPI. Now, since implementing PPI is resource demanding (Edler and Yeow, 2016) and quite risky (Georghiou et al., 2014), commitment to implement it also signals conviction about its usefulness. Thus, we argue that an organization's support of PPI signals commitment and conviction about its usefulness, which in turn should increase public purchasers' perceived usefulness of PPI. Thus, the following hypothesis is proposed:

**H3.** Organization support is positively associated with perceived usefulness of PPI.

#### 2.4. Availability of support schemes and public purchaser attitudes towards PPI

As Rolfstam (2012) suggests, PPI is influenced by both endogenous and exogenous factors. These factors can be at a regional, national or even global level. Among others, exogenous factors may include various incentives/schemes for risk relief in order to promote PPI (Skogli and Nellemann, 2016). For instance, Austria has established Public Procurement Promoting Innovation (PPPI), an initiative geared to implement various measures that encourage industry actors to deliver innovative solutions and to provide public bodies and citizens with advanced and eco-efficient goods/services (OECD, 2017). Most of the scholarly works have emphasized the role of such institutional interventions as a means to promote PPI (e.g. Dale-Clough, 2015; Landoni, 2017; Li, 2017). Conceivably, considering the new practices that need to be adopted in the course of implementing PPI and the risks associated with the exercise of such practices, such interventions are crucial for the successful implementation of PPI. As Mwesumo et al. (2019) found, the national and EU programmes were among the key enablers of PPI implementation. Such schemes facilitate PPI by providing financial resources as well as building required capabilities. This way, the programmes provide risk relief for public purchasers, which, according to Edler and Yeow (2016), is highly needed in the implementation of PPI.

Against this backdrop, we argue that the availability of schemes that support PPI should encourage public purchasers by providing risk relief, which subsequently should engender a positive attitude towards PPI. Further, we argue that resources deployed in programmes that support PPI signify external conviction of the usefulness of PPI. As a result, the availability of such schemes should strengthen the effect that public purchasers' perceived usefulness of PPI has on attitude. Based on this reasoning, we propose two hypotheses as follows:

**H4.** Availability of PPI support schemes is positively associated with public purchaser attitudes towards PPI.

**H5.** Availability of PPI support schemes strengthens the effect of perceived usefulness of PPI on public purchaser attitudes towards PPI.

### 3. Methodology

This section presents the key methodological choices made in the study. These include the level of analysis, setting, research approach, strategy, data collection, and analytical approach.

#### 3.1. Level of analysis

When analysing PPI, Rolfstam (2012) recommends five levels of analysis. Ordered hierarchically from the bottom, these levels are: procurement division; the public agency; national level; EU level (representing a regional community level); and the global level. These levels are argued to be relevant because PPI is affected by endogenous factors (factors within the organization) as well as exogenous factors (factors outside of the organization). In addition to the five levels recommended by Rolfstam (2012), Mwesumo et al. (2019) propose one more level of analysis below the procurement division level. The proposed level, which is the focus of this study, is the public purchaser. Extending the level of analysis to include the public purchaser is consistent with the framework of the public procurement system proposed by Thai (2001). This framework recognizes that even in the presence of national laws and organizational policies, PPI can hardly achieve its intended outcomes if public purchasers do not support it. Fig. 1 shows the level of analysis in the present study.

#### 3.2. Research setting

The setting of the present study is Norway. Public organizations in Norway spend close to 58 billion euros every year in the procurement of

goods, services and works. As a part of its commitment to the European Economic Area agreement, Norway has embraced the Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement. More so, in 2017 Norway enacted a new Public Procurement Act, which, among other things, focuses on increasing efficiency in public procurement, facilitating the involvement of small- and medium-sized enterprises, and promoting the attainment of common societal goals related to social and environmental sustainability. Besides the new procurement act and the accompanying regulations, Norway has implemented several other initiatives to promote PPI. The initiatives include building capacity in public sector organizations, incentives schemes for PPI, and support for suppliers. Such initiatives include an innovation contracts scheme introduced in 2017 by Innovasjon Norge<sup>1</sup> (the Norwegian Government's most important entity for promoting innovation and development of Norwegian enterprises and industry), support for companies wishing to apply for funds from Horizon (2020) offered by The Norwegian Research Council,<sup>2</sup> research-based training on public procurement offered by Anskaffelse-akademiet,<sup>3</sup> and the National Programme for Supplier Development.<sup>4</sup> Given the measures taken to promote PPI, we consider Norway as a relevant setting for testing the conceptual model proposed in this study.

In this study, the target respondents were public purchasers in Norwegian municipalities. Norwegian municipalities account for almost 50% of public procurement in Norway. Typically, the organization of the procurement function in municipalities varies from a hybrid to a centralized structure. The hybrid structure is common among large municipalities whereby procurements are conducted by a central purchasing unit as well individual user departments. A centralized structure is common among small municipalities, whereby the majority of the municipality's procurements are carried out in a central unit. So far, municipalities across the country have undertaken a considerable number of PPI projects. Table 1 provides examples of completed and ongoing PPI projects carried out by Norwegian municipalities.

#### 3.3. Research approach, strategy, and data collection

As we are testing a theory-driven conceptual model, the present study deploys a deductive approach. To collect sufficient data for the analysis, we chose to deploy an online self-administered survey. The questionnaire included questions that captured focal constructs of the study and other variables of interest. To obtain a relevant sampling frame and the contact details of our target respondents, we used Doffin,<sup>5</sup> the Norwegian Web-based database for notices of public procurement. In total, we sent 200 email invitations for the survey and obtained 114 usable responses. Considering that the average response rate for email survey is 30% (Lindemann, 2019), our response rate, 57%, is adequate. In addition, following Armstrong and Overton (1977), we conducted a paired samples test of the responses of the first 25% of respondents and the responses of the last 25% to assess non-response bias. No significant difference was found between the two groups ( $p > .05$  level). This suggested that non-response bias was unlikely, and hence did not pose a problem for the subsequent analysis of the data.

#### 3.4. Operationalization of the focal constructs

To operationalize the constructs, we first adopted indicators used by previous studies and modified them based on the insights obtained from in-depth interviews conducted with public purchasers from six Norwegian municipalities. The results of these interviews are detailed in

<sup>1</sup> <https://www.innovasjon norge.no/en/start-page/>.

<sup>2</sup> <https://www.forskningradet.no/en/>.

<sup>3</sup> <https://anskaffelseakademiet.no/>.

<sup>4</sup> <https://innovativeanskaffelser.no/about/>.

<sup>5</sup> <https://www.doffin.no/>.

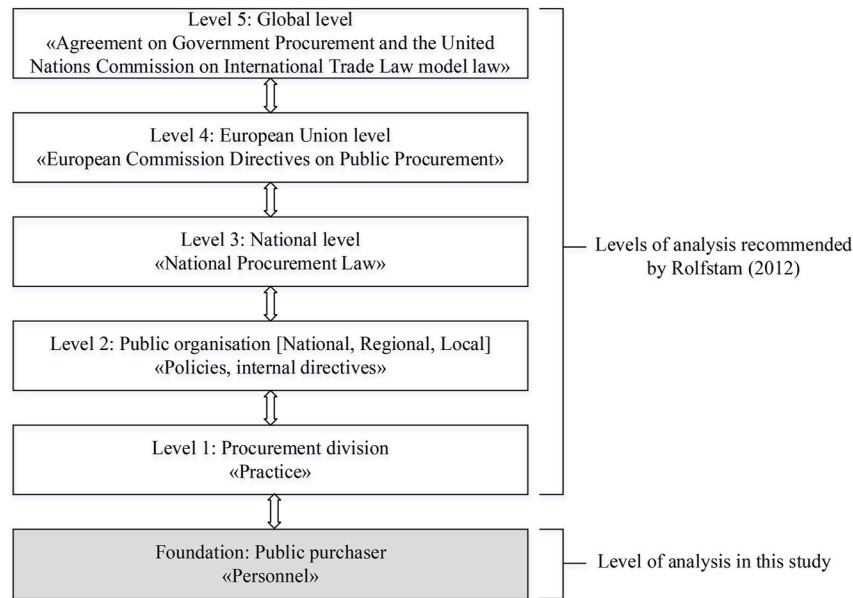


Fig. 1. Level of analysis.

Mwesiuno et al. (2019). Indicators for all focal constructs were measured on a 5-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). Operationalization for each of the constructs is explained as follows.

*Attitude towards PPI.* This is the dependent variable in our conceptual model (Fig. 2). Operationally, we define attitude towards PPI as a summary of public purchasers' evaluative judgement that predisposes them to respond to PPI either positively or negatively. The indicators for this construct were created in line with previous studies (e.g. Chapman and Hewitt-Dundas, 2018; Chen et al., 2013) and modified accordingly to ensure relevance to the context of the study. The construct is labelled as ATTUPI and reflected by three indicators.

*Perceived usefulness of PPI.* This is a mediating variable in our conceptual model. Operationally, we define it as a summary of public purchasers' assessment of the utility of PPI. The indicators for this construct were created in line with the logic used by George et al. (2018) and Jamal and Sharifuddin (2015) and modified accordingly to ensure relevance to the context of the present study. The construct is labelled as PPIUSE and reflected by three indicators.

*Organizational support of PPI.* This is an independent variable in our conceptual model. Operationally, we define it as public purchasers' impressions of the extent to which their organization provides adequate resources for the implementation of PPI. Following the logic used in previous studies (e.g. Cullen et al., 2014; Ming-Chu and Meng-Hsiu, 2015), and taking into account our research context, two indicators were used to measure it. The construct is labelled as ORGSUP.

*PPI support schemes.* This is also an independent variable in our conceptual model. In addition, it strengthens the effect of perceived usefulness of PPI on public purchaser attitudes towards PPI. Operationally, we define it as public purchasers' evaluation of the availability of external schemes that support the implementation of PPI. In line with Bergkvist and Rossiter (2007) who recommend the use of a single item when measuring a concrete singular object and a concrete attribute, this construct was measured by using a single indicator. This choice is also supported by Freed (2013), who recommends the use of a single item when the construct is sufficiently narrow and unambiguous. The construct is labelled as PPISCH.

*Assessment of possible alternative explanations for variations in attitudes.* To assess a potential effect of possible alternative explanations, two variables were added to the conceptual model as controls. The use of control variables has become debatable (Spector and Brannick, 2011),

even more so when applying partial least squares structural equation modelling (PLS-SEM). However, Ringle et al. (2012) acknowledged the use of control variables in research that applied PLS-SEM. Becker et al. (2016) recommend the use of control variables which are conceptually meaningful and could provide alternative theoretical explanations in the hypothetico-deductive model. The first control variable used in this study identifies whether PPI is included in the municipality's strategy documents or not. This dichotomous variable, labelled as STRDOC, was added because the inclusion of PPI in the strategy documents of the municipality would mean that the practice is formalized, which, in turn, could contribute to shaping the attitude of the purchasers. The second variable, experience with PPI (PPIEXP), is also a dichotomous variable that identifies whether a municipality is experienced with PPI or not. We followed the Norwegian national programme for supplier development and categorized a municipality as being experienced if they had conducted at least three PPI projects. Urban vs. rural settings and size are also interesting factors, however, these factors tend to relate to experience with PPI. That is, municipalities in urban settings tend to be large and experienced with PPI compared to their rural counterparts. As such, including experience with PPI in our model largely takes care of these two factors. To sum up, Table 2 provides a summary of the variables considered in the present study, while Fig. 2 illustrates their tentative relationships.

#### 4. Analysis

The collected data set was analysed by using PLS-SEM. Considering the fact that the focal constructs in this study are composite, meaning that the empirical essence of the constructs is captured by their indicators (see Richter et al., 2016; Sarstedt et al., 2016), the choice of PLS-SEM is appropriate. The sample size of 114 used in this study satisfies the minimum of 100 observations recommended for conducting PLS-SEM (Assaker et al., 2012) as well as Hair et al. (2017)'s recommended sample size thresholds for a statistical power of 80 per cent. Subsequently, an importance-performance map analysis (IPMA) (Hair et al., 2017) was conducted. The methodological basis for conducting this analysis is to identify the relative importance of the factors that explain variations in public purchaser's attitudes. By identifying factors with relatively high and low performance, IPMA provides insights for guiding policy and managerial interventions.

**Table 1**  
Examples of PPI projects undertaken by municipalities in Norway<sup>a</sup>.

Municipality	Project description	Status	Documented outcomes
Asker	An innovative swimming pool. Asker municipality needed a new swimming pool for its residents. They required a swimming pool that would be built and operated with the environmental considerations in mind. In addition, the swimming pool should cater for the needs of diverse groups among the residents of the municipality and should encourage swimming in the municipality.	Completed	80 percent of the heating is done by renewable energy, making it one of most energy effective swimming pools in the country. Saved water by 30 percent. Won national innovation prize.
Østfold	Biogas buses. As part of its ambition to contribute to the environmental sustainability, Østfold county municipality wanted to acquire buses that are powered by more environmentally friendly fuel types (biogas) and better environmental solutions in their new public transport agreements.	Completed	Over 80 percent of bus traffic in Østfold is fossil-free. Østfold became a pioneer county municipality in fossil-free transportation.
Bærum	Innovative food delivery service for elderly people who still live in their own homes. Previously, home-helpers used to run around in grocery stores with client's cards or cash to buy food and carry the heavy bags back to the client's home. Due to increased number of elderly people, this became inconvenient and costly. Thus, Bærum municipality sought an innovative and cost effective solution to deliver food.	Completed	Outcomes: Saved millions of Norwegian kroner. Better service to the elderly people as home-helpers get more time to focus on them.
Bergen	An innovative water treatment plant. Bergen municipality wants to develop the most innovative and cost effective water treatment plant in the world. Among other things the plant should be energy efficient, should handle large variations in water volume and organic matter, operationally efficient (in terms of personnel, work environment, maintenance and utilization of resources).	Ongoing	-
Kviteseid	Flexible green apartment building. Due housing shortage, Kviteseid municipality wants to build an innovative, flexible and sustainable apartment building for	Ongoing	-

**Table 1 (continued)**

Municipality	Project description	Status	Documented outcomes
	rent. Among other things, the building should include future-oriented technical solutions. It should use cost effective materials and construction methods that provide the lowest possible climate footprint.		
Ringsaker	Future-oriented nursing home. Ringsaker municipality wants to challenge the market to come up with innovative solutions in terms of technology, sustainability, design and material use, service development and operational solutions.	Ongoing	-

<sup>a</sup> Reported by the National Programme for Supplier Development in Norway, available at: <https://innovativeanskaffelser.no/resultater/>.

4.1. Assessing the measurement model and potential common method bias

Assessing the measurement model is crucial for ensuring validity of the findings and conclusions of a structural equation modelling (Henseler et al., 2016). When the measurement model is reflective, as is the case in this study, the assessment involves checking the internal consistency reliability, convergent validity and discriminant validity.

4.1.1. Internal consistency reliability and convergent validity

As for internal consistency reliability, Dijkstra and Henseler (2015) proposed a novel and more effective measure,  $\rho_A$  (rho\_A). The recommended threshold for this measure is  $\rho_A > 0.7$ . Currently, this is the only consistent measure for assessing the reliability of PLS construct scores (Henseler et al., 2016). Convergent validity is checked by assessing the value of the average variance extracted (AVE) whereby the recommended threshold is  $AVE > 0.5$ . In addition, the loading of each measure on its associated construct should be higher than 0.7 for indicator reliability to be considered acceptable. Table 3 presents the descriptive statistics of the measures along with their loadings and the values of  $\rho_A$  and AVE for the corresponding focal constructs. As reported in Table 3, the loadings of the measures are higher than the recommended threshold of 0.7 ( $p < .001$ ) and the values of  $\rho_A$  and AVE are above the recommended thresholds of 0.7 and 0.5, respectively. As shown by Table 3, the internal consistency reliability of the constructs appears to be adequate even by conventional standards, namely the Cronbach  $\alpha$  and composite reliability test.

4.1.2. Discriminant validity

Discriminant validity is the extent to which each construct is different from other constructs included in the model (Hair et al., 2017). The assessment of discriminant validity is important because it ensures that each construct is empirically distinctive and represents a phenomenon not represented by other constructs in the model. Conventionally, Fornell-Larcker criterion is often used to assess discriminant validity and it is established when the square root of each construct's AVE is greater than its highest correlation with any other construct. However, Hair et al. (2019) recommend that researchers using PLS-SEM should use heterotrait-monotrait ratio of correlations (HTMT) to determine discriminant validity. This is a superior approach for assessing discriminant validity developed by Henseler et al. (2015). According to Henseler et al. (2015), discriminant validity for constructs that are conceptually similar is established when the HTMT ratio is less than

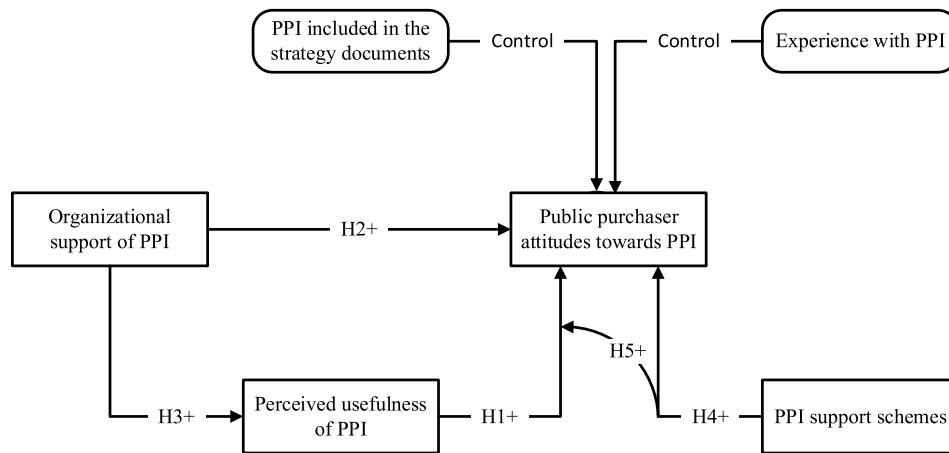


Fig. 2. Focal constructs and hypotheses.

Table 2  
Operationalization of focal constructs and control variables.

Construct	Abbreviation	Indicators
Attitude toward PPI (ATTTPPI)	ATTTPPI1	Conducting public procurement of innovations gives me opportunity for professional development
	ATTTPPI2	I am very positive toward public procurement of innovations
	ATTTPPI3	Conducting public procurement of innovations is interesting
Perceived usefulness of PPI (PPIUSE)	PPIUSE1	Public procurement of innovations is the best way to achieve value for money
	PPIUSE2	Public procurement of innovations is the best approach for our municipal to provide high quality service to the citizens
	PPIUSE3	Public procurement of innovations is the best approach to guarantee development of suppliers
Organizational support of PPI (ORGSUP)	ORGSUP1	I have received adequate training on public procurement of innovations
	ORGSUP2	Our top leaders strongly support public procurement of innovations
Availability of PPI support schemes (PPISCH)	PPISCH	There is sufficient availability of schemes to support our implementation of public procurement of innovations
PPI in the strategy documents (STRDOC)	STRDOC	Dichotomous variable that identifies whether PPI is included in the municipal's strategy documents or not.
Experience with PPI (PPIEXP)	PPIEXP	Dichotomous variable that identifies whether a municipal has conducted at least three PPI projects or not.

Note: Except the control variables (STRDOC and PPIEXP), indicators for all other variables were measured on a 5-point Likert scale, ranging from strongly disagree (1) to strongly agree (5).

0.90, while for constructs that are not conceptually similar it is established when the HTMT ratio is less than 0.85. In their analysis, Voorhees et al. (2016) conclude that, overall, an HTMT ratio of 0.85 is the best threshold for assessing discriminant validity. As shown in Table 4, both the Fornell–Larcker criterion and HTMT ratios confirm the discriminant validity of the focal constructs in this study.

#### 4.1.3. Assessing potential common method variance

Common method variance (CMV) is the ‘variance that is attributable to the measurement method rather than to the construct the measures represent’ (Podsakoff et al., 2003, pp. 879). Although some scholars

ignore it, and some even suggest that it is an urban legend (e.g. Spector, 2006), many agree that this problem is prevalent and researchers need to address it (Chang et al., 2010). To address potential CMV, we applied both procedural and statistical measures (Hulland et al., 2018; Jordan and Troth, 2020). First, we avoided ambiguous construct indicators that were difficult to comprehend and interpret. Second, we applied Harman’s single-factor test to determine whether one single factor accounts for the majority of the covariance between the measures (Podsakoff and Organ, 1986). This was performed by conducting factor analysis whereby all measures were loaded onto a single factor. The results showed that a single factor only accounted for 37.949 per cent of the variance, which is less than the recommended threshold of 50 per cent. This suggests that common method bias is not a problem in this study.

#### 4.2. Hypotheses testing

The hypotheses of the study were tested by analysing the corresponding conceptual model (Fig. 2). The model includes both the focal constructs and control variables. Following Hair et al.’s (2017) recommendation, a two-stage approach was used to create the interaction term.

To evaluate the structural model, values of the path coefficients, R<sup>2</sup>, and approximate model fit were evaluated. The predictive relevance of the model was evaluated by checking the value of Stone–Gaiasser’s Q<sup>2</sup>, which measures the out-of-sample predictive power of the model. Predictive relevance is determined when Q<sup>2</sup> is greater than zero, indicating that the model makes accurate predictions for data not used in the model. As for the approximate model fit, Henseler et al. (2016) recommend using the standardized root mean residual (SRMR) criterion whereby the recommended threshold is SRMR < 0.08. Following Hair et al. (2011), the analysis was conducted by using 5000 bootstrap samples.

### 5. Results

This section presents the results of the analysis and explores their relevance. The results of the analysis are reported in Fig. 3 and Table 5, followed by their description and further exploration.

#### 5.1. Results of the structural model estimation

As shown by the results (Table 5), the absolute values of the path coefficients range from 0.019 to 0.411 while the effect sizes range from 0 to 0.225. The SRMR value is 0.068 and the adjusted R<sup>2</sup> of the target dependent variable is 0.25, suggesting that an approximate model fit and the amount of the variation explained by the model are acceptable. As the Stone–Gaiasser’s Q<sup>2</sup> values are greater than zero, the predictive

**Table 3**  
Descriptive statistics of the multi-item constructs.

Item	Mean	Std. dev	Loading	Cronbach's $\alpha$	rho_A	Composite reliability	AVE
ATTPPI1	3.991	0.767	0.824***	0.828	0.830	0.895	0.740
ATTPPI2	4.248	0.735	0.869***				
ATTPPI3	4.142	0.786	0.894***				
PPIUSE1	3.202	0.818	0.921***	0.825	0.870	0.897	0.745
PPIUSE2	3.228	0.773	0.876***				
PPIUSE3	3.570	0.868	0.777***				
ORGSUP1	2.693	1.125	0.817***	0.662	0.705	0.853	0.744
ORGSUP2	3.202	1.241	0.906***				

**Table 4**  
Assessment of discriminant validity.

	ATTPPI	PPIUSE	ORGSUP
ATTPPI	(0.860) <sup>a</sup>		
PPIUSE	0.439 [0.523] <sup>b</sup>	(0.863) <sup>a</sup>	
ORGSUP	0.210 [0.261] <sup>b</sup>	0.244 [0.325] <sup>b</sup>	(0.894) <sup>a</sup>

<sup>a</sup> Fornel-lacker criterion ( $\sqrt{AVE}$ ).  
<sup>b</sup> HTMT ratio.

relevance of the model is established.

The hypotheses were checked by assessing the significance of the path coefficients in the structural model, which illustrates the causal relationships between the focal variables (Fig. 3). The first hypothesis (H1) proposed that an increased level of perceived usefulness of PPI is positively associated with public purchaser attitudes towards PPI (ATTPPI). This hypothesis is supported as the corresponding path coefficient is positive (0.411) and significant at  $p \leq .01$ . The second hypothesis (H2) proposed that organization support is positively associated with public purchaser attitudes towards PPI (ATTPPI). Although the corresponding path coefficient is positive (0.137), the hypothesis is not supported as the effect is not significant. The third hypothesis (H3) proposed that organization support is positively

associated with increased public purchasers' perceived usefulness of PPI (PPIUSE). This hypothesis is supported as the corresponding path coefficient is positive (0.210) and significant at  $p \leq .05$ . The fourth hypothesis proposed that perceived availability of schemes to support PPI (PPISCH) is positively associated with public purchaser attitudes towards PPI (ATTPPI). The results show that the corresponding path coefficient is not significant and has a negative sign (-0.046), which is opposite to the hypothesized sign. The last hypothesis proposed that perceived availability of schemes to support PPI (PPISCH) strengthens the effect of perceived usefulness of PPI (PPIUSE) on public purchaser attitudes towards PPI (ATTPPI). Although the results show that the corresponding coefficient is significant at  $p \leq .05$ , the sign is opposite to that of the hypothesis (-0.204). This suggests that when the level of perceived availability of PPI support schemes (PPISCH) is increased by one standard deviation unit, the effect of perceived usefulness of PPI (PPIUSE) on public purchaser attitudes towards PPI (ATTPPI) decreases to 0.207 (-0.204 + 0.411), as shown in Fig. 4.

The two control variables, that is whether PPI is included in the municipality's strategy documents or not (STRDOC) and experience with PPI (PPIEXP), appear to have no significant effect. The path coefficient between presence of strategy (STRDOC) and public purchaser attitudes towards PPI (ATTPPI) and that between experience with PPI (PPIEXP) and public purchaser attitudes towards PPI (ATTPPI) are 0.019

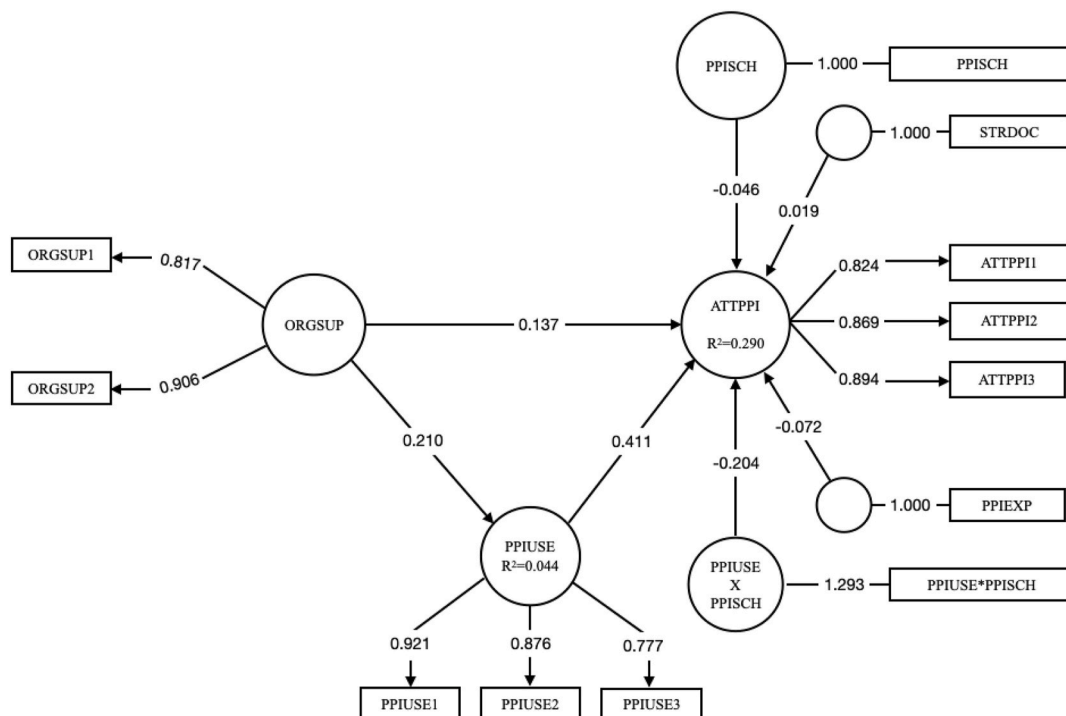


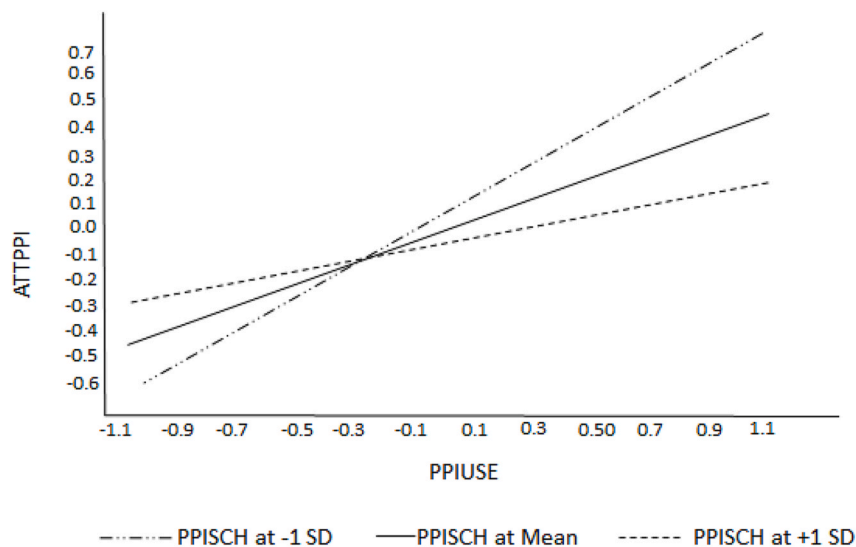
Fig. 3. Structural model.



**Table 5**  
Results of the structural model analysis (n = 114).

	Effect on PPIUSE		p-value	Effect on ATTPTPI			Significant
	Path coefficient	t-value		Path coefficient	t-value	p-value	
<i>Direct effects</i>							
ORGSUP	0.210	2.128	0.035 <sup>b</sup>				Yes
ORGSUP				0.137	1.317	0.177 <sup>n</sup>	No
PPIUSE				0.411	5.193	0.000 <sup>a</sup>	Yes
PPISCH				-0.046	0.474	0.637 <sup>n</sup>	No
<i>Interaction effect</i>							
PPIUSE * PPISCH				-0.204	2.282	0.024 <sup>b</sup>	Yes
<i>Control variables</i>							
STRDOC				0.019	0.195	0.846 <sup>n</sup>	No
EXP				-0.072	0.774	0.445 <sup>n</sup>	No
<i>Indirect effect</i>							
ORGSUP				0.086	1.930	0.055 <sup>c</sup>	Yes
R <sup>2</sup>	0.044			0.290			
Adj. R <sup>2</sup>	0.036			0.250			
Q <sup>2</sup>	0.025			0.181			
SRMR				0.068			

Significance (two-tailed test): <sup>a</sup>significant at  $p \leq .01$ ; <sup>b</sup>significant at  $p \leq .05$ ; <sup>c</sup>significant at  $p \leq .10$ ; <sup>n</sup>not significant.



**Fig. 4.** Interaction effect of perceived usefulness of PPI and availability of support schemes.

( $p = .846$ ) and  $-0.072$  ( $p = .430$ ), respectively (Fig. 3).

Zhao et al. (2010) recommend that when a model involving a mediation effect is estimated (like the model in this study), researchers should assess both direct and indirect effects. This is important in order to identify the nature of mediation or non-mediation involved. The results of this study show that the indirect effect of ORGSUP on ATTPTPI through PPIUSE is positive (0.086) and significant at  $p < .10$ . Based on the types of mediation suggested by Zhao et al. (2010), the model exhibits indirect-only mediation. This means organizational support only improves public purchaser attitudes towards PPI by increasing the perceived usefulness of PPI.

**5.2. Importance-performance map analysis**

This section further expounds on the PLS-SEM results by conducting IPMA. For each construct, the IPMA contrasts the structural model total effects (importance measured on a scale from 0 to 100) and the average values of the latent variable scores (performance). This way, it identifies

the potential room for improving the score of each predictor variable. As the target variable in the present study is public purchaser attitudes towards PPI, IPMA helps to identify factors that can subsequently be addressed by policymakers or other entities involved in the promotion of PPI. Fig. 5 summarizes the results of IPMA.

As shown in Fig. 5, the most important factor in our model is the perceived usefulness of PPI, followed by organizational support. Interestingly, the results further show that among the municipalities considered in this study there is still room for improving both organizational support and perceived usefulness of PPI. This is because perceived usefulness only performs at 57.52 per cent while organizational support only performs at 47.29 per cent. Although the presence of strategy for PPI, PPI support schemes and experience with PPI are fairly close to organizational support and perceived usefulness of PPI in terms of performance, they have very low importance in the model. As such, the results lead to two conclusions. First, organizational support and perceived usefulness of PPI are key to improving public purchaser attitudes towards PPI. Second, more work is required to increase public

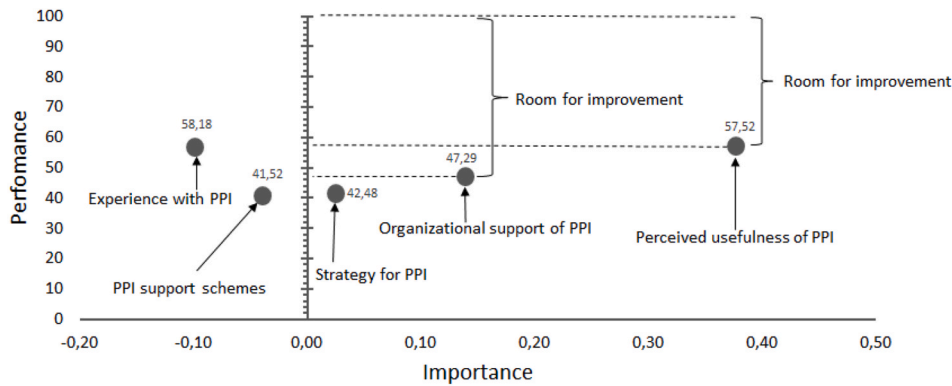


Fig. 5. Results of importance-performance map analysis.

purchasers' appreciation of the usefulness of PPI (42.48 per cent room for improvement) and public procuring entities should increase their support of PPI (52.71 per cent room for improvement).

## 6. Discussion

Public procurement has been touted as an 'engine' for driving innovation in an economy (Edler and Georghiou, 2007); this is so because public procurement constitutes a large proportion of public sector demand for goods and services. Public procurement has been cited as an effective instrument in supporting early stages of a product's life cycle because in this phase technological advances are made while there is no demand. This study sought to find answers to how public purchaser attitudes towards PPI can be improved and to investigate the role of perceived usefulness, organizational support and support schemes in the public procurement of innovations. The findings of the study provide several insights that are relevant for both the theory and practice of public procurement management and innovation.

### 6.1. Theoretical contributions

Due to the overwhelming evidence that attitude tends to generate actual behaviour, the underlying premise of the study is that a positive attitude towards PPI will engender behaviours that are supportive of its implementation. Unlike previous studies on PPI, the level of analysis in the present study is the procurement personnel, which is a recognition of the important role of public purchasers in the public procurement system. This is important because even with support and stipulations of national procurement regulations and organizational policies, PPI can hardly achieve its intended outcomes if public purchasers do not support it. The study was guided by a conceptual model that hypothesized the link between organizational support, perceived usefulness, and perceived availability of support schemes on public purchaser attitudes towards PPI. To the best of our knowledge, this is among the first studies to explore attitudinal factors in the context of PPI.

First, the results supported the hypothesis that increased level of perceived usefulness of PPI is positively associated with public purchaser attitudes towards it. In other words, the results confirm that when public purchasers are convinced about the usefulness of PPI, they are likely to develop a positive attitude towards it. Based on the theory of planned behaviour (Ajzen, 1991), this will lead to a willingness to implement PPI. Moreover, the IPMA showed that perceived usefulness is the most important factor in our conceptual model. Theoretically, this finding confirms and thus solidifies evidence on the link between usefulness and attitude. Although the relationship between these two variables has been established in other contexts, especially related to the adoption of technology, the present study confirms its broad applicability. This is useful because applicability in a wide range of contexts is an important quality of a good theory.

Second, the integration of the constructs of technology acceptance model (TAM) and theory of planned behaviour (TPB) in the present study provides us with the mechanisms through which an organizational level construct (organizational support) and the usefulness of an innovation procurement help explain variations in attitude. TAM has frequently been applied in information systems research (Davis, 1989) while TPB is a useful framework for researching attitudinal and behavioural intentions (Ajzen, 1991). Our contribution here shows that an organization-level construct can explain an individual-level construct. The study has shown that in the context of the procurement of innovations, an individual level construct such as attitude could best be explained by relating it with an organizational level construct measured at an individual level. In addition, the modelling of attitude towards public procurement of innovations and its antecedent factors provides factorial validity. The operationalization and validation of the constructs used in the present study provide researchers useful means by which to conduct similar studies in the future. This is particularly useful since very few studies have looked at the phenomenon studied in this paper.

Third, considering the strong effect that perceived usefulness has on public purchaser attitudes, a logical question is where does perceived usefulness of PPI come from? To answer this question, the study tested and found that organizational support has a strong positive association with the perception of PPI usefulness. As PPI projects tend to be risky, it makes sense that public purchasers would need to see their leaders support its implementation. Organizational support including support from top management has also been found to be critical in the successful implementation of new practices and change in organizations (Cullen et al., 2014; Fuchs and Prouska, 2014; Gigliotti et al., 2019). Contrary to our expectation, organizational support did not have a significant direct effect on the public purchaser attitudes towards PPI but rather a significant indirect effect. According to Zhao et al.'s (2010) guidelines on mediation analysis, this means that perceived usefulness of PPI fully mediates the effect that organizational support has on public purchaser attitudes towards PPI. Potentially, the results of the mediation explain why organizational support did not have a significant direct effect on public purchaser attitudes. In the sense that the organizational support requires a mechanism through which it impacts public purchaser attitudes towards PPI. Particularly, the present study identifies perceived usefulness as one of the potential causal mechanisms. Theoretically, this points to the central role of the perceived usefulness construct when it comes to the adoption of new practices.

Fourth, the study developed a theoretical model and empirically shows how public purchaser attitudes towards PPI could be improved. The model is useful for finding out which factors may have the most impact on attitude and which of these factors may require further attention for improvement. We illustrate this contribution by the results of the IPMA analysis. For example, the IPMA results suggest that there is still room for improving the perceived usefulness of PPI among public

purchasers. In addition, the IPMA analysis also showed that there is still room for increasing the level of organizational support of PPI. In other words, overall organizational support and the perception of the usefulness of PPI are less than optimal. This presupposes that in the procurement of innovations, especially within the public procurement system, optimality is a key issue regarding the antecedent factors that explain the mechanisms by which public purchaser attitudes influences the process. One important implication is that the support of the top management of public organizations is a necessary condition to increase public purchasers' perceived usefulness of PPI.

## 6.2. Managerial and policy implications

Public purchasers have an important role to play regarding the successful implementation of public procurement policies. The use of systematic policies, regulation, public procurement and support of private demand as demand-side innovation policy instruments has long been acknowledged (Edler and Georghiou 2007). In these situations, the motive has been to use public needs as a driver for innovation. Indeed, the attitude of those concerned in the procurement process has a direct impact on the successful implementation of such policies, both at the national level and the EU level. The findings of this study provide several managerial and policy implications related to the role of the public purchaser.

While the level of analysis in the present study is the public purchaser, it is important to recognize the interplay that exists among the different stakeholders involved in public procurement. The role of the actors in the higher levels of analysis identified by Rolfstam (2012), such as regional, national and international stakeholders, can also be important in promoting public purchaser attitudes towards PPI. In light of our findings, these stakeholders can contribute by disseminating information that demonstrates the usefulness of PPI. The implication is that sharing success stories about PPI can be one of the ways that can be used to increase its perceived usefulness and hence improve public purchaser attitudes towards it. For instance, a considerable number of PPI projects in Norway have been accomplished, and thus sharing outcomes of these projects and lessons learnt could be one of the ways to increase perceived usefulness of PPI. In addition, PPI projects from other parts of Europe or even beyond can contribute to increasing the perceived usefulness of PPI and hence improve public purchaser attitudes towards it. Furthermore, the usefulness of PPI should be made a central theme in the training and awareness creation of the public procurement of innovations.

Interestingly, perceived availability of PPI support schemes does not seem to have significant effect on public purchaser attitudes towards PPI. Indeed, rather than strengthening the effect of public purchasers' perceived usefulness of PPI on attitude, it significantly weakens it. Both of these observations are contrary to our expectation. Essentially, one expects that these schemes, such as Horizon 2020, would trigger interest in PPI and thus have a strong positive effect on the attitude. In other words, these schemes would act as an incentive to promote the implementation of PPI. The results suggest that this is not the case. One possible explanation can be that although these support schemes are useful, they tend to be quite demanding in terms of the paperwork required. Thus, rather than encouraging and inculcating a positive attitude towards PPI, the demanding paperwork and the bureaucracy might actually dissuade public purchasers from implementing it. This implies that if these schemes are to achieve their intended goals, the required paperwork should be simplified in order to encourage public purchasers to apply and benefit from them. Another possible explanation is that these schemes are not well understood among public purchasers. This is signified by the lowest performance index of PPI support schemes as revealed through IPMA. Given the various schemes geared to support PPI in Norway, and the obvious benefits of these schemes, our results suggest that deliberate policy measures are needed to scale-up PPI support schemes parallel with the dissemination of information

about their mode of operation and the associated benefits.

Furthermore, the study's findings demonstrate that if an organization supports PPI, the attitude of the purchasers towards PPI will have the desired impact only if they perceive it to be useful. The implication is that leaders must provide moral and material resources to support PPI as well as communicating the importance of embracing PPI and its related practices. This includes facilitating training on PPI and showing acceptance of the risks associated with PPI. More so, since PPI external schemes are mainly geared at providing resources to support the PPI process itself, leaders in public organizations should consider providing remunerative incentives to public purchasers who successfully complete PPI projects. Such incentives will send a strong signal regarding the management's conviction about the usefulness of PPI and will encourage public purchasers to embrace the practical challenges associated with its execution. Policy makers and external stakeholders can also consider providing remunerative incentives to public purchasers who work with PPI. Finally, although the results show that experience with PPI and the presence of a PPI strategy positively affect attitude towards PPI, their effects are not as strong as we expected. A possible explanation could be that a certain mediating factor is required in order to translate PPI experience and strategy into public purchasers' positive attitude towards PPI.

## 7. Conclusion

Public procurement of innovation is one of the ways through which public entities can modernize their services and promote innovation. Despite the benefits of PPI, more work is required to promote its implementation. Recognizing the role of attitude in influencing behaviour, the present study sought to explain ways through which public purchaser attitudes towards PPI can be improved. Our analysis has confirmed that organizational support positively affects the perceived usefulness of PPI, which in turn positively affects public purchaser attitudes towards it. On the contrary, the perceived availability of support schemes does not appear to have a significant effect on attitude. In fact, it weakens the effect of perceived usefulness on attitude. Since the conceptual model of the study was driven by a well-established theory, we expect the results of this study to be relevant in other countries as well, especially in Europe, where public procurement practices, laws, regulations and policies tend to be similar.

Although these findings are quite insightful, the study has some limitations that provide avenues for future studies. Firstly, the study is confined to one setting. Although Norway has a lot in common with other European countries and thus the results of this study are expected to have external validity, conducting similar studies in other settings is desirable. Secondly, although the variables included in the model provided an adequate explanation for the variation of attitude towards PPI, future studies can explore other factors that might contribute to a positive attitude towards PPI. For instance, this study did not explore the effect of intrinsic motivation on the public purchaser attitudes towards PPI. Intrinsic motivation is concerned with inherent satisfaction for something and it is often related to an individual's values and well-being (Wilhelm et al., 2019). Exploring the impact of personal values on the attitude towards PPI is an avenue that future studies may consider. Thirdly, the questionnaire used in this study did not capture information such as education level, work experience, status in the organization, age, and gender of the individual purchasers. Future studies may include such variables to assess whether they can provide alternative explanation on the variations of attitudes. Fourthly, the results show that experience with PPI and the presence of a PPI strategy do not have significant effect on the attitude. Future studies may explore potential mediating factor(s) that may be required in order to translate PPI experience and strategy into public purchasers' positive attitude towards PPI. Lastly, due to the cross-sectional design, the present study does not provide any information regarding the evolution of the public purchaser attitudes towards PPI. However, attitudes are dynamic and

they are formed over time as individuals get exposed to stimuli (Albarracin and Shavitt, 2018). An interesting avenue for future research is to find out how the attitude towards PPI evolves.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

## Acknowledgement

The authors appreciate the three anonymous reviewers whose constructive comments led to a significant improvement of this paper.

## References

- Ajzen, I., 1991. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50, 179–211.
- Albarracin, D., Shavitt, S., 2018. Attitudes and attitude change. *Annu. Rev. Psychol.* 69 (1), 299–327.
- Armstrong, J.S., Overton, T.S., 1977. Estimating nonresponse bias in mail surveys. *J. Market. Res.* 14 (3), 396–402.
- Assaker, G., Huang, S., Hallak, R., 2012. Applications of partial least squares structural equation modeling in tourism research: a methodological review. *Tourism Anal.* 17 (5), 679–686.
- Becker, T.E., Atinc, G., Breugh, J.A., Carlson, K.D., Edwards, J.R., Spector, P.E., 2016. Statistical control in correlational studies: 10 essential recommendations for organizational researchers. *J. Organ. Behav.* 37 (2), 157–167.
- Bergkvist, L., Rossiter, J.R., 2007. The predictive validity of multiple-item versus single-item measures of the same constructs. *J. Market. Res.* 44, 175–184.
- Bohner, G., Dickel, N., 2011. Attitudes and attitude change. *Annu. Rev. Psychol.* 62 (1), 391–417.
- Brammer, S., Walker, H., 2011. Sustainable procurement in the public sector: an international comparative study. *Int. J. Oper. Prod. Manag.* 31 (4), 452–476.
- Burcharth, A.L.D.A., Knudsen, M.P., Søndergaard, H.A., 2014. Neither invented nor shared here: the impact and management of attitudes for the adoption of open innovation practices. *Technovation* 34 (3), 149–161.
- Chang, S.-J., Van Witteloostuijn, A., Eden, L., Eden, L., 2010. From the Editors: common method variance in international business research. *J. Int. Bus. Stud.* 41 (2), 178–184.
- Chapman, G., Hewitt-Dundas, N., 2018. The effect of public support on senior manager attitudes to innovation. *Technovation* 69, 28–39.
- Chen, K., Chan, A.H.S., 2014. Predictors of gerontechnology acceptance by older Hong Kong Chinese. *Technovation* 34 (2), 126–135.
- Chen, M.F., Lin, Y.P., Cheng, T.J., 2013. Public attitudes towards nanotechnology applications in Taiwan. *Technovation* 33 (2–3), 88–96.
- Chicot, J., Matt, M., 2018. Public procurement of innovation: a review of rationales, designs, and contributions to grand challenges. *Sci. Publ. Pol.* 45 (4), 480–492.
- Chuah, S.H.W., Rauschnabel, P.A., Krey, N., Nguyen, B., Ramayah, T., Lade, S., 2016. Wearable technologies: the role of usefulness and visibility in smartwatch adoption. *Comput. Hum. Behav.* 65, 276–284.
- Cullen, K.L., Edwards, B.D., Casper, W.C., Gue, K.R., 2014. Employees' adaptability and perceptions of change-related uncertainty: implications for perceived organizational support, job satisfaction, and performance. *J. Bus. Psychol.* 29 (2), 269–280.
- Dale-Clough, L., 2015. Public procurement of innovation and local authority procurement: procurement modes and framework conditions in three European cities. *Innovat. Eur. J. Soc. Sci. Res.* 28 (3), 1–23.
- Dalpe, R., DeBresson, C., Xiaoping, H., 1992. The public sector as first user of innovations. *Res. Pol.* 21 (3), 251–263.
- Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q.: Manag. Inf. Syst.* 13 (3), 319–339.
- Dijkstra, T.K., Henseler, J., 2015. Consistent partial least squares path modeling. *MIS Q.* 39 (2), 297–316.
- Dooley, K., Purchase, S., 2006. Factors influencing E-procurement usage. *J. Public Procure.* 6 (1/2), 28–45.
- Duerden, M.D., Witt, P.A., 2010. The impact of direct and indirect experiences on the development of environmental knowledge, attitudes, and behavior. *J. Environ. Psychol.* 30 (4), 379–392.
- Edler, J., Georghiou, L., 2007. Public procurement and innovation. Resurrecting the demand side. *Res. Pol.* 36 (7), 949–963.
- Edler, J., Yeow, J., 2016. Connecting demand and supply: the role of intermediation in public procurement of innovation. *Res. Pol.* 45 (2), 414–426.
- Edquist, C., Zabala-Iturrriagaitia, J.M., 2012. Public procurement for innovation as mission-oriented innovation policy. *Res. Pol.* 41 (10), 1757–1769.
- Edquist, C., Zabala-Iturrriagaitia, J.M., 2015. Pre-commercial procurement: a demand or supply policy instrument in relation to innovation? *R&D Management* 45 (2), 147–160.
- Elias, S.M., 2009. Employee commitment in times of change: assessing the importance of attitudes towards organizational change. *J. Manag.* 35 (1), 37–55.
- European Commission, 2014. Innovation Procurement - H2020 Online Manual. Retrieved September 5, 2018, from H2020 Online Manual website. [http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/innovative-procurement\\_en.htm](http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/innovative-procurement_en.htm).
- European Commission, 2018. Public Procurement of Innovative Solutions : Shaping Europe's Digital Future. Retrieved June 18, 2020, from. <https://ec.europa.eu/digital-single-market/en/public-procurement-innovative-solutions>.
- Freed, L., 2013. *Innovating Analytics : Word of Mouth Index: Use the Next Generation of Net Promoter to Increase Sales and Drive Results*. Wiley, New Jersey.
- Fuchs, S., Prouska, R., 2014. Creating positive employee change evaluation: the role of different levels of organizational support and change participation. *J. Change Manag.* 14 (3), 361–383.
- George, B., Desmidt, S., Cools, E., Prinzie, A., 2018. Cognitive styles, user acceptance and commitment to strategic plans in public organizations: an empirical analysis. *Publ. Manag. Rev.* 20 (3), 340–359.
- Georghiou, L., Edler, J., Uyarra, E., Yeow, J., 2014. Policy instruments for public procurement of innovation: choice, design and assessment. *Technol. Forecast. Soc. Change* 86, 1–12.
- Ghissetti, C., 2017. Demand-pull and environmental innovations: estimating the effects of innovative public procurement. *Technol. Forecast. Soc. Change* 125, 178–187.
- Gigliotti, R., Vardaman, J., Marshall, D.R., Gonzalez, K., 2019. The role of perceived organizational support in individual change readiness. *J. Change Manag.* 19 (2), 86–100.
- Guerzoni, M., Raiteri, E., 2015. Demand-side vs. supply-side technology policies: hidden treatment and new empirical evidence on the policy mix. *Res. Pol.* 44 (3), 726–747.
- Hair, J., Ringle, C.M., Sarstedt, M., 2011. PLS-SEM: indeed a silver bullet. *J. Market. Theor. Pract.* 19 (2), 139–152.
- Hair, Joseph F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., 2017. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage Publications, Thousand Oaks, California.
- Hair, Joseph F., Sarstedt, M., Ringle, C.M., 2019. Rethinking some of the rethinking of partial least squares. *Eur. J. Market.* 53 (4), 566–584.
- Henseler, J., Ringle, C.M., Sarstedt, M., 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Market. Sci.* 43 (1), 115–135.
- Henseler, J., Hubona, G., Ray, P.A., 2016. Using PLS path modeling in new technology research: updated guidelines. *Ind. Manag. Data Syst.* 116 (1), 2–20.
- Hovland, L., 2020. Sykehusinnkjøp Med Innovativ Hasteanskaffelse for Hjelp Mot Corona – Anbud365. Retrieved July 13, 2020, from Anbud365 website. <https://www.anbud365.no/bransjer/helse-omsorg/sykehusinnkjop-med-innovativ-hasteanskaffelse-for-hjelp-mot-corona/>.
- Hulland, J., Baumgartner, H., Smith, K.M., 2018. Marketing survey research best practices: evidence and recommendations from a review of JAMS articles. *J. Acad. Market. Sci.* 46 (1), 92–108.
- Jamal, A., Sharifuddin, J., 2015. Perceived value and perceived usefulness of halal labeling: the role of religion and culture. *J. Bus. Res.* 68 (5), 933–941.
- Johnsen, Å., (in press). Does formal strategic planning matter? An analysis of strategic management and perceived usefulness in Norwegian municipalities. *International Review of Administrative Sciences Available Online*, <https://doi.org/10.1177/0020852319867128>.
- Kattel, R., Lember, V., 2010. Public procurement as an industrial policy tool: an option for developing countries? *J. Public Procure.* 10 (3), 368–404.
- Kraus, S.J., 1995. Attitudes and the prediction of behavior: a meta-analysis of the empirical literature. *Pers. Soc. Psychol. Bull.* 21 (1), 58–75.
- Landoni, M., 2017. Innovation policy in progress. Institutional intermediation in public procurement of innovation: satellite telecommunications in Italy. *R&D Management* 47 (4), 583–594.
- Lember, V., Kalvet, T., Kattel, R., 2011. Urban competitiveness and public procurement for innovation. *Urban Stud.* 48 (7), 1373–1395.
- Lember, V., Kattel, R., Kalvet, T., 2015. Quo vadis public procurement of innovation? *Innovation. The European Journal of Social Science Research* 28 (3), 403–421.
- Li, Y., 2017. Assessing public procurement of innovation as a cross-domain policy: a framework and application to the Chinese context. *Rev. Pol. Res.* 34 (3), 421–446.
- Lindemann, N., 2019. What's the Average Survey Response Rate? [2019 Benchmark]. Retrieved February 3, 2020, from Survey Anyplace website. <https://surveyanyplace.com/average-survey-response-rate/>.
- Liu, P., Xu, Z., 2020. Public attitude towards self-driving vehicles on public roads: direct experience changed ambivalent people to be more positive. *Technol. Forecast. Soc. Change* 151 (C).
- Marsh, P.A., Poepsel, D.L., 2008. Perceived usefulness of learning outcomes predicts ratings of departmental helpfulness. *Teach. Psychol.* 35 (4), 335–342.
- Ming-Chu, Y., Meng-Hsiu, L., 2015. Unlocking the black box: exploring the link between perceived organizational support and resistance to change. *Asia Pac. Manag. Rev.* 20 (3), 177–183.
- Montes, F.J.L., Ruiz Moreno, A., García Morales, V., 2005. Influence of support leadership and teamwork cohesion on organizational learning, innovation and performance: an empirical examination. *Technovation* 25 (10), 1159–1172.
- Mwesumo, D., Olsen, K.M., Svenning, G.A., Glavee-Geo, R., 2019. Implementing public procurement of innovations in an organization: lessons from Norway. *J. Public Procure.* 19 (3), 252–274.
- Neves, P., 2009. Readiness for change: contributions for employee's level of individual change and turnover intentions. *J. Change Manag.* 9 (2), 215–231.
- Obwegeser, N., Müller, S.D., 2018. Innovation and public procurement: terminology, concepts, and applications. *Technovation* 74–75, 1–17.
- OECD, 2017. Initiative public procurement promoting innovation in Austria (PPPI initiative). Retrieved February 3, 2020, from. [https://www.oecd.org/governance/observatory-public-sectorinnovation/innovations/page/initiativepublicprocurementpromotinginnovationinaustriappiinitiative.htm#tab\\_description](https://www.oecd.org/governance/observatory-public-sectorinnovation/innovations/page/initiativepublicprocurementpromotinginnovationinaustriappiinitiative.htm#tab_description).

- Podsakoff, P.M., Organ, D.W., 1986. Self-reports in organizational research: problems and prospects. *J. Manag.* 12, 531–544.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J. Appl. Psychol.* 88 (5), 879–903.
- Purnawirawan, N., De Pelsmacker, P., Dens, N., 2012. Balance and sequence in online reviews: how perceived usefulness affects attitudes and intentions. *J. Interact. Market.* 26 (4), 244–255.
- Renny, Guritno, S., Siringoringo, H., 2013. Perceived usefulness, ease of use, and attitude towards online shopping usefulness towards online airlines ticket purchase. *Procedia – Social and Behavioral Sciences* 81, 212–216.
- Richter, N.F., Cepeda, G., Roldán, J.L., Ringle, C.M., 2016. European management research using partial least squares structural equation modeling (PLS-SEM). *Eur. Manag. J.* 34, 589–597.
- Ringle, C.M., Sarstedt, M., Straub, D.W., 2012. Editor's comments: a critical look at the use of PLS-SEM in "mis quarterly". *MIS Q.* iii–xiv.
- Rolfstam, M., 2012. An institutional approach to research on public procurement of innovation. *Innovat. Eur. J. Soc. Sci. Res.* 25 (3), 303–321.
- Sánchez-Carreira, M. del C., Peñate-Valentín, M.C., Varela-Vázquez, P., 2018. Public procurement of innovation and regional development in peripheral areas. *Innovat. Eur. J. Soc. Sci. Res.* 32 (1), 119–147.
- Sarstedt, M., Hair, J.F., Ringle, C.M., Thiele, K.O., Gudergan, S.P., 2016. Estimation issues with PLS and CBSEM: where the bias lies! *J. Bus. Res.* 69 (10), 3998–4010.
- Shah, N., Irani, Z., Sharif, A.M., 2017. Big data in an HR context: exploring organizational change readiness, employee attitudes and behaviors. *J. Bus. Res.* 70, 366–378.
- Skogli, E., Nellemann, R.G., 2016. Incentives/schemes for Risk Relief for Innovative Public Procurement. Menon Economics, Oslo.
- Spector, P.E., 2006. Method variance in organizational research. *Organ. Res. Methods* 9 (2), 221–232.
- Spector, P.E., Brannick, M.T., 2011. Methodological urban legends: the misuse of statistical control variables. *Organ. Res. Methods* 14 (2), 287–305.
- Thai, K.V., 2001. Public procurement re-examined. *J. Public Procure.* 1 (1), 9–50.
- Timmermans, B., Zabala-Iturriagoitia, J.M., 2013. Coordinated unbundling: a way to stimulate entrepreneurship through public procurement for innovation. *Sci. Publ. Pol.* 40 (5), 674–685.
- Uyarra, E., Zabala-Iturriagoitia, J.M., Flanagan, K., Magro, E., 2020. Public procurement, innovation and industrial policy: rationales, roles, capabilities and implementation. *Res. Pol.* 49 (1), 103844.
- van Winden, W., Carvalho, L., 2019. Intermediation in public procurement of innovation: how Amsterdam's startup-in-residence programme connects startups to urban challenges. *Res. Pol.* 48 (9), 103789.
- Voorhees, C.M., Brady, M.K., Calantone, R., Ramirez, E., 2016. Discriminant validity testing in marketing: an analysis, causes for concern, and proposed remedies. *J. Acad. Market. Sci.* 44 (1), 119–134.
- Wayne, H.D., MacInnis, D.J., Pieters, R., 2013. *Consumer Behavior*, sixth ed. South-Western Cengage Learning, Mason.
- Wilhelm, R.A., Miller, M.W., Gable, P.A., 2019. Neural and attentional correlates of intrinsic motivation resulting from social performance expectancy. *Neuroscience* 416, 137–146.
- Yu, C.S., Tao, Y.H., 2009. Understanding business-level innovation technology adoption. *Technovation* 29 (2), 92–109.
- Zhao, X., Lynch, J.G., Chen, Q., 2010. Reconsidering baron and kenny: myths and truths about mediation analysis. *J. Consum. Res.* 37 (2), 197–206.