Sustainable innovation in public procurement: the decisive role of the individual

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Abstract

Purpose – This study aims to highlight the effect of individual attributes of procurement professionals on goals concerning public procurement of sustainable innovation. Several barriers have been observed regarding the application of public money to achieve these goals. Most research concerning these barriers focuses on organizational factors. Corporate initiatives are typically presented as a way forward to achieve sustainable innovation. Less attention is paid to the efforts and attributes of the individual procurement professional.

Design/methodology/approach – A questionnaire was sent to 283 officials, involved in the procurement process of a large public organization.

Findings – As expected, a lack of top management support has a negative impact on sustainable innovation. Legal and regulatory complexity is less of a hindrance. The results indicate that both individual innovativeness and individual collectivism have a significant positive effect on sustainable innovation. Findings further suggest that an important way for an organization to achieve sustainable innovation is to allow individuals sufficient discretion to pursue sustainable initiatives. Many initiatives can be attributed to the individual innovativeness of procurement professionals.

Originality/value – The relation between individual attributes of procurement professionals on the application of public money to achieve goals of sustainable innovation is investigated and can serve as a basis for further study on this subject.

Keywords Public procurement, Sustainable innovation, The individual

Paper type Research paper

Introduction

In recent years, public procurement has been recognized as an important driver for encouraging innovation (Knutsson and Thomasson, 2013; Uyarra et al., 2014; Uyarra and Flanagan, 2009). Concerning the stimulation of innovation transfers, the European Commission (EC) observes a “market failure” in the European market. The demand seems unable to encourage the market to sufficiently invest in innovations. In this field, the potential power of public procurement to develop new markets is left unused (EC, 2009). The potential contribution of public procurement to sustainability is evident considering the size and impact of the sector in percent of the GDP of a country (Preuss, 2009). Additional research on intra-organizational processes in public buying organizations could provide insight in the malfunction of the market concerning sustainable innovations.

Most studies use a suppliers’ perspective to investigate the barriers that hinder public organizations to act as intelligent and informed customers (Uyarra et al., 2014). Very few studies have looked inside public buying organizations themselves to identify how specific
organizational conditions and individual characteristics affect procurement of sustainable innovations in these organizations. Many studies have focused on drivers and barriers concerning the implementation of sustainable initiatives (Walker, 2015). Most commonly, research addressed (external) legal and supply market factors and (internal) organizational factors, such as top management support and (perceived) cost of sustainability (Giunipero et al., 2012; Walker et al., 2008; Gelderman et al., 2015). Typically, these studies implicitly assume a top-down implementation of sustainable innovation initiatives. Analyses of employee initiatives in promoting sustainable innovation within their organization are scarce (Rutgering and Weitzel, 2013). In scholarly literature, corporate entrepreneurship and intrapreneurship are recognized as important research topics.

Extant literature provides an abundance of relevant factors inside public buying agencies which affect the application of government policy instruments in the markets that public buyers utilize. However, the specific role of these factors and their effects on the public procurement of sustainable innovation still remains unclear. Little is known about the influence of procurement professionals and their individual attributes on sustainable innovation in the public sector. This study aims to contribute to the body of knowledge regarding the use of public procurement to stimulate sustainable innovation, by providing deeper insight in the relevant factors that affect it, and to increase awareness in public organizations regarding the potential of procurement as an instrument for sustainable innovation.

The scope and purpose of this study is to explore whether specific individual characteristics of procurement officials actually have a significant effect on the buying behavior of the public organization regarding sustainable innovations. Specifically, we investigate the impact of organizational support, individual innovativeness, collectivism and regulatory complexity. The study also attempts to identify some relevant individual characteristics of the procurement officials regarding this subject.

Regarding the explorative character of individual aspects of procurement officials, we chose to focus on a single, large buying organization with a major effect on public procurement. In this study, we investigated the Dutch public organization “ProRail”. ProRail is the second largest public procurement organization in The Netherlands and accounts for €2.33bn of public investments every year (ProRail, 2013). (ProRail is the Dutch equivalent of Network Rail in the UK). The total amount of public investments in The Netherlands sums up to €25.8bn a year (EC, 2012). Because ProRail has a leading position in public procurement in The Netherlands, it presents an interesting case to study the factors affecting procurement of sustainable innovation.

The remainder of this paper is organized as follows. First, the literature is reviewed to construct a framework with factors influencing public procurement of sustainable innovation. Hypotheses are derived, resulting in a research model. The results of the model are presented next. We end with the conclusion, discussion and implications for future research.

**Literature review**

*Public procurement and sustainable innovation*

Different from other types of innovation, sustainable innovation is characterized by systemness, that is, “rather than dealing with the production process or product component over which they have full control, sustainable innovations engage with the larger system of which they are a part” (Boons et al., 2013, p. 3). The procurement of sustainable innovation refers to the purchasing of a new product, service or system by a public agency that requires technological innovation and that does not compromise the needs of future generations. Little is known about the way public agencies utilize the procurement function to promote sustainability.
Despite the importance of public procurement, the field is still relatively under-theorized (Lember et al., 2011). Little is known about how procurement can be utilized to promote innovation. Uyarra et al. (2014) state that future research should investigate the specific conditions or mechanisms within public procurement that actually lead to, or hinder innovation. Recent studies have provided some insight in the role of public procurement in sustainable developments. For instance, Gelderman et al. (2015) investigated intra-organizational mechanisms influencing public procurement by local government to stimulate sustainability, specifically the relation between politicians and procurement managers (Gelderman et al., 2015). In addition, researchers have identified several barriers in the procurement of sustainable innovation such as: individual factors of a cognitive and affective nature; organizational factors as managerial control, organizational structure and culture, a lack of interaction with other procuring organizations; use of rigid as opposed to outcome-based specifications; low competences of procurers; lack of mandate given to the procurer; group adaptation processes; and poor management of risk; cumbersome prequalification procedures and conditions (Green, 2010; Preuss and Walker, 2011; Sporrong and Bröchner, 2009; Uyarra et al., 2014).

**Barriers to public procurement of sustainability**

There is an increasing recognition that organizations must address the issue of sustainability in their operations. In implementing public procurement of sustainable and innovative products and services, psychological aspects have to be taken in consideration. Preuss and Walker (2011) investigated psychological barriers to implementing sustainable development in procurement by local government and health care authorities. They found several aspects influencing the procurement of sustainable products and services and constructed a framework of psychological barriers to sustainable procurement by public bodies. Individual and organizational aspects play an important role in the public procurement of innovation and sustainability. The Preuss and Walker (2011) framework consists of:

- individual factors of both a cognitive and affective nature that interact with organizational factors, such as managerial control, organizational structure and organizational culture;
- adaptation processes in small working groups, which may provide anchorage for individuals but also produce conformity pressures;
- adaptation processes in the wider organization, like intra-organizational resistance and coordination problems in large decentralized organizations; and
- adaptation processes between organizations, comprising of a range of isomorphic pressures, issues of coordination horizontally between different public sector organizations and vertically between various members of public sector supply chains as well as consideration for the local situation of specific local government authorities and health care organizations.

**Relevance of individual attributes of procurement officials**

Scholarly literature on innovation distinguishes between entrepreneurial activities that are initiated top-down by the organization (corporate entrepreneurship) and entrepreneurial activities that are pursued bottom-up by employees within an organization (intrapreneurship) (Kuratko, et al., 2005; Rigtering and Weitzel, 2013). Although research has highlighted the importance of autonomous bottom-up strategic behavior of employees
(Kuratko et al., 2005), in many cases top-down induced behavior is typically presented as a way forward to sustainable innovation. In that line of thinking, the entrepreneurship literature predominantly treats managers as a homogenous group (Hornsby et al., 2009), while managers can be very different concerning their entrepreneurial behavior and underlying competencies (Hayton and Kelley, 2006).

Individual attributes of procurement officials seem to affect the procurement of sustainable innovations by public organizations. Therefore, it is important to understand whether and which individual attributes are relevant to the subject.

**Development of hypotheses**

**Lack of organizational support.** A governmental efficiency review in the UK found several hindering factors for the public procurement of innovative products and services. Factors found were lack of organizational support, coordination between purchasing units within the same government, the inability to leverage the buying power of the government and a lack of mandate given to the purchaser. (Green, 2010). These factors complicate the public procurement process and create thereby obstacles for small suppliers to enter public procurement processes (Karjalainen and Kemppainen, 2008; Knutsson and Thomasson, 2013; Morgan, 2008).

In contrast, organizational structure and culture that are conducive towards sustainable innovation are considered very important. Sustainable solutions may be perceived as expensive and require a large investment while not resulting in immediate returns. The support of top management is important to foster the procurement of sustainable innovation. We predict:

**H1.** Lack of organizational support is negatively related to the procurement of sustainable innovation.

**Individual innovativeness.** Researchers found indications that policy incentives alone do not guarantee the practical use of procurement of sustainable solutions. Sporrong and Brochner found a lack of procurement skills amongst local government procurement professionals concerning their responsibilities towards the procurement of sustainable solutions and suggest training of these professionals to solve the problem (Sporrong and Bröchner, 2009). This indicates similarities with the findings of Uyarra et al. (2014), where suppliers perceived low competences of procurers as one of the barriers for public procurement of innovation. Preuss and Walker (2011) also justify a focus on psychological aspects regarding the barriers towards sustainable procurement by positioning it as a prerequisite for understanding and explaining how individuals inside public organizations deal with these barriers. Procurement professionals have their own individual strategy, needs and goals which may differ from the organization, resulting in a series of internal and external adaption processes within the organization. Preuss and Walker (2011) distinguish between psychological factors of affective and psychological factors of a cognitive nature. Individual cognitive attributes of the procurer such as information processing; sense-making; information dissemination and reflective learning, are expected to have a positive effect on the public procurement of sustainable innovation (Akgün et al., 2003; Bandura, 1986; Preuss and Walker, 2011).

The safety and support at work (i.e. psychosocial factors) promote risk-taking which is inherent to innovation (Aschhoff and Sofka, 2009). In addition, a public procurement professional’s engagement in sustainable innovation requires the person to be willing to be innovative and open to new experiences (i.e. psychological factors). Individual innovativeness is related to the individual’s orientation towards the adoption of new ideas and practices. (Hurt et al., 1977). Therefore, the adaptation of new ideas and practices...
concerning sustainability by the procurer is also to be expected to have a positive effect on the public procurement of sustainable innovation:

**H2.** Individual innovativeness as a personal attribute is positively related to the public procurement of sustainable innovation.

**Collectivism.** Individualism and collectivism refer to a longstanding dichotomy on orientations on personal attributes. Typical for collectivism is that relationships rest on assumptions of common bonds, rather than on personal independence (Triandis, and Charalambos, 1995). Judgment, reasoning and causal inference are in case of collectivism generally oriented toward a specific situation or social context.

The individual attribute “collectivism” in contrast to the attribute “individualism” is expected to have a positive effect on the behavior of the individual to societal goals, such as sustainable procurement: “Collectivists are closely linked individuals who view themselves primarily as parts of a whole, be it a family, a network of co-workers, a tribe or a nation. Such people are mainly motivated by the norms and duties imposed by the collective entity, where individualists are mainly motivated by their own preferences, needs, and rights, giving priority to personal rather than to group goals” (Triandis, and Charalambos, 1995).

Cho et al. (2013) found “horizontal collectivism, vertical collectivism and Confucian collectivism significantly related to environmental attitude” (Cho et al., 2013). Collectivist procurers are therefore likely to adopt environmental issues, resulting in a preference towards procurement of sustainable rather than non-sustainable products, processes and services. We expect:

**H3.** Collectivism as a personal attribute is positively related to the public procurement of sustainable innovation.

**Regulatory complexity.** Expectations abound that flexible regulations concerning procurement and sustainability can at times enhance innovation (Pelkmans and Renda, 2014). However, prescriptive and complex regulation may result in inflexible procurement processes, forming an obstacle for the public procurement of innovation (Knutsson and Thomasson, 2013). Complex regulations stimulate risk avoidance behavior of the public procurement professional and consequently hinder creation of market opportunities for the procurement of sustainable innovation (Aschhoff and Sofka, 2009; Schapper et al., 2006; Uyarra and Flanagan, 2009).

Studies reveal that purchasers within public buying organizations within the European Union consider EU procurement legislation as complicated and “play it safe” to avoid problems in the tendering process (Aschhoff and Sofka, 2009; Schapper et al., 2006). Playing it safe however means avoidance of risks, and it is therefore resulting in inflexible procurement processes (Uyarra and Flanagan, 2009). Aschoff and Sofka (2009) found that the use of public procurement to stimulate innovation is effective in particular for smaller firms in regional areas under economic stress and in distributive and technological services (Aschhoff and Sofka, 2009). Smaller actors in the market are however hindered by their perceived lack of legal and administrative knowledge to participate in public tendering processes (Karjalainen and Kemppainen, 2008). Consequently, larger suppliers dominate several of the markets for public services. The complex public procurement regulation could therefore be regarded as hindering innovation in several markets (Knutsson and Thomasson, 2013). We expect:

**H4.** Regulatory complexity is negatively related to the procurement of sustainable innovation.
Methodology

Research design

Data were gathered by administering a questionnaire to employees of the Dutch public organization ProRail (Figure 1). The chosen organization is a very large public organization with an added focus on innovation and sustainability. Although multiple cases could provide additional evidence to support the results, our research design has the advantage of excluding the influence of confounding variables. We have thus controlled for differences between organizations and industries by surveying professional within one organization.

A questionnaire was constructed and distributed among 283 officials involved with the procurement process. With a yearly spend of $2.5bn, ProRail is the second largest public buyer in The Netherlands. Moreover, ProRail controls and shapes the entire market for railway infrastructure in The Netherlands. The legal form of ProRail is a LLC, where all shares are owned by the state (ProRail, 2013). Within ProRail three types of professionals are in some way linked to the procurement process and have an influence on how the procurement process is shaped:

- the project manager, who is responsible for the entire project, including finance, time, risk and compliance with rules and legislation;
- the tender manager, specialized in the tender process and tender legislation, specifying the legal and compliance part of the tender and the contract; and
- the system-engineer, responsible for formulating the functional and technical part of the tender and the contract.

The survey was first pre-tested by a panel of two tender managers and three project managers. After refining some questions, a survey was distributed to 283 employees, of which 119 project managers; 29 tender managers; 128 system engineers and seven managers. After sending a reminder a total of 127 forms were finally returned, for a response rate of 45 per cent. Table I shows the response rates for the different job titles.

![Research model](image-url)

**Table I**

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>41%</td>
</tr>
<tr>
<td>Tender Manager</td>
<td>41%</td>
</tr>
<tr>
<td>System Engineer</td>
<td>45%</td>
</tr>
<tr>
<td>Manager</td>
<td>41%</td>
</tr>
</tbody>
</table>

**Figure 1.**

Research model
Measures

Adopting prior studies (Weber et al., 2002), constructs were measured by means of multiple-item scales. For most measures, we used five-point Likert scales ranging from 1 (negative assessment of the trait e.g. strongly disagree) to 5 (positive assessment of the trait e.g. strongly agree). Some items were reverse coded to control for response bias.

The composite reliability values of 0.80 and higher show that the constructs have high levels of internal consistency (0.70 = threshold). In addition, the AVE (average variance explained) values of the constructs were above the threshold level of 0.5 which shows that the set of indicators explain more than half of its variance (Table II). Finally, the latent variable correlations show that each construct is truly distinct from other constructs in the model (Table III). Each latent variable shared more variance with its own measures than with measure of other constructs. Thus, we conclude that all constructs have sufficient discriminant and convergent validity.

Table I.
Response rate per job title

<table>
<thead>
<tr>
<th>Job title</th>
<th>No. approached</th>
<th>No. of responses</th>
<th>% of Response</th>
<th>% of Response per job title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project manager</td>
<td>119</td>
<td>73</td>
<td>57.5</td>
<td>61.3</td>
</tr>
<tr>
<td>Tender manager</td>
<td>29</td>
<td>9</td>
<td>7.1</td>
<td>31.0</td>
</tr>
<tr>
<td>Manager</td>
<td>9</td>
<td>9</td>
<td>7.1</td>
<td>100</td>
</tr>
<tr>
<td>System-engineer</td>
<td>128</td>
<td>36</td>
<td>28.3</td>
<td>28.1</td>
</tr>
<tr>
<td>Total</td>
<td>283</td>
<td>127</td>
<td>100</td>
<td>44.8</td>
</tr>
</tbody>
</table>

Table II.
Validity and reliability

<table>
<thead>
<tr>
<th>Construct</th>
<th>Composite reliability</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of organizational support</td>
<td>0.736</td>
<td>0.512</td>
</tr>
<tr>
<td>Individual innovativeness</td>
<td>0.885</td>
<td>0.720</td>
</tr>
<tr>
<td>Collectivism</td>
<td>0.819</td>
<td>0.693</td>
</tr>
<tr>
<td>Regulatory complexity</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>Public procurement of sustainable innovation</td>
<td>0.679</td>
<td>0.527</td>
</tr>
</tbody>
</table>

Table III.
Latent variable correlations

<table>
<thead>
<tr>
<th>Construct</th>
<th>Lack of organizational support</th>
<th>Individual innovative-ness</th>
<th>Collectivism</th>
<th>Regulatory complexity</th>
<th>Sustainable public procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of organizational support</td>
<td>0.716</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual innovativeness</td>
<td>-0.079</td>
<td>0.849</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collectivism</td>
<td>0.012</td>
<td>0.124</td>
<td>0.832</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory complexity</td>
<td>0.018</td>
<td>0.019</td>
<td>-0.084</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sustainable public procurement</td>
<td>-0.192</td>
<td>0.294</td>
<td>0.270</td>
<td>-0.129</td>
<td>0.726</td>
</tr>
</tbody>
</table>

Note: Numbers shown in italic represent the square root of the average variance extracted.
Results
We used structured equation modeling (SEM-analysis) to test the plausibility of our causal model. The advantage of this method compared to regression is that it allows analyzing a system of variables at once. We specifically decided to use the variance-based PLS-SEM approach. The goal of our study was to provide deeper insight in the relevant factors that affect public procurement of sustainable innovation. We also used PLS-SEM because the measurement properties are less restrictive; therefore, we could incorporate constructs with fewer items in the model (Hair et al., 2011). With SmartPLS we investigated the model’s reliability and validity, calculated the outer weights and loadings and assessed the structural model’s path coefficients.

In the critical meta-analysis of Ringle et al. (2012) on the use of PLS-SEM in MIS Quarterly, it was reported that the most frequently cited reason for using PLS-SEM relate to small sample sizes, and the use of formatively measured latent variables. A common argument for using PLS-SEM is that the technique excels at prediction. If correctly applied, PLS-SEM can be a “silver bullet” for estimating causal models in many model and data situations (Hair et al., 2011). Our study is of a formative nature which prompted the use of PLS.

Next, we analyzed the structural model which represents the relationships between the constructs that were hypothesized in the research model. The variance explained by the model is 21.3 per cent, indicating “Public Procurement of Sustainable Innovation” can be explained by the constructs “Lack of Organizational support”; “Individual Innovativeness”; “Collectivism”; and “Regulatory Complexity”. The results show that a significant negative relation exists between the construct “lack of organizational support” and “public procurement of sustainable innovation” ($\beta = 0.237; p < 0.05$), supporting our hypothesis (H1). In addition, results show that a positive significant relation exists between the constructs “Individual Innovativeness” and “public procurement of sustainable innovation” ($\beta = 0.264; p < 0.05$) providing support for hypothesis H2. The construct “collectivism” also appears to be positively related to “public procurement of sustainable innovation” ($\beta = 0.261; p < 0.05$), proving support for the hypothesis (H3). Finally, no significant effect was found for the influence of “regulatory complexity” on “public procurement of sustainable innovation” ($\beta = -0.101; p = 0.212$), where a negative effect was expected (Table IV).

Discussion, conclusion and recommendations
We investigated the procurement of sustainable innovation from the perspective of the public buying organization. Our results indicate that both individual innovativeness and individual collectivism appear to have a significant positive effect on the public procurement of sustainable innovation. Lack of organizational support also has a significant effect, hindering sustainable innovation. However, factors on the individual level appear stronger than factors on the organizational level. It could be that the psychological and psychosocial factors reflect the degree of empowerment and individual responsibility, which should be

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Paths</th>
<th>$\beta$</th>
<th>$T$-values</th>
<th>$p$-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Supported</td>
<td>Lack of organizational support → Public procurement</td>
<td>$-0.237$</td>
<td>2.663</td>
<td>0.008</td>
</tr>
<tr>
<td>2 Supported</td>
<td>Individual innovativeness → Public procurement</td>
<td>0.264</td>
<td>3.935</td>
<td>0.000</td>
</tr>
<tr>
<td>3 Supported</td>
<td>Collectivism → Public procurement</td>
<td>0.261</td>
<td>3.467</td>
<td>0.001</td>
</tr>
<tr>
<td>4 Not supported</td>
<td>Regulatory complexity → Public procurement</td>
<td>$-0.101$</td>
<td>1.250</td>
<td>0.212</td>
</tr>
</tbody>
</table>

Table IV. Structural path model
encouraged by top management (Odoardi et al., 2015; Pearce et al., 2014). For the construct “regulatory complexity” no significant relation could be found.

In our quest for better understanding, we further organized a series of interviews with thirteen key executives of the organization. They were asked to give their expert opinion on the most pressing issues hindering sustainable innovation. Interestingly, the organization and legal factors were mentioned most frequently in these interviews. Especially, a management focus on performance issues was considered the main barrier. Performance objectives were thought to negatively impact sustainable innovation initiatives. In addition, the complexity of legislation and governmental guidelines were seen as prohibitive. These findings are in contrast with the results of our survey study within the same organization. Our survey of 283 purchasing professionals underlines the decisive role of individual professionals. Our findings suggest that one of the ways for an organization to achieve sustainable innovation is to empower its professionals.

This study provides some new insights for practical use. It appears that for the application of the instrument “public procurement” with the objective to enhance sustainable innovation, merely putting “sustainability” as a strategic goal or appointing “sustainable innovation” as a specific program by the public organization is not enough to exploit the full force of public money to promote sustainability and innovation. Top management of public organizations should empower individuals who are genuinely concerned with the procurement process. Separate departments typically have separate objectives, whereas sustainability and innovation objectives are overarching. Combining sustainability and innovation objectives with other performance objectives such as reliability, safety and cost savings is apparently key in our case organization. Sustainable innovations appear to stem from creative, inventive and innovative employees, who manage to deploy public money on sustainable, innovative products, services and processes. Our findings suggest that an important way for an organization to achieve sustainable innovation is to allow individuals enough discretion to pursue sustainable initiatives.

The study has a number of limitations. Our study was conducted within one single public organization in The Netherlands. The use of a single case study obviously limits the external validity of the results. The results should therefore be interpreted with caution. The conclusions are derived from a single public organization and could be tested in another research setting. In addition, it is conceivable that Dutch public agencies are friendlier towards green procurement policies and innovation. The organizational aspects could be regarded as fairly constant within one organization. Furthermore, our model is by no means a comprehensive model. Future research could extend this model or look for different connections between the constructs. In addition, our findings are based on a relatively small sample size which limits the extent to which the results can be generalized. Given these characteristics the research findings should be viewed as exploratory rather than conclusive. For academic and practical purposes, it would be interesting to duplicate this study in another public buying organization in The Netherlands. Conducting this research in another EU country would provide useful complementary insights, placing the research in another social and cultural setting, possibly providing different results on the relation between the cultural-related construct collectivism and public procurement of sustainability. It also could be useful to carry out a longitudinal study that could capture a possible changing societal attitude towards sustainability, represented in the attitudes of the public procurement professionals.
References


Further reading


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