

Public Procurement of Innovation in Construction: A Design Science Approach

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Abstract – The inclusion of innovation as a policy objective in public procurement has increased significantly at public organizations over the last years. However, public organizations often struggle with how they should stimulate innovation through public procurement as there are many different ways possible and knowledge on the efficiency and effectiveness of different methods is relatively scarce and mostly based on case studies. In this study a combined approach of design science and engaged scholarship will be followed to (1) identify the factors that influence the impact of public procurement of innovation; (2) develop recommendations for including innovation in the public procurement strategy of municipalities and (3) develop tools that can be used in individual procurement projects.

Keywords—Public procurement, innovation policy, design science

I. INTRODUCTION

A growing interest in public procurement as an instrument to stimulate innovation in the private sector, has significantly increased the inclusion of innovation as a horizontal policy objective for procurement in public organizations in the last decade [1, 2]. The main objective of public procurement is to obtain goods, works or services on the best terms, whereas horizontal policy objectives also cover other objectives such as regional development, social return, and sustainability [3]. From a national or international policy perspective innovation can be seen as an objective on its own as it is widely acknowledged to contribute to technological development, competitiveness and economic development and growth. Moreover, it has an important role in addressing societal challenges (e.g. climate change, energy, and depletion of the earth's resources). However, in public procurement practice the stimulation of innovation is usually not an objective on its own. Instead, it is generally a means to contribute to organizational goals, such as public safety, health, transportation, public facilities, regional economic growth and employment, and often coupled with other policy objectives such as sustainability, social return and stimulation of small and medium enterprises [4].

As challenges for public organizations have increased over the years and are likely to continue to increase, public organizations realize more and more that they need to make use of the knowledge and experience of private organizations next to their own knowledge and experience in order to reach their organizational objectives. Public

procurement of innovation can be seen as a tool to utilize the knowledge and experience of private organizations, to stimulate the development of new improved solutions and to obtain a higher value over money ratio of procured goods, works and services on the middle to long term. However, public procurement of innovation is a very broad notion, defined by Rolfstam as “purchasing activities carried out by public agencies that lead to innovation” [5, 6]. As such, there are many different ways to stimulate innovation through public procurement and most research on public procurement of innovation focuses on a specific approach to stimulate innovation through public procurement. For example, the use of a specific award mechanism for public contracts [7], functional specification of requirements [8] using a specific procurement procedure [9], integrated contracts e.g. by combining design and execution of public works [10], reducing uncertainty of future demand [11], and best value procurement [12]. Knowledge on the efficiency and effectiveness of different methods for stimulating innovation through public procurement is still relatively scarce and is often based on specific case studies [13-18]. For these reasons public organizations struggle with how they should include innovation in their organizational procurement strategy, and stimulate innovation or specifically procure innovative solutions in practice.

This research focuses on the use of public procurement of innovation at municipalities in the construction sector for a number of reasons. Most of the public money spend through procurement is spend by decentralized public agencies in which municipalities take a large share. If these considerable budgets are used to stimulate innovation through procurement, this might lead to a substantial impact in the development of innovative solutions. The construction sector represents a significant share of the procurement budgets [19] and it has a great impact on organizational objectives of municipalities, like economic growth, employment and wellbeing of civilians in general. In addition, innovations in the construction sector may have large positive effects on sustainability, as construction is considered to be a polluting industry in terms of CO_2 emissions and energy consumption.

The aim of this research is to improve the impact of public procurement of innovation at municipalities in the construction sector by:

1. Identifying factors and relations between factors which influence the *impact* of public procurement of innovation;

Financial support for this research is provided by the municipalities of Amsterdam and Eindhoven
(The Netherlands)

2. Translating these factors in recommendations for including innovation as a policy objective in the procurement strategy in the physical domain of public organizations; and
3. Translating the factors and organizational procurement strategy in the physical domain in tools for stimulating innovation, or specifically procuring an innovative solution, in individual projects.

We consider the *impact* of public procurement of innovation to be twofold:

- 1) The extent to which public procurement stimulates innovation in the private sector, and
- 2) The extent to which these innovations contribute to reaching the organizational goals and policy objectives of public organizations.

II. METHODOLOGY

The research methodology is based on the principles of design science[20, 21] and engaged scholarship [22, 23]. The combination of design science and engaged scholarship is used to develop insights, recommendations and tools for improving public procurement of innovation in active collaboration with stakeholders and practitioners in the field. The research design consists of three main parts (see fig.1). The first part consists of a literature study to obtain relevant knowledge with respect to: a) theories, frameworks, models and methods with respect to public procurement of innovation; b) factors influencing the impact of public procurement of innovation; and c) methodologies on empirical research and design science to ensure academic rigor of applied research methods.

The second part consists of empirical research to obtain relevant knowledge on stimulating innovation in construction through public procurement with a focus on large municipalities. In consultation with the participating public organizations three topics were identified to address this research from multiple perspectives. The first is the evaluation of different public procurement of

innovation projects in construction. The second is stimulating innovation at sub-suppliers via direct suppliers, and the third topic focuses on the required conditions for innovation from a supplier perspective and the extend that suppliers are stimulated to innovate through procurement. In addition to these topics a focus on the public organizations and their internal work processes is of critical importance for stating the requirements and evaluating of the products developed in this research.

The third part of the research will focus on the actual design part of the research. Here, all the knowledge obtained from literature and empirical research on factors influencing the impact of public procurement of innovation is used to develop recommendations for including innovation in the procurement strategy of municipalities and to design tools which can be used for stimulating innovation or procuring innovative solutions in individual projects.

Although the research design may appear linear on first sight, it is designed to be performed in different development cycles, in which new knowledge is used to refine the requirements and optimize the developed tools and products, to refine the focus and methods for empirical research and to contribute to the existing body of knowledge. In fact, each development cycle consists of a number of sequential steps: 1) problem investigation based on literature study and empirical research, 2) development of insights, recommendations and tools based on requirements, and 3) evaluation of developed insights, recommendations and tools against requirements, and the existing body of knowledge in literature and practice. The fourth part, the implementation of the developed products, is not part of this research although essential for having a substantial impact on society [22].

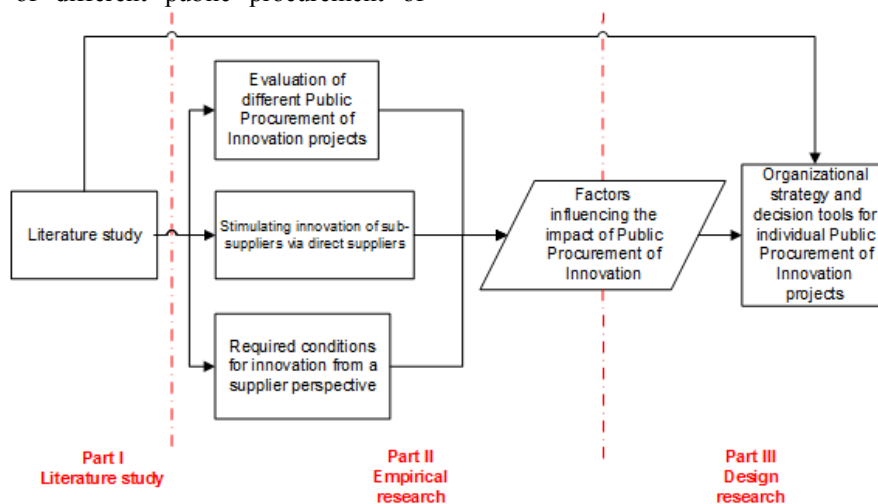


Fig. 1. Research design

III. PRELIMINARY RESULTS

Based on a literature study and preliminary research some preliminary findings will be discussed in this section. The first subsection is linked to factors influencing the impact of public procurement of innovation, which is the focus of part I and part II of the research. The second subsection is linked to the design part of the research.

A. Factors influencing the impact of public procurement of innovation

Public procurement of products and services in the construction sector occurs in a complex environment with a lot of different stakeholders and interests. One of the things that makes public procurement in the construction sector different from public procurement in most sectors is the project-based nature of work processes, in which temporary project teams from one or more public client(s) as well as collaborating suppliers address a need or problem which is often unique on several aspects, e.g. location, budget, stakeholders, and requirements[24, 25].

Based on our knowledge in construction, innovation and public procurement, we argue that factors influencing the impact of public procurement of innovation may stem from: 1) within the public organization; 2) the involved suppliers; 3) the specific nature of the project and its environment; and 4) external institutions on which neither the client nor the suppliers have influence, such as regulations, law, policy and treaties. Factors stemming from the public organizations can for example be associated with the structure of the organization, the way work processes, responsibility and authorizations are organized, knowledge and expertise of individuals or cultural aspects such as risk favorable or adverse behavior. Factors stemming from the suppliers are likely to be associated with the extent to which suppliers are stimulated to innovate through public procurement, what they may gain from it with respect to the situation in which they do not innovate, and the extent to which they are able to innovate (e.g. power position and position in the supply chain)[26]. The impact of the specific nature of the projects and its environment on public procurement of innovation is often unpredictable a priori, though may be vary significant in some cases. The extent in which external institutions may affect the stimulation of innovation through public procurement is still a topic of debate in literature [5, 27].

B. Organizational strategy and tools for individual projects

In a paper on innovation impacts of public procurement Uyarra and Flanagan stated that most of the debate on stimulating innovation through public procurement is focused on a number of successful cases, which are not representative for public procurement in daily practice [18]. As a result we expect that public organizations have to decide whether they will opt for a limited set of

projects which are expected to deliver radical innovations against high efforts from the public organization as well as from suppliers, or opt for stimulating innovation over a large number of projects, in which innovation is not a primary objective and where projects are expected to deliver incremental innovations or no innovation at all. Moreover, there are types of projects which are more suitable for stimulating innovation than others and decisions have to be taken in what type of projects innovation will be stimulated through public procurement and in what type of projects this will be deliberately avoided.

Knowledge from literature and empirical research will be used to provide information and recommendations for these types of decisions and policy making on the role of stimulating innovation in the procurement strategy of public organizations. Further it will deliver tools which can aid decision making on how to stimulate innovation in individual projects, depending on the context of the project and the goals which it should deliver.

IV. CONCLUSION

The use of public procurement as an instrument for stimulating innovation in private organizations has attained an increasing amount of interest over the last decade, which led to a major increase in the inclusion of innovation as a horizontal policy objective in the procurement strategy of public organizations. However, public organizations often struggle with how they should stimulate innovation through public procurement, as there are many different ways possible and knowledge on the effectiveness and efficiency of different methods is relatively scarce.

In order to address this problem this study uses a design science and engaged scholarship approach to develop products and recommendations for including innovation as a policy objective in the procurement strategy in the physical domain of municipalities and other decentralized public organizations, and to develop tools which can aid decision making on how to stimulate innovation in individual projects. There are two premises underpinning this approach. First, the research is expected to contribute to academic knowledge as well as knowledge which can be used to improve public procurement of innovation in practice[28]. Second, grounding research in practice and actively involving experts in the field, who provide alternative and possibly conflicting perspectives, is expected to lead to more reliable and robust knowledge in this specific field of research. From a methodological perspective we state that this research adopts a critical realism approach, which assumes that there is a real world out there independent of the observer, but our attempts to understand this reality are severely limited[22].

The initial literature study and empirical research focuses on identifying factors and relations between

factors which influence the impact of public procurement of innovation. This impact is considered to be twofold: 1) the extent to which public procurement stimulates innovation in the private sector, and 2) the extent to which these innovations contribute to reaching the organizational goals and policy objectives of public organizations. We argue that the factors which influence the impact of public procurement of innovation may stem from: 1) within the public organization; 2) the involved suppliers; 3) the specific nature of the project and its environment; and 4) external institutions on which neither the client nor the suppliers have influence, such as regulations, law, policy and treaties. Further we expect that this research will contribute to decision making with respect to the procurement strategy in the physical domain of public organizations (e.g. with regard to the suitability of different type of projects for inducing innovation through public procurement and with respect to which methods should be used in which case). We consider the latter example of vital importance for decision making in individual projects along with the timing for determining the procurement strategy and scope.

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