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Rethinking Public Procurement in the context of Socio-technical Transitions

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Resumo

O desafio do Desenvolvimento Sustentável requer “transições” ou “inovações sistêmicas” para sistemas socio-técnicos mais sustentáveis. Na Europa, as políticas deixaram de estar apenas centradas no lado da oferta para se focarem no lado da procura, onde as compras públicas desempenham um papel proeminente. Este interesse reflecte-se também nas autoridades públicas, resultando num fator de mercado com enorme potencial para mudar os atuais padrões de produção e consumo. Esta tese explora a forma como as organizações públicas podem repensar as suas práticas de compra, alargando a sua visão e ambição, através de um processo de mudança de cultura, estratégia, estrutura e práticas, contribuindo para a emergência de transições socio-técnicas, ou transições para a sustentabilidade.

A tese contribuiu para a literatura através do desenvolvimento de um quadro analítico constituído por dois instrumentos que se complementam: o Modelo STP, que prescreve práticas que influenciam a transformação dos sistemas socio-técnicos, integrando diferentes abordagens para as compras públicas (compras ecológicas, para a sustentabilidade e para a inovação) numa estrutura de três níveis (nicho, regime e paisagem); e o Processo STP, que descreve o papel das compras públicas como mecanismo de governança no desenvolvimento de nichos, no contexto das transições socio-técnicas.

O Modelo STP é operacionalizado numa ferramenta prática – a *SPP Toolbox*—desenhada para apoiar as organizações públicas neste processo de repensar as suas práticas de compra. A *SPP Toolbox* integra, numa só ferramenta, diferentes abordagens e diferentes níveis, incluindo compras ecológicas, sustentáveis e para a inovação, bem como as dimensões organizacional e inter-organizacional. Esta integração permite flexibilidade nos objetivos a atingir, que podem ser desenvolvidos em níveis crescentes de complexidade, de acordo com as características, experiência e conhecimentos da organização.

Por último, a *SPP Toolbox* foi testada em casos de estudo em diferentes contextos, mostrando que organizações públicas de diferentes tipos - dimensão, estrutura organizacional, poder de compra e nível de experiência – são capazes de implementar esta ferramenta, melhorando o desempenho, ambição e visão das suas práticas de compras. Estas aplicações práticas forneceram evidências para a demonstração do funcionamento do modelo e processo de compras numa perspetiva de transições para a sustentabilidade (Modelo STP e Processo STP).

Palavras-chave:

Compras Públicas Ecológicas; Compras Públicas Sustentáveis; Compras Públicas para a Inovação; transições socio-técnicas.

Abstract

Addressing sustainable development requires a “transition” or “system innovation” away from the current socio-technical system. In Europe, the focus of sustainability policies moved from the supply to the demand side, in which public procurement plays a prominent role. This interest is spreading through authorities at different government levels, resulting in a market factor with enormous potential to shape production and consumption trends. This thesis explores how public organizations can re-think the procurement process, raising their ambitions and broadening their vision, changing their organizational approach towards culture, strategies, structures, and practices, contributing to the emergence of socio-technical transitions or sustainability transitions.

The research contributed to the literature by developing an analytical framework linking the fields of public procurement and transitions, constituted by two complementary instruments: the STP Model, which prescribes practices that influence the transformation of socio-technical systems, integrating different approaches to public procurement, (green, sustainable and innovation procurement), in a three-level structure (niche, regime, and landscape); and, the STP Process, which introduces a dynamic perspective of the process of using public procurement as a governance mechanism in the context of socio-technical transitions.

The STP Model was further operationalized into a practical tool - the SPP toolbox-- to support public organizations in the process of re-thinking the procurement process. The SPP Toolbox incorporates different approaches at different levels, including procurement practices (GPP, SPP, PPI), as well as the organizational and inter-organizational dimensions, into one tool. This allows for flexibility in the objectives to be achieved, which can be developed in increasing degrees of complexity, according to the characteristics, experience, and knowledge of the organization.

Finally, the SPP Toolbox was tested in case studies and in different contexts, showing that public organizations of different types – regarding dimension, organizational structure, purchasing power and level of experience – were able to improve the performance, ambition, and vision of their procurement practices by implementing the tool, providing evidence for part of the STP Model and the STP Process.

Keywords:

Green Public Procurement; Sustainable Public Procurement; Public Procurement of Innovation; Socio-technical transitions.

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List of abbreviations

CP	Circular Procurement
EU	European Union
GPP	Green Public Procurement
ICLEI	Local Governments for Sustainability
IPR	Intellectual Property Rights
LCC	Life-Cycle Costs
LNEG	National Laboratory of Energy and Geology
MLP	Multi-Level Perspective
OECD	Organisation for Economic Co-operation and Development
PCP	Pre-Commercial Procurement
PPI	Public Procurement of Innovation
SME	Small and Medium size Enterprise
SNM	Strategic Niche Management
SPP	Sustainable Public Procurement
SPPI	Sustainable Public Procurement Initiative
STP	Sustainability Transitions Procurement
TM	Transition Management

CHAPTER 1. INTRODUCTION

INTRODUCTION

1.1. Relevance of the study

The context

The challenge of sustainable development requires a radical change in the actual production and consumption patterns, involving a “sustainability transition” or “system innovation” from one socio-technical system to another (Smith et al., 2010). In Europe, the focus of sustainability policies has changed from supply to demand side policies, in which public procurement plays a prominent role as a key strategic approach for achieving sustainability and innovation goals (Edler and Georghiou, 2007). This interest is spreading through authorities at different government levels, resulting in a very powerful market factor (Testa et al., 2012).

The need or problem

Yet, this enormous potential remains largely unexplored, as transitions theory, dedicated to studying what specific transformations are required to change socio-technical systems into more sustainable states, neglects the role of public procurement in steering system transitions. This problem is reinforced by the slow uptake of Green Public Procurement, Sustainable Public Procurement and Public Procurement of Innovation practices by public organizations.

How this study addresses the need

To address this problem, this thesis proposes to link the fields of public procurement and transitions theory, with the broader aim of exploring the role of public procurement as a governance mechanism for the transformation of socio-technical systems.

The contribution of this study

The thesis contributes to a wider perspective on public procurement and to an improved understanding of how public organizations can effectively orchestrate the emergence of new and more sustainable systems through their procurement activities.

1.2. Background

The following sections provide an overview of the theoretical bases that support the research, given the proposal to link the fields of public procurement and transitions theory.

1.2.1. A broader perspective on sustainability

Since the 1970s several studies have shown that the Earth's capacity to sustain human populations, with current production and consumption patterns, is reaching its limit (Cleveland and Ruth, 1997; Georgescu-Roegen, 1975, 1971; Meadows et al., 1972). The term Sustainable Development was formally adopted in the United Nations Conference on Human Environment in 1972 (Bolis et al., 2014), but it became well known with the Brundtland Report (WCED, 1987), which forced the embracement of sustainable development as a top priority of the United Nations' agenda, obtaining a remarkable consensus on society and development banks (Daly, 1990). The report included what is one of the most widely recognized definitions of sustainable development (WCED, 1987):

“Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

The support for an economic growth contributed, above all, to the adoption of the WCED' definition by business and governments, and therefore, the implementation of the concept did not cause substantial changes in the development path (Bolis et al., 2014; Daly, 1990).

Since then, mainstream policies continue to call for economic growth, leading to increased environmental degradation, including resource scarcity and climate change (Kemp et al., 2007). By aiming to combine economic wealth and environmental protection with social cohesion, there are trade-offs between the three goals of sustainable development (Kemp et al., 2007). In other words, the focus on incremental innovation along established paths does not suffice for achieving sustainability goals, and thus radical changes are required (Kemp et al., 2007; Nill and Kemp, 2009).

The efforts to decouple economic growth from environmental degradation highlighted the role of innovation within sustainable development, by placing particular emphasis on the direction of innovation – not only focusing on economic potential but also addressing environmental and social consequences (Smith et al., 2010).

This emphasis on innovation was translated at the policy level. The European Commission proposed the Innovation Union Flagship Initiative (European Commission, 2010a), aiming to ensure that new knowledge-intensive products and services contribute substantially to growth and jobs. Also, the latest Communication for a European Industrial Renaissance (European Commission, 2014a) sets out the European Commission's key priorities for industrial policy. At the global level, the Organisation for Economic Co-operation and Development (OECD) has endorsed its Innovation Strategy (OECD, 2010).

Innovation studies have much to offer in understanding how and why more sustainable production and consumption practices establish, or not (Smith et al., 2010). The concern for sustainable development resulted in a broader perspective on innovation studies: from the focus on cleaner production in the 1980s to the innovation of entire systems of production and consumption (Smith et al., 2010); from a neo-classical environmental economics to a system innovation perspective (Smith et al., 2010); and, from individual organizations to networks of organizations (Geels, 2004).

This broader perspective has oriented innovation studies on wider, linked processes that transform systems of social and technological practice into more sustainable configurations, as they fulfil societal needs (Smith et al., 2005). In this context, innovation is considered socio-technical, as technological innovations induce social innovations and vice versa (Raven et al., 2010).

Within this notion, socio-technical systems include technology, regulations, user practices, markets, cultural meaning, infrastructures, and networks. Transitions involve multi-dimensional interactions between technology, policy/power/politics, economics/business/markets and culture/discourse/public opinion, requiring a combination of technical, organizational, economic, institutional, socio-cultural and political changes (Geels, 2011; van den Bergh et al., 2011).

Recent literature argues that sustainable development depends on radical changes in systems, both in government policy and in current systems of governance (Kemp et al., 2007), converging with the emergent acknowledgment of the need for large scale transformations in the way societal functions are fulfilled (Geels, 2011), involving a “transition” or “system innovation” away from one socio-technical system towards another (Elzen et al., 2004; Smith et al., 2010).

1.2.2. Conceptual approaches for socio-technical transitions

The topic of “systems innovation”, “socio-technical transitions” or “sustainability transitions” became a promising strand of study in the last decade (Geels, 2004) and different theories have been developed as to what specific transformations are required to change socio-technical systems into more sustainable states (Geels, 2011, 2002; Grin et al., 2011; Kemp et al., 1998; Rip and Kemp, 1998).

These include four frameworks that have achieved prominence in transition studies: the multi-level perspective (MLP) on socio-technical transitions, strategic niche management (SNM), transition management (TM) and technological innovation systems, complemented by a broad range of other relevant theoretical approaches which have been used to study and explain particularities of transitions (Markard et al., 2012). The first three conceptual frameworks will be discussed below, as they contribute directly for the purpose of this work.

Building on the work of Kemp, Rip and Schot, and on the study of long-term historical transitions in a broad range of empirical domains, Geels developed the Multi-Level Perspective on sustainability transitions (Geels, 2002; Markard et al., 2012; Smith et al., 2010). The MLP is recognized as the main approach for the understanding of major system level shifts in social, economic and technological practices, at the necessary scale to meet the present challenges of sustainability (McMeekin and Southerton, 2012). The MLP theory considers that transitions, defined as shifts from one regime to another, result from non-linear interactions at three levels - the landscape, regime, and niche, as has been articulated in more depth elsewhere (Geels, 2011, 2004, 2002) and explained below (figure 1.1).

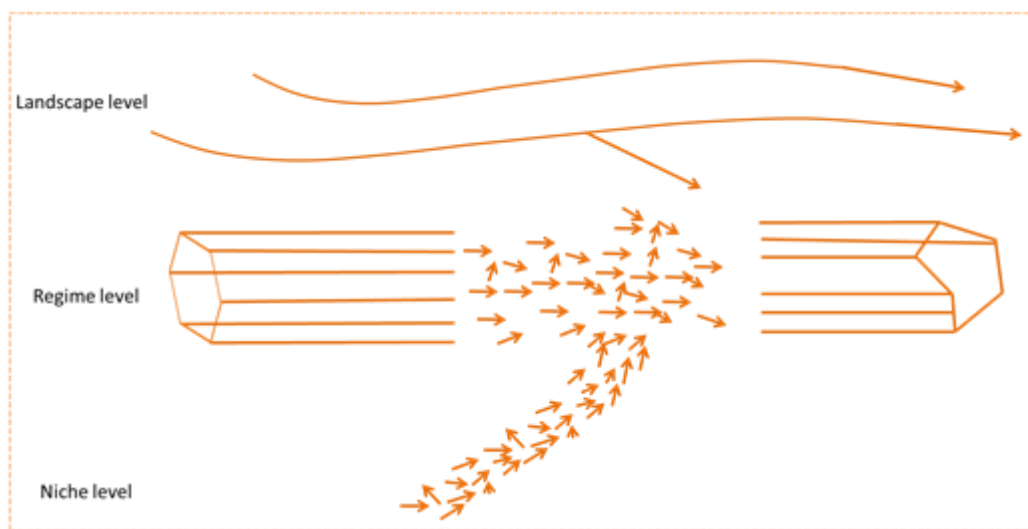


Figure 1.1. The MLP Perspective. Adapted from Geels (2011).

Regimes are formed by the routine-based behavior of organizations, as well as by other actors involved (Geels, 2002). Hence, regimes refer to the “meso” context, composed by socio-cultural, user/market, science/technological practices, and rules, forming the deep structure and accounting for the stability of an existing socio-technical system. As regimes are characterized by lock-in, innovation occurs incrementally, with small adjustments accumulating into stable trajectories (Geels, 2011, 2004).

Landscapes, on the other hand, refer to the external macro context, such as demographical trends, political ideologies, societal values and macro-economic patterns (e.g. the material and spatial arrangements of cities, factories, highways and electricity infrastructures), which influence niches and regimes (Geels, 2011, 2002). The context of a landscape is even harder to change than that of a regime (Geels, 2002).

Niches are “protected spaces”, such as R&D laboratories, subsidized demonstration projects, or small market niches, where users have special demands and are willing to support emerging innovations that deviate away from existing regimes (Geels, 2011). Overall, regimes are embedded within landscapes, and niches are embedded within regimes (Geels, 2002).

Transitions are characterized by the interaction between the three levels: niche-innovations build up internal momentum; whilst, changes at the landscape level create pressure on the regime; and, destabilization of the regime creates windows of opportunity for niche innovations (Geels, 2011). While regimes usually generate incremental innovations, radical innovations are generated in niches (Geels, 2002). Therefore, within the MLP framework, niches provide the seeds for systemic change (Geels, 2011) and, consequently, niche development is a fundamental part of transitions (Raven et al., 2010).

This bottom-up perspective has evolved into a specific line of research, which investigates how niches develop in interaction with the dynamics of prevailing regimes (Markard et al., 2012). Strategic Niche Management refers to multi-actor processes in so-called arenas, with the aim of deliberately managing the creation, development, and breakdown of niches (Kemp et al., 2001; Raven, 2007). Within SNM, a niche is understood as a special geographical location or specific application domain, which act as stepping stones for learning, building new social networks and improving the innovation; eventually, it gains momentum for diffusion to other niches or even replaces the dominant regime practice (Raven et al., 2010).

Strategic Niche Management theory explains the success or failure of a niche by analyzing the interactions between three main niche processes: (i) shaping of expectations – articulating expectations and visions in order to attract resources and new actors and provide direction to the process; (ii) building social networks – new combination of actors, in order to promote the emergence of new social networks; and, (iii) learning processes – social embedding to increase chances on successful diffusion (Raven et al., 2010).

Another line of research combines the work on technological transitions with insights from complex systems theory and governance approaches (Markard et al., 2012). In the Transitions Management theory, the nature of the innovation in a transition experiment is characterized by changes in culture, practices, and structures (Loorbach and Rotmans, 2010; Rotmans et al., 2001). Changes in culture – the sum of shared images and values that constitute the perspective from which actors think and act – comprise shifts in thinking, mental models, and perceptions. Changes in practices – the sum of activities (routines, behavior, daily practices) – comprise changes in what actors actually do, as well as how they work or behave. And, changes in structure – the institutional (legal, organizations and power), physical (infrastructure, technologies, resources, materials) and economic (financial or fiscal)

structures – comprise changes in how actors organize the things they do, either physically, institutionally or economically (van den Bosch and Rotmans, 2008).

Both SNM and TM consider that experimenting in niches is crucial for learning about social challenges and for stimulating transitions. Through a series of “transition experiments” – i.e., innovation projects in which actors in society learn about social challenges in different niches, social innovations can be improved and eventually replace the dominant practice (Raven et al., 2010). One main difference in these two approaches concerns the positioning of TM as a tool for social transition, while in TM technological innovations often play a key role (Raven et al., 2010). Another difference results from the fact that TM explicitly considers experiments as a part of a portfolio of systemic instruments that operate on other levels, whilst SNM gives to experiments a more central role and elaborates upon setting up niches. Despite this, SNM scholars are increasingly considering the need for instruments on other levels (Raven et al., 2010).

Building on SNM and TM theoretical notions, Van den Bosch and Rothmans (2008) developed a conceptual framework, with a theoretical and practice oriented perspective, to understand and steer the contribution of experiments to transitions through three mechanisms: deepening, broadening and scaling up (figure 1.2).

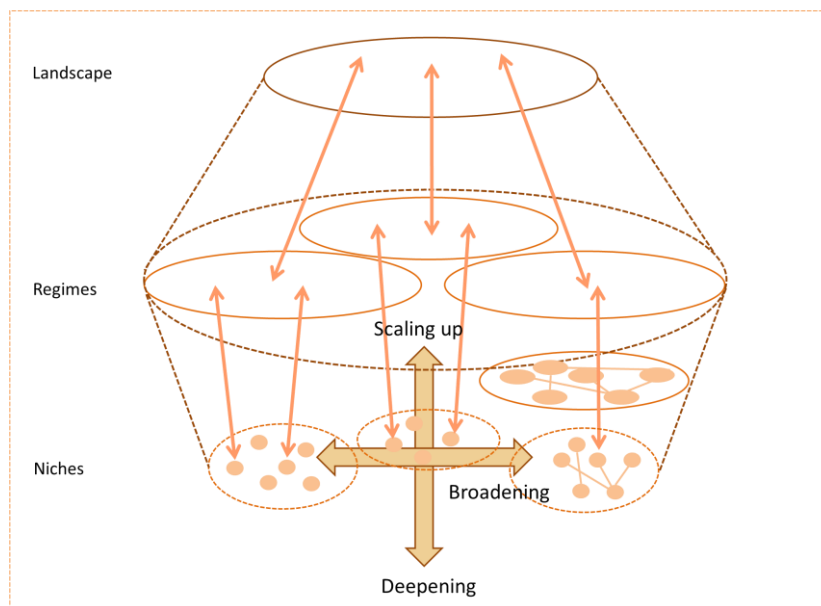


Figure 1.2. Deepening, broadening and scaling up mechanisms in transition experiments (van den Bosch and Rotmans, 2008).

Deepening is a mechanism through which actors can learn about (local) shifts in ways of thinking, values, and perspectives (culture), shifts in doing things, habits and routines (practices) and shifts in

organizing the physical, institutional or economic context (structure). Through deepening, actors interact and develop different perspectives on reality, learning about the complex relation between new practices, culture, and structure. The outcome of deepening is a local constellation of culture, practices, and structures, characterized by low influence, instability, and low dominance, in comparison to the regime (van den Bosch and Rotmans, 2008).

Broadening refers to repeating a transition experiment in different contexts, linking it to other function or domains. In other words, it relates to diffusing the outcome of innovation and learning processes (deepening), increasing the influence and stability of the deviant constellation of culture, practices, and structure. The application to new contexts provides further variation and elements from different contexts and practices, which become integrated and consolidated in a new dominant design (van den Bosch and Rotmans, 2008).

Scaling up concerns to the process of embedding a transition experiment into a new dominant way of thinking (culture), doing (practices) and organizing (structure), at the level of the societal system, moving sustainable practices from experimentation to mainstream. Through scaling up, the new, deviant constellation attains more influence and stability, increasingly becoming part of the dominant way in which a societal need is fulfilled (van den Bosch and Rotmans, 2008).

Given the conceptual approaches explained above, the challenge is to understand and guide “systems innovations”, by facilitating more sustainable practices from all members of regimes (Smith et al., 2005). In this research, we are mainly interested in exploring the role of demand side approaches, and especially public procurement, in promoting innovation and sustainability.

1.2.3. The role of public procurement in promoting innovation and sustainability

In the past, sustainability policies focused mainly on supply-side policies, for example, grants for environmental R&D, whilst demand-side policies, such as the potential of public procurement to promote system innovation, were largely underestimated (Edler and Georghiou, 2007; Gee and Uyarra, 2013).

In the last decade, demand-side policies start receiving increasing interest, encouraged by a number of recommendations and reports at the EU level (Zelenbabic, 2015). Among them, public procurement has received the widest interest on both the European and the national level (Zelenbabic, 2015), followed by the same trend on the international level. The significance of public procurement in the portfolio of demand-side policies derives from the fact that it represents 16% of the gross domestic product of the EU (Edler and Georghiou, 2007; Rolfstam, 2009). Thus, the interest

in linking public procurement and political objectives - as innovation and sustainability - has grown at national and at the European level (Deambrogio et al., 2017).

Accordingly, initiatives regarding Green Public Procurement (GPP), Sustainable Public procurement (SPP), Public Procurement of Innovation (PPI), and, most recently, Circular Procurement (CP), have emerged (Deambrogio et al., 2017): the EU Sustainable Development Strategy (European Commission, 2017a), issued in 2001 and revised in 2009, addressed, in one of the objectives, the increasing of Green Public Procurement implementation; the Communication on Integrated Product Policy (European Commission, 2003) encouraged the Member States to draw up publicly available National Action Plans (NAPs) for greening their public procurement; the Lead Market Initiative (European Commission, 2007) aimed at bringing new products or services to the market in six sectors, whilst specific resources were funded to assist the procurement of the innovative solutions; the Action Plan for Sustainable Consumption and Production (European Commission, 2008a) aimed to improve the energy and environmental performance of products through a number of legal schemes to establish a harmonized base for public procurement, as well as incentives provided by the European Union (EU) and its Member States; the Eco-innovation Action Plan (Eco_AP) (European Commission, 2011) referred to the role of GPP for promoting eco-innovation, namely through networks of public and private-sector procurers to test and develop tender specifications; and, the Europe 2020 strategy (European Commission, 2010b) called for a wider use of public procurement as a way to achieve more resource and energy efficiency, whilst fostering the market uptake of innovative products. Furthermore, social considerations were introduced by the European Commission in 2001 in its communication on “Integrating social considerations into public procurement” (European Commission, 2001) and in 2009, through the communication on the role of Fair Trade and non-governmental trade-related sustainability assurance schemes (European Commission, 2009a).

At the international level, the 10YFP Programme on Sustainable Public Procurement (UNEP, 2015), supported by the United Nations Environment Programme (UNEP), is a global platform that addresses the implementation of SPP around the world, bringing together a variety of stakeholders. The 10YFP on SPP further amplifies and extends the impact of the Sustainable Public Procurement Initiative (SPPI), which was launched in June 2012 at the Rio+20 Conference. The SPPI was itself a continuation of the Marrakech Task Force on Sustainable Public Procurement, led by the government of Switzerland from 2005 until 2011 (European Commission, 2016a). On the other hand, the OECD supports the establishment of links between greener public purchasing and other policy areas, such as general environmental policy, public expenditure management, trade law and competition policy (European Commission, 2016a).

These developments resulted in an increasing call for environmental and social criteria in the European Directives on Public Procurement. In line with this trend, new procurement procedures were recently defined, such as the “innovation partnerships”, which identify a strong link between procurement and innovation (European Commission, 1995).

The rationale behind these policies is that public procurement can be used, not only to satisfy the immediate needs of the public sector, but also as a way of stimulating and catalyzing the creation of new markets, promoting aspects of various sectoral policies (Pelkonen and Valovirta, 2015), including environmental, societal and innovation goals.

Hence, public procurement has acquired a strategic role, and public tenders are regarded as means for achieving policy goals in the areas of innovation, sustainable and social development. In a study from DG Grow, GPP, socially responsible public procurement and PPI are referred as the commonly used forms of strategic procurement (European Commission, 2015). Additionally, within the broader field of public procurement, GPP, SPP, and PPI are acknowledged as practices that actually support sustainable development (Piga et al., 2014). In what regards to transitions theory, the empirical study done by Gee and Uyarra (2013) recognizes public procurement as a demand-side policy tool with potential for creating socio-technical niches that may “breakthrough”, when landscape pressures destabilize the dominant industrial trajectory.

For these reasons, this study focuses, within the broader area of public procurement, on GPP, SPP and PPI approaches, as they can play an important role within innovation, sustainability, and transitions.

Green Public Procurement (GPP) aims to achieve value for money, while reducing the environmental impact of purchased products and services through their whole life-cycle, developing the capacity for green supplies and markets (Zhu et al., 2013). It is based on the use of environmental criteria in public tenders.

As we have seen, GPP is becoming a cornerstone of environmental policies, both at the European Union and Member State level. Its role in supporting sustainable consumption and production patterns has strongly increased, and currently, it is spreading throughout public authorities. The high purchasing power of public authorities is a market factor with enormous potential (Testa et al., 2012), representing a stimulus for innovation and diversification in products and services through a direct increase in demand and, consequently, an opportunity for coherent research and development (Rizzi et al., 2014; Testa et al., 2016). In Circular Procurement (CP), often considered as a type of GPP, the main object of the negotiation between supplier and procurer switches from product-oriented to product-service systems, closing loops, improving resource efficiencies through

recovery (Witjes and Lozano, 2016) and promoting new business models, hence stimulating innovation.

Sustainable public procurement (SPP) (...) “allows organizations to meet their needs for goods, services, construction works and utilities in a way that achieves value for money on a whole-life basis, generating benefits, not only to the organization, but also to society and the economy, while remaining within the carrying capacity of the environment” (Roman, 2017). Therefore, SPP entails paying attention, within the procurement process, to elements related to social aspects, such as sustainable supply chains and labor conditions, complementing the environmental goals of GPP (Piga et al., 2014). Walker and Brammer (2011), cited by Witjes and Lozano (2016), refer to sustainable public procurement as the achievement of sustainable development objectives through procurement, incorporating sustainability criteria into the tender and, therefore, into the procurement process, thus supporting sustainable product-service system innovation (Bratt et al., 2013).

Public procurement of innovation means “public procurement as an innovation policy tool” (Lember et al., 2011; Rolfstam, 2009) and thus it is understood as a tool for stimulating the development of new products - goods, services or systems, but it can also refer to public procurement that attempts to open up innovation possibilities, without necessarily targeting new products (Lember et al., 2014; Rolfstam, 2012; Uyarra and Flanagan, 2010). This is supported by Uyarra and Flanagan (2010), who concluded that spillover effects of procurement are not usually considered and that too much attention is given to the direct effects of procurement on innovation.

For these reasons, this work uses a broad concept of innovation, including product and service innovation, innovation in organizational processes, and societal innovation (Preuss, 2007), meaning that innovation in the public procurement context takes into account: innovation in the design and delivery of public services; the procurement of innovative goods and services; and, innovative procurement processes and models (ICLEI European Secretariat, 2013). In line with this notion, Lember et al. (2014) recognize that PPI induces radical, new-to-the world breakthrough technologies; promotes incremental innovations where existing products are adapted to the local context and are, thus, new to a country or a region; promotes new organizational and/or technological capabilities; and, promotes innovations in mature markets. PPI is therefore characterized by public agencies carrying out purchasing activities that lead to innovation (Rolfstam, 2012), requiring more radical approaches than GPP and SPP (Piga et al., 2014).

Despite the high interest in public procurement policies, several studies have reported the slow uptake of GPP, SPP, and PPI by public organizations (Bratt et al., 2013; Testa et al., 2016). Walker and Brammer (2012) conducted a review of studies on sustainable procurement in the public sector and

concluded that there is a need for further development and testing of theories, in order to improve how sustainable procurement is conceptualized and understood.

In addition, Testa et al. (2016) argue that the adoption of guidelines and tools can assist organizations in becoming more GPP oriented. The importance of guidelines, toolkits, and documents in promoting GPP and SPP practices has been highlighted by several studies (Meehan and Bryde, 2011; Testa et al., 2016) and also applies to PPI. Furthermore, this can be especially important for small public authorities (Testa et al., 2016).

Hence, there is a gap in understanding as to how public organizations can enhance their procurement practices concerning sustainability (i.e. GPP, SPP, and PPI), through a process of change at technical, organizational, economic, institutional, socio-cultural and political levels, to support the creation of socio-technical niches.

1.2.4. The potential of public procurement as an additional mechanism for transitions

The MLP theory focuses on the development of radical innovations by producers, and on the role of political governance, thus neglecting the potential of trajectories in consumption processes that are also of critical importance to orchestrate a system transition (McMeekin and Southerton, 2012). Despite this focus, the MLP associates the category of “special users”, i.e., early adopters that engage intensively in modifying and developing the innovation ready for market release, to processes of radical socio-technical innovation (McMeekin and Southerton, 2012). This is also supported by Raven (2007), who locates radical transformation of regimes in early niche markets, constituted by early adopters with different preferences than mainstream users, often willing to pay a higher price for the particular benefits they gain from innovation. Furthermore, Kemp et al. (2001) refer that niche development happens in two partly overlapping forms: protected spaces and market place. Following these arguments, this research claims that GPP, SPP, and PPI can contribute to the process of niche development.

This claim is supported by several studies. Knutsson and Thomasson (2014) demonstrated that, even for small local authorities, it is possible to affect the market through innovative procurement processes, spreading innovation to other public services through networking. Uyarra et al. (2017) underlined the role of public procurement to promote innovation at the regional level. Gee and Uyarra (2013) demonstrated, by using an empirical case, the potential of public bodies to orchestrate system innovation, by actively managing the required interdependencies between technologies, institutions, and practices, thus establishing public procurement as an additional governance mechanism for niche development and the transformation of socio-technical systems. These studies

demonstrate the relation between socio-technical transitions and consumption, and specifically public procurement, providing ground to the development of an analytical framework that incorporates insights from GPP, SPP and PPI practices into the MLP framework.

1.3. Thesis aim, scope, and research questions

As we have seen in the previous sections, addressing the challenge of sustainable development requires changing actual production and consumption patterns through socio-technical transitions. At the same time, public procurement is emerging as a key strategic approach to achieve sustainability and innovation goals. Despite this interest, transitions theory neglects the potential role of public procurement in the governance of system transitions. This is underlined by the slow uptake of GPP, SPP, and PPI by public organizations. To address these problems, the thesis proposes to link the fields of public procurement and transitions theory.

Thus, the broader aim of this study is to investigate the role of public procurement as a governance mechanism for the transformation of socio-technical systems. Supported by the literature review, this general purpose will be explored with a focus on the following aspects: (1) GPP, SPP and PPI approaches, as they play an important role within innovation and sustainability, (2) niche development processes, as they constitute a fundamental part of transitions; and, (3) the role of public organizations in actively managing GPP, SPP and PPI as additional governance mechanisms for niche development and the transformation of socio-technical systems.

The purpose will be fulfilled with the development of a conceptual framework on the role of public procurement as a governance mechanism for the transformation of socio-technical systems. The conceptual approach will be then developed into an operational perspective, to support public organizations in the re-thinking of the procurement process, raising their ambitions and broadening their vision, by changing their organizational approach towards culture, strategies, structures, and practices, whilst contributing to sustainability transitions. This means a focus on the individual organization and on its relationships with other stakeholders. Therefore, when compared with the conceptual approach, the operational approach has a considerable narrower scope.

Thus, the central question that the research aims to answer is:

How can public procurement contribute to sustainability transitions?

The main research question will be addressed by taking the following sub-questions, which are tackled in chapters 3, 4 and 5.

RQ#1 - Which key factors, accounting for changes in culture, structures, and practices, favor the successful implementation of GPP, SPP, and PPI, contributing to sustainability?

RQ#2 –How to depict these key factors into socio-technical transitions theory by developing an analytical framework?

RQ#3 – How to develop an operational tool to support public organizations in the process of re-thinking the procurement process in the context of socio-technical transitions?

RQ#4 – What are the lessons learned from the cases of public organizations implementing the practical tool?

To answer these questions, this research employs a qualitative approach (Yin, 2011) to study public procurement and socio-technical transitions, based on several strands of literature and on case studies.

1.4. Structure of the thesis

The thesis is divided into three parts (figure 1.3). The first part provides the relevance of the study, the research background and the thesis aim, scope and research questions, (chapter 1), whilst explains the research approach and design, along with its methodologies (chapter 2).

The second part provides results of the conceptual and empirical work and consists of two research papers (chapters 3 and 4).

In the third part, findings from chapters 3 and 4 are integrated and discussed in terms of the contribution of public organizations to socio-technical transitions by using procurement (chapter 5). The concluding chapter (chapter 6) briefly reviews the findings and their relationship, reflecting on policy implications and paths for further research.

	STRUCTURE OF THE THESIS	OBJECTIVE
FIRST PART	CHAPTER 1 INTRODUCTION	Context of the study Identification of the problem Main topic of the study Purpose of the study Research questions
	CHAPTER 2 METHODS	Methodologies used during the research Research design to answer research questions
SECOND PART	CHAPTER 3 STP FRAMEWORK	Conceptual framework on the role of public procurement as a governance mechanism for transitions
	CHAPTER 3 SPP TOOLBOX	Operationalization of public procurement as a governance mechanism for transitions (focus on individual organizations)
THIRD PART	CHAPTER 5 DISCUSSION	Challenges of public procurement as a governance mechanism for transitions - Findings at conceptual and operational levels
	CHAPTER 6 CONCLUSIONS	Conclusions Practical implications Further research

Figure 1.3. The structure of the thesis.

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CHAPTER 2. METHODS

METHODS

A central issue of this research is to investigate the role of public procurement as a governance mechanism for the transformation of socio-technical systems. Thus, besides literature review, this work uses methods to enable the researcher to understand, assess and learn from practitioners. This chapter explains the research approach and research design employed in the thesis.

2.1. Research methodology

The study uses a qualitative case study approach, found useful when a *how* or *why* question is being asked about a phenomenon, which is hardly distinguished from the context and over which the researcher has little or no control (Yin, 2003). Case study research uses empirical evidence from one or more organizations where an attempt is made to study the subject matter in context. Multiple sources of evidence are used, although most of the evidence comes from documents. Compared to other methods, the strength of the case study method is its ability to examine, in-depth, a “case” within its “real-life” context (Yin, 2004). In this research, the case or the unit of analysis is the procurement process of public organizations.

This research is exploratory in nature, as it explores situations in which the intervention being evaluated has no clear, single set of outcomes (Yin, 2003). Furthermore, the research method is based on multiple case studies, as it allows the researcher to analyze different contexts for each of the cases, i.e., to analyze within each setting and across settings. In a multiple case study, we are examining several cases to understand the similarities and differences between cases (Baxter and Jack, 2008). The exploratory case study approach is developed in line with another approach, the grounded theory, which assumes that the natural occurrence of social behavior within real world contexts is best analyzed by deriving “bottom-up” grounded categories and concepts (Yin, 2011), i.e., it implies the discovery of theory from data. The research presented in this thesis assumes this iterative process of travelling back and forth between the theory and the evidence.

2.2. Research design

As discussed in section 1.3., this study aims to investigate the role of public procurement as a governance mechanism for the transformation of socio-technical systems, using a conceptual and an operational approach (figure 2.1).

To fulfill these two approaches, the study was organized in two parts: (1) development of an analytical framework incorporating insights from GPP, SPP and PPI practices into the transitions theory, to respond to the research questions 1 and 2; and, (2) translation of part of the analytical framework, corresponding to the focus on the individual organization, by developing an operational tool, responding to the research questions 3 and 4. As we will see in the following sections, the research design of this study was such that the conceptual approach informed the operational approach and vice-versa, in an iterative way.

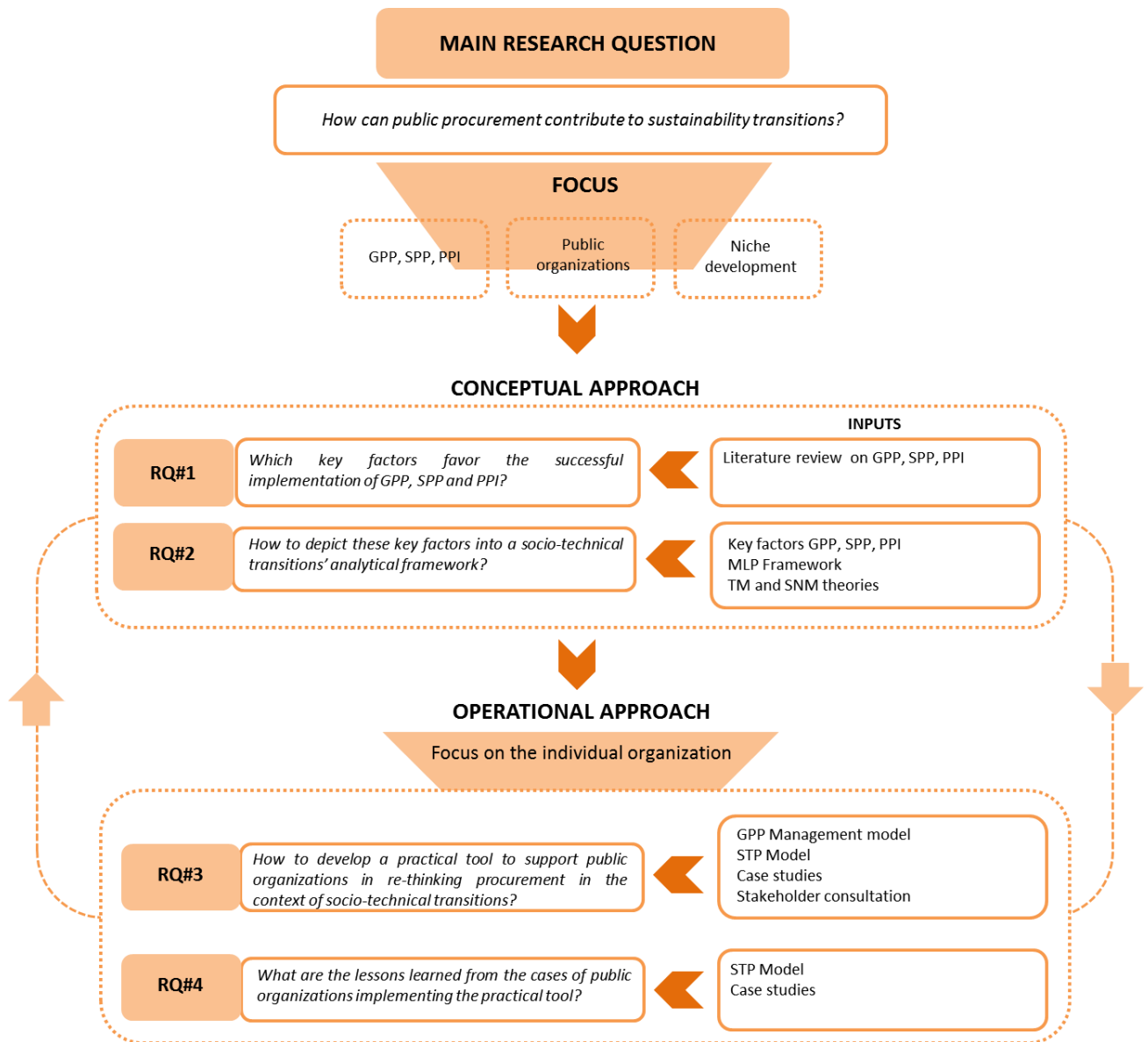


Figure 2.1. Research design.

2.2.1. Conceptual approach

We started with the focus of the study proposed in section 1.3., i.e, oriented to the role of public organizations in actively managing GPP, SPP and PPI approaches, constituting an additional governance mechanism for niche development processes and, ultimately, for transitions.

To respond to this problem, the study was organized in three main parts: (1) identification of key factors that enable successful implementation of GPP, SPP and PPI practices; (2) mapping out the key

factors into the transitions theory; and, (3) developing of a dynamic process for public procurement as a governance mechanism for transitions.

Identification of key factors

Firstly, we needed to develop an understanding of which key factors enable technical, organizational, economic, institutional, socio-cultural and political changes in public organizations, leading to successful implementation of GPP, SPP and PPI practices. For this purpose, a literature review was performed on peer-reviewed English language research papers focused on GPP, SPP, and PPI, using the Online Library of Knowledge (B-on), a virtual library. Several major databases allowing access to publications in full text were searched, including Academic Search Premier, Business Source Complete, Science Direct, ISI Web of Science, IEEE, Wiley Interscience, Sage, and SpringerLink. The time period chosen was from 1996 to 2017, as 1996 was pointed out by Appolloni et al. (2014) as the beginning of the debate on GPP in the literature, whilst SPP and PPI approaches were developed later.

The keywords used for the selection of articles were: “green procurement”; “green purchas*”; “sustainable procurement”; “sustainable purchas*”; “innovation procurement”; “innovation purchas*”; “public procurement”; “purchas*”; “procur*” in the title or in the abstract. “Purchas*” was included as the terms “purchasing” and “purchase” are often used by authors in place of procurement, and “procur*” was included because other terms besides procurement can be used, such as procured.

An initial selection was made based on abstracts, in order to decide if the whole research work should be considered for further analysis. The criterion for the selection was based on each study’s contents, focusing on a rich description of cases allowing tracing of key factors, centered on the public organization, and enabling GPP, SPP and PPI institutionalization and operationalization.

The initial selection resulted in 52 papers, whose full text was analyzed. This in-depth analysis revealed 25 studies considered relevant for key factor analysis (6 scientific papers on GPP, 8 on SPP and 11 on PPI). Drawing on the selected literature, different aspects or dominant elements that could support GPP, SPP and PPI practices, at the public organization level, were identified and grouped in key factor categories with similar characteristics. The key factors were considered only in the cases where they were referred to in the conclusions, or in the conceptual framework, and not in the introduction. In other words, key factors were considered only if they resulted from the work of the author and not from other authors' work, in order to avoid multiple counting.

Mapping the key factors into the transitions theory

Secondly, we needed to relate the key factors with the socio-technical transitions theory, exploring the role of public procurement as an additional governance mechanism for the transformation of socio-technical systems. We started with the MLP perspective developed by Geels (2011, 2004, 2002) as the theoretical framework. To better understand the transition processes and the niche development mechanisms, we used the work done by Raven (2007), Raven et al. (2010), van den Bosch and Rotmans (2008), and Gee and Uyarra (2013). These provided the rationale for mapping the key factors into the transitions theory - the STP Model (Sustainability Transitions Procurement Model).

Development of a dynamic process for public procurement as a governance mechanism for transitions

The discussion of the relation of the STP Model and TM and SNM theories (Raven, 2007; Raven et al., 2010; van den Bosch and Rotmans, 2008) provided the rationale for the proposal of a dynamic process for public procurement as a governance mechanism for transitions– the STP Process.

2.2.2. Operational approach

Responding to the research questions 3 and 4, the aim was to develop an operational tool – the SPP Toolbox, based on the STP Model, and focused on the individual public organizations, incorporating insights from GPP, SPP and PPI practices into the MLP framework.

The approach taken for the development of this practical tool was adapted from the GPP Management Model, proposed by the European Commission (European Commission, 2008b) and ICLEI - Local Governments for Sustainability (Clement et al., 2016, 2007), which is comprised of five phases: (1) preparation; (2) target setting; (3) developing an action plan; (4) implementing the action plan; (5) monitoring progress and reporting results. The use of a Deming cycle type of tool offers a simple, flexible and comprehensive approach, facilitating the integration with the existing management systems (European Commission, 2008c). Additionally, the tool aimed to assemble a range of perspectives, as well as practical skills, concerning GPP, SPP, and PPI approaches.

The tool was initially focused on GPP and SPP. It was developed from the existing literature and prototype versions were then tested and applied in three public Portuguese organizations which operate at the local level: Torres Vedras (Municipality of Torres Vedras), Loures (Municipality of Loures) and LIPOR (Intermunicipal Waste Management Company of Greater Porto), generating three case studies.

The strategy for selecting the cases considered the following criteria: public organizations illustrating different dimensions, organizational structures, purchasing power and with some experience in GPP, SPP or PPI. Willingness to participate was also an important factor for shaping the final selection of cases.

Torres Vedras is a medium-sized city, located in a rural area, with 79,500 inhabitants. Its municipality employs 550 people. The municipality of Loures, by contrast, is part of the Lisbon Metropolitan Area, encompassing 200,000 inhabitants and employing about 2100 people. Finally, LIPOR is the inter-municipal waste management enterprise of the Oporto region, employing 191 people. All three organizations have a procurement department, but purchasing activities are more centralized in Loures and LIPOR than in Torres Vedras. With reference to their experience in GPP, SPP, and PPI, all three organizations had some previous experience, yet limited to GPP. LIPOR, in particular, implemented the SA 8000 social accountability management system and, therefore, has applied a code of conduct for all suppliers and subcontractors, since 2009. The three organizations thus represented different situations and were considered adequate examples for testing the SPP Toolbox. The case studies were implemented in the period 2012–2014, via regular meetings held in the three organizations' premises, with the aim of implementing the six steps of the SPP Toolbox.

In addition, the development of the tool involved a participatory process, through the consultation of key Portuguese public procurement stakeholders (i.e. municipalities, central public administration and other public organizations) in several events organized at the National Laboratory of Energy and Geology (LNEG), including: (1) Portuguese SPP Network meetings, held on the 15 March 2012 (22 participants), 23 November 2012 (14 participants) and 9 April 2014 (18 participants); (2) one meeting especially dedicated to getting feedback from the organizations participating in the three case studies, held on the 20 June 2013; and (3) a one-day workshop on GPP, held on the 21 May 2014 (48 participants). The method for gathering feedback from participants included the step-by-step presentation of the tool, followed by discussion and comments, which were then recorded in the form of minutes. Additionally, a questionnaire was handed out at the end of the meeting, which assessed the participants' view of each step of the tool, based on the following topics: relevance, implementation difficulty/capability, positive/negative aspects and measures to overcome obstacles. The questionnaire also asked respondents to evaluate the tool as a whole.

Results from the three implementation case studies, as well as the participatory process, fed into an iterative design process, whereby collected suggestions and feedback were built progressively into the next version of the tool. Changes were tracked using version control.

From 2015 to 2016, the SPP Toolbox was further improved to better accommodate the key factors mapped out at the niche level of the STP Model, as well as PPI approaches.

2.3. Research limitations and delimitations

There are a few conceptual and practical challenges that the present research had to take into consideration.

First, the broader aim of investigating the role of public procurement as a governance mechanism for the transformation of socio-technical systems implicated the study of two strands of knowledge: public procurement and socio-technical transitions. For practical reasons, the focus of the research had to be narrowed, and the following boundaries were established in the development of the study: (1) focus on organizations' practices and not public policies, as the main objective was to highlight the role of organizations in governing transition processes, from a bottom-up perspective; (2) public organizations and not private organizations, due to the significance of public expenditure and to the role that public procurement organizations might have as first-movers; (3) within the broader area of public procurement, GPP, SPP and PPI approaches were selected, as they play a significant role within innovation and sustainability; (4) regarding socio-technical transitions, the focus on MLP, SNM and TM theories, resulting from the MLP prominence as a main approach for understanding transitions and the ability of SNM and TM theories to describe the development of niches and their interaction with the dynamics of prevailing regimes, (4) and, within the MLP framework, on niche development processes, as they constitute a fundamental part of transitions.

Second, the research approach had some limitations and shortcomings: (1) the procurement approaches to be considered were limited to GPP, SPP and PPI, thus neglecting other approaches, as social procurement, circular procurement or pre-commercial procurement (PCP); in an attempt to mitigate this limitation, circular procurement was included in GPP and the study took a wider definition of PPI; (2) although the literature review has resulted in the analysis of 52 papers for the identification of the key factors, it was not possible to cover books and other sources that could be significant for the work. On one hand, this was a consequence of the method used - a search on B-On, the Online Library of Knowledge, which returned mostly scientific papers; on the other hand, due to the objective of covering simultaneously three strands of literature - GPP, SPP, and PPI, along with time limitations, the inclusion of books would turn the analysis into an unworkable task; (3) the same argument has resulted in the limitation of the literature review on transitions to strands on MLP, SNM, and TM; (4) for complexity reasons, and in order to make the study objectives achievable, the operational approach and, thus, the development of the practical tool, focused on the individual organization; therefore, it concerns the early stages of niche development of the analytical framework, as the translation of the whole framework into a practical tool would represent an enormous and unfeasible task within this study; and, (5) the development of the practical tool, corresponding to the operational approach of the study has been supported by case studies, participatory process and questionnaires from Portugal, limiting the iterative process of feedback to

a region. However, due to similarities between the case study organizations and other European and worldwide organizations, we think that our conclusions can be generally accepted.

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CHAPTER 3. A FRAMEWORK FOR PUBLIC PROCUREMENT IN THE CONTEXT OF SOCIO-TECHNICAL TRANSITIONS

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DOES PUBLIC PROCUREMENT SUPPORT LONG TERM CHANGES TOWARDS SUSTAINABILITY?

A FRAMEWORK FOR PUBLIC PROCUREMENT IN THE CONTEXT OF SOCIO-TECHNICAL TRANSITIONS

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Abstract

Addressing the challenge of sustainable development requires changing actual production and consumption patterns through socio-technical transitions. Recently, public procurement emerged as a key strategic approach to achieve sustainability and innovation goals. Despite this interest, transitions theory neglects the potential role of public procurement in system transitions. To address this gap, we propose to link the fields of public procurement and transitions theory.

This purpose was fulfilled through the development of the sustainability transitions procurement model – STP Model, which prescribes practices that may support the transformation of socio-technical systems, incorporating different approaches to public procurement (GPP, SPP, and PPI), in a three-level structure (niche, regime, and landscape). Although the STP Model was first presented in Cayolla Trindade et al. (2017), this paper sets forth a number of extensions and elaborations, as the further development of the model into a dynamic process illustrating the role of PP as a governance mechanism in the context of socio-technical transitions – the STP Process.

The STP Model and the STP Process provide an analytical framework for a broader perspective on procurement approaches including insights from transitions theory, positioning public procurement as an additional mechanism of niche development that potentially enables system transitions.

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Keywords:

Green Public Procurement; Sustainable Public Procurement; Public Procurement of Innovation; Socio-technical transitions.

3.1. Introduction

Sustainability, innovation, and transitions

Since the 1970s, several studies have shown that the Earth's capacity to sustain human populations, with current production and consumption patterns, is reaching its limit (Cleveland and Ruth, 1997; Georgescu-Roegen, 1975, 1971; Meadows et al., 1972); yet, mainstream policies continue to call for economic growth, leading to increased environmental degradation, including resource scarcity and climate change. Sustainable development aims to conciliate these two trends by combining economic wealth and environmental protection with social cohesion (Kemp et al., 2007). These efforts to decouple economic growth from environmental degradation highlighted the role of innovation within sustainable development, by putting particular emphasis on the direction of innovation – not only focusing on economic potential, but also addressing environmental and social consequences (Smith et al., 2010).

Recent literature acknowledges that sustainable development requires a “sustainability transition” or “system innovation” from one socio-technical system to another, involving a fundamental change in the way societal functions are fulfilled (Geels, 2011); in other words, it requires a large-scale transformation in a variety of elements of the system, including cultural meaning, user practices, technology, infrastructures, markets, networks and regulations (Elzen et al., 2004; Smith et al., 2010). Within this notion, technological innovations are considered socio-technical, because they induce social innovations and vice versa (Raven et al., 2010).

Transitions and the Multi-Level Perspective (MLP)

Different theories have been developed as to what specific transformations are required to change socio-technical systems into more sustainable states (Geels, 2011, 2002; Grin et al., 2011; Kemp et al., 1998; Rip and Kemp, 1998). Transitions literature thoroughly recognizes the Multi-Level Perspective (MLP) (Geels, 2002) as the main approach to understanding large-scale transformations in technological, social, and economic practices, at the necessary scale to meet sustainability challenges (McMeekin and Southerton, 2012). The MLP theory acknowledges that transitions, defined as shifts from one regime to another, result from interactions between the landscape, regime, and niche, as has been articulated in more depth elsewhere (Geels, 2011, 2004, 2002).

Regimes are formed by the routine-based behavior of organizations, as well as by other actors involved (Geels, 2002). Hence, regimes refer to the meso context, forming the deep structure constituted by science/technological, user/market, socio-cultural practices and rules accounting for the stability of an existing socio-technical system. As regimes are characterized by lock-in, innovation occurs incrementally, with small adjustments accumulating into stable trajectories (Geels, 2011, 2004).

Landscapes, including macro-economic patterns, political ideologies, societal values and demographical trends (e.g. the material and spatial arrangements of cities, factories, highways and electricity infrastructures), operate as the external macro context. The context of a landscape influences niches and regimes, but the changes are even slower than that of a regime (Geels, 2002).

Niches are “protected spaces” where deviant innovations from the existing regime emerge, supported by users with special demands (Geels, 2011). Examples of niches are small market niches, subsidized demonstration projects, and R&D laboratories. In the MLP framework, niches are embedded within regimes and regimes are embedded within landscapes (Geels, 2002).

The MLP theory defines transitions as non-linear processes resulting from the interaction of developments at three levels: niches gain internal momentum within processes of learning and articulation on various dimensions, along with building expectations and social networks; whilst, landscape developments create pressure on the regime; these tensions eventually destabilize the regime, creating windows of opportunity for niche innovations (Geels, 2011). Hence, in the MLP framework, niches are crucial for transitions, providing the seeds for systemic change (Geels, 2011). While regimes usually generate incremental innovations, radical innovations are generated in niches (Geels, 2002), granting a special importance to niche development mechanisms in recent transition literature.

The success or failure of a niche is explained, in Strategic Niche Management (SNM) theory, through the analysis of the interplay between three main niche processes: (i) shaping of expectations – corresponding to the articulation of the expectations and visions of the different actors, providing direction to the process and resulting in the attraction of new actors and resources; (ii) building social networks – corresponding to the expansion and reinforcement of the social network with new actors; and, (iii) learning processes – corresponding to the interaction of multiple actors developing different perspectives on reality, therefore increasing successful diffusion (Raven et al., 2010).

In Transitions Management (TM) theory transition experiments are used in combination with other systemic instruments to govern the emergence of a niche, defined as a constellation of culture, practices, and structures fulfilling social needs in a deviant way (Loorbach and Rotmans, 2010);

Rotmans and Loorbach, 2009). These innovations are characterized by shifts in the dominant perspective, values and shared images (culture), shifts in the daily activities, routines, behavior (practices), and shifts in the institutional, physical and economic setting (structures) (Rotmans and Loorbach, 2009; van den Bosch and Rotmans, 2008).

Van den Bosch and Rothmans (2008) developed a conceptual and operational framework to govern experiments in the direction of transitions through three mechanisms: deepening, broadening and scaling up.

Deepening is a mechanism through which the multiple actors can learn about local shifts in culture, practices, and structure. This interaction results in a local constellation of deviant culture, practices, and structures, with low stability and influence, comparing to the regime (van den Bosch and Rotmans, 2008).

Broadening refers to “repeating a transition experiment in different contexts, linking it to other functions or domains” (van den Bosch and Rotmans, 2008). In other words, it corresponds to diffusing the outcome of the deviant constellation of culture, practices, and structure (deepening), whilst increasing its influence and stability. The application to new contexts provides further variation and elements from different contexts and practices, which become integrated and consolidated in a new dominant design (van den Bosch and Rotmans, 2008).

Scaling up concerns to the “process of embedding a transition experiment in new dominant ways of thinking (culture), doing (practices) and organizing (structure), at the level of a societal system” (van den Bosch and Rotmans, 2008). Through scaling up, the new, deviant constellation attains more influence and stability, increasingly becoming part of the regime. In other words, scaling up refers to the process of mainstreaming new ways of fulfilling societal needs (van den Bosch and Rotmans, 2008).

Public procurement potential to promote innovation and sustainability

In the past, sustainability policies focused mainly on supply-side policies, neglecting the potential of demand-side policies, such as public procurement, to promote system innovation (Edler and Georghiou, 2007; Gee and Uyarra, 2013). The significance of public procurement in the portfolio of demand-side policies derives from the fact that it represents 16% of the gross domestic product of the EU (Edler and Georghiou, 2007; Rolfstam, 2009).

In the last decade, the interest in linking public procurement and political objectives - as sustainability and innovation - has grown, both at national and at the European level. Accordingly, initiatives regarding Green Public Procurement (GPP), Sustainable Public procurement (SPP), Public

Procurement of Innovation (PPI), and, most recently, Circular Procurement (CP), have emerged (Deambrogio et al., 2017).

The European Directives on Public Procurement followed this trend, promoting the inclusion of environmental and social criteria in tenders, and recently introducing new procurement procedures such as the “innovation partnerships”, thus operationalizing the relation between procurement and innovation (European Commission, 1995). The rationale behind these policies is that public procurement can be used, not only to satisfy the immediate needs of the public sector, but also as a way of stimulating and catalyzing the creation of new markets, promoting aspects of various sectoral policies (Pelkonen and Valovirta, 2015), including environmental, societal and innovation goals.

Currently, public procurement has acquired a strategic role at the political level, and public tenders are acknowledged as a mean to achieve goals in the areas of innovation, sustainable and social development. In a study from DG Grow, GPP, socially responsible public procurement and PPI are referred to as the commonly used forms of strategic procurement (European Commission, 2015). Additionally, within the broader field of public procurement, GPP, SPP, and PPI are considered practices that actually support sustainable development (Piga et al., 2014). Furthermore, empirical studies have recognized public procurement as a demand-side policy tool to create socio-technical niches that may “breakthrough”, when landscape pressures destabilize the dominant trajectory (Gee and Uyarra, 2013). For these reasons, we choose to focus this study on GPP, SPP, and PPI, within the broader area of public procurement.

Public procurement practices supporting innovation and sustainability

Green Public Procurement (GPP) concerns to the integration of environmental criteria in public tenders, aiming to reduce the impact of products and services in the environment, within a life-cycle perspective, whilst achieving value for money and developing the capacity for green supplies and markets (Zhu et al., 2013).

In Europe, the role of GPP in supporting sustainable consumption and production has strongly increased, and it is becoming a pillar of environmental policies. As it is spreading throughout public authorities, it represents a market factor with enormous potential (Testa et al., 2012). Therefore, by achieving a direct increase in demand, GPP can play an important role in stimulating the innovation and diversification of products and services, consequently representing an opportunity for coherent research and development (Rizzi et al., 2014; Testa et al., 2016). In Circular Procurement (CP), often considered as a type of GPP, the main object of the negotiation between the supplier and the procurer switches from product-oriented to product-service systems, closing loops, improving resource efficiencies through recovery (Witjes and Lozano, 2016) and promoting new business models - hence stimulating innovation.

Sustainable public procurement (SPP) (...) “allows organizations to meet their needs for goods, services, construction works and utilities in a way that achieves value for money on a whole-life basis, generating benefits, not only to the organization, but also to society and the economy, while remaining within the carrying capacity of the environment” (Roman, 2017). Thus, SPP adds to GPP, by paying attention also to the social aspects of the procurement process, such as sustainable supply chains and labor conditions, complementing the environmental goals of GPP (Piga et al., 2014). Walker and Brammer (2011), cited by Witjes and Lozano (2016), refer to sustainable public procurement as the achievement of sustainable development objectives through procurement, incorporating sustainability criteria into the tender and, therefore, into the procurement process., thus supporting sustainable product-service system innovation (Bratt et al., 2013).

In this work, public procurement of innovation (PPI) means “public procurement as an innovation policy tool” (Lember et al., 2011; Rolfstam, 2009). This definition is in line with other scholars, which consider PPI as an adequate approach to gear the development of new products, services or systems, including public procurement practices that pursuit the opening up of innovation possibilities, therefore not necessarily aiming at new products (Lember et al., 2014; Rolfstam, 2012; Uyarra and Flanagan, 2010). This wider scope of PPI is supported by Uyarra and Flanagan (2010), who recognized that spillover effects of procurement are not usually considered, and that too much attention is given to the direct effects of procurement on innovation.

For these reasons, this work uses a broad concept of innovation, including product and service innovation, innovation in organizational processes, and societal innovation (Preuss, 2007). Lember et al. (2014) take account of this broad notion, by acknowledging that PPI practices: generate radical breakthrough technologies which are new-to-the-world; motivate incremental innovations by adapting existing products to the local context, that are new to a region or a country; support new technological and/or organizational capabilities; and, induce innovations in mature markets. This being said, PPI is characterized by public agencies carrying out purchasing activities that lead to innovation (Rolfstam, 2012), requiring more radical approaches than GPP and SPP (Piga et al., 2014).

Public procurement as an additional mechanism for transitions

The role of producers in the emergence of radical innovations and of political governance in steering such system-level transitions is the main focus of the MLP theory. As the mainstream of innovation studies, it neglects the potential of trajectories in consumption processes that are also of critical importance to orchestrate a system transition (McMeekin and Southerton, 2012). Despite this focus, the MLP associates the category of “special users” to processes of radical innovation in socio-technical systems, considering early adopters that engage intensively with the innovation ready for market release, applying pressure to incumbent regimes (McMeekin and Southerton, 2012). In the

work developed by Raven (2007), early niche markets are the locus of radical transformation of regimes, characterized by early users with different preferences than the mainstream, which are willing to pay a higher price to gain benefits from innovation. Kemp et al. (2001) refer that niche development happen in two partly overlapping forms: protected spaces and marketplace. In line with these arguments, we claim that GPP, SPP, and PPI can effectively contribute to the process of niche development.

This claim is supported by other studies. Knutsson and Thomasson (2014) concluded that small local authorities can play an important role in changing the market by using innovative procurement processes, as they spread the innovation to other public services through networking. From a different perspective, Uyarra et al. (2017) underlined the role of public procurement to promote innovation at the regional level. By using an empirical case, Gee and Uyarra (2013) demonstrated that public bodies can actively manage the required interdependencies between practices, technologies, and institutions, operationalizing their potential to orchestrate system innovation and thus defining public procurement as an additional governance mechanism for niche development and the transformation of socio-technical systems. By demonstrating the relation between socio-technical transitions and consumption, and specifically public procurement, these studies pave the way to the development of a framework that incorporates insights from GPP, SPP and PPI practices into transitions theory (Cayolla Trindade et al., 2017).

Despite the high interest in public procurement policies, several studies have reported the slow uptake of GPP, SPP, and PPI by public organizations (Bratt et al., 2013; Testa et al., 2016). Walker and Brammer (2012) conducted a review of studies on sustainable procurement in the public sector and concluded that there is a need for further development and testing of theories, aiming to improve how procurement is conceptualized and understood. Specifically, there is a gap in understanding as to how public organizations can enhance their procurement practices concerning sustainability (i.e. GPP, SPP, and PPI), through a process of change at technical, organizational, economic, institutional, socio-cultural and political levels to support the creation of socio-technical niches.

To address this gap, the purpose of this paper is to analyze how public organizations, using procurement practices (GPP, SPP, and PPI) can trigger the transformation of socio-technical systems towards a more sustainable society, by contributing to niche development processes. The purpose will be fulfilled by exploring which key factors enable the successful implementation of GPP, SPP and PPI practices through technical, organizational, economic, institutional, socio-cultural and political changes in public organizations and by applying the sustainability transitions theory.

The paper is organized as follows. Section 3.2 describes the methodology applied for an in-depth exploratory study of the key factors or dominant elements for implementing GPP, SPP, and PPI and for mapping the key factors into an operational model for transitions. The key factors are explored

and presented in section 3.3. In section 3.4, the key factors are related to the transitions theory, resulting in the Sustainability Transition Procurement Model - STP Model. In section 3.5, we discuss the findings and propose a dynamic process illustrating the role of public procurement as a governance mechanism in the context of socio-technical transitions – the STP Process. In section 3.6 we outline our key contributions.

3.2. Methodology

The main question guiding this research can be stated as: “how public organizations, using public procurement practices (GPP, SPP, and PPI), can trigger the transformation of socio-technical systems towards a more sustainable society, by contributing to niche development processes?”

To respond to this problem, the study was organized in three main parts: (1) identification of key factors to enable successful implementation of GPP, SPP and PPI practices; (2) mapping out the key factors into the transitions theory; and, (3) proposal of a dynamic process for public procurement as a governance mechanism for transitions.

Identification of key factors

In the first part, we needed to develop an understanding of which key factors enable technical, organizational, economic, institutional, socio-cultural and political changes in public organizations, leading to the successful implementation of GPP, SPP and PPI practices. For this purpose, a literature review was performed on peer-reviewed English language research work focused on GPP, SPP, and PPI, using the Online virtual Library of Knowledge (B-on). Several major databases were searched, allowing access to publications in full text, including Academic Search Premier, Business Source Complete, Science Direct, ISI Web of Science, IEEE, Wiley Interscience, Sage, and SpringerLink. The time period chosen was from 1996 to 2017, as Appolloni et al. (2014) refer that this starting point represents the beginning of the debate on GPP in the literature, whilst SPP and PPI approaches were developed later.

The keywords used for the selection of articles were: “green procurement”; “green purchas*”; “sustainable procurement”; “sustainable purchas*”; “innovation procurement”; “innovation purchas*”; “public procurement”; “purchas*”; “procur*” in the title or in the abstract. “Purchas*” (purchasing and purchase) was included as these terms are often used by authors in place of procurement, and “procur*” was included because terms other than procurement can be used, such as procured. The literature review returned mainly scientific papers; as we intended to cover

simultaneously three strands of literature - GPP, SPP, and PPI, we choose not to include books in the analysis, in order to keep the research feasible within the available timeframe.

An initial selection was made based on papers' abstracts, in order to decide if the whole research work would be considered for further analysis. The criteria for the selection was based on the studies' contents, focusing on rich description of cases, centered on public organizations, that allowed tracing of key factors for the institutionalization and operationalization of GPP, SPP, and PPI.

The initial selection resulted in 52 papers whose full text was analyzed. The in-depth analysis revealed 25 studies considered relevant for key factor analysis (6 scientific papers on GPP, 8 on SPP and 11 on PPI). Drawing on the selected literature, different aspects or dominant elements that could support GPP, SPP and PPI practices, at the public organization level, were identified and grouped in key factor categories with similar characteristics. The key factors were considered only in the cases where they were referred to in the conclusions, or in the conceptual framework, and not in the introduction. In other words, key factors were considered only if they resulted from the work of the author and not from the reference to other authors' work, in order to avoid multiple counting.

Mapping out the key factors into the transitions theory

In the second part, we needed to relate the key factors with the socio-technical transitions theory, exploring the role of public procurement as an additional governance mechanism for the transformation of socio-technical systems. We started with the MLP perspective developed by Geels (2011, 2004, 2002) as the theoretical framework. To better understand the transition processes and the niche development mechanisms, we used the work done by Raven (2007), Raven et al. (2010), van den Bosch and Rotmans (2008), and Gee and Uyarra (2013). These provided the rationale for mapping the key factors into an operational framework for transitions - the STP Model.

Developing a dynamic process for public procurement as a governance mechanism for transitions

The discussion of the relation of the STP Model and TM and SNM theories (Raven, 2007; Raven et al., 2010; van den Bosch and Rotmans, 2008) provided the rationale for the proposal of a dynamic process for public procurement as a governance mechanism for transitions— the STP Process.

Since little prior academic research exists on the role of public procurement on the transformation of socio-technical systems, the aim of the study was to generate an integrated framework from literature; it was not our aim, at this stage, to test the framework. Our findings are presented in the next sections.

3.3. Key factors for GPP, SPP, and PPI

By analyzing the selected literature (table A.1), key factors or dominant elements that can act as either a barrier or an incentive to GPP, SPP, and PPI were identified. These key factors, corresponding to technical, organizational, economic, institutional, socio-cultural and political changes, enhance the institutionalization and operationalization of GPP, SPP, and PPI within the organization; eventually, they also support the creation of socio-technical niches. The results are presented in table 3.1, and the description of the key factors is presented in the next section.

Table 3.1. Key factors for GPP, SPP, and PPI in the literature review.

Key factors	GPP literature Author						SPP literature Author						PPI literature Author												
	Testa et al. (2012)	Zhu et al. (2013)	Rizzi et al. (2014)	Testa et al. (2016)	Smith and Terman (2016)	Witjes and Lozano (2016)	Meehan and Bryde (2011)	Preuss and Walker (2011)	Walker and Brammer (2012)	Bratt et al. (2013)	Meehan and Bryde (2014)	Grandia (2015)	Grandia (2016)	Roman (2017)	Preuss (2007)	Rolfstam (2009)	Edquist and Zabala-Iturriagoitia (2012)	Gee and Uyarra (2013)	Timmermans and Zabala-Ihurriagoitia (2013)	Uyarra et al. (2014)	Knutsson and Thomasson (2014)	Georgiou et al. (2014)	Pelkonen and Valoviirta (2015)	Amann and Essig (2015)	Dale-Clough (2015)
Change agents				x			x	x			x	x	x	x						x	x				x
Knowledge	x			x	x							x				x		x	x	x	x				
Organizational culture							x							x											x
Strategy									x																x
Internal change				x			x	x						x			x								
Internal collaboration				x				x																	x
Responsibilities	x																								
Aggregate demand																			x						
Market research																						x			
Monitoring																								x	
SME participation																			x						
LCC		x																				x			
Risk management																			x						
Functional criteria/variants																x		x	x		x				
IPR management																			x						
Suppliers' involvement			x			x	x	x		x					x	x	x	x	x		x	x	x	x	x
Networking									x											x					
External stakeholders																									
Vision																					x				
Policies and regulations																								x	
Policy guidance																									x

3.3.1. Characterization of key factors

The innovation process undoubtedly begins with the innovating person (Preuss, 2007), and therefore an important aspect identified in the literature is the willingness to change. This includes the proactive role of individuals, including their motivation and ambition, whilst acting as change agents, champions or leaders in facilitating GPP, SPP, and PPI, as well as the personal commitment of procurers, managers, top management and local politicians. These elements, designated here as **CHANGE AGENTS**, were identified as a key factor for GPP by Testa et al. (2016). The pivotal role of individuals as change agents for SPP implementation is also referred to in the conceptual framework developed by Meehan and Bryde (2011). Moreover, Preuss and Walker (2011) identified key factors, including motivation, perception, and attitudes, concluding that SPP is influenced by management commitment and the existence of champions. Grandia (2016, 2015) acknowledged that procurers acting as change agents play a crucial role, whilst Roman (2017) refers to transformational leadership. Much earlier, Preuss (2007) included, in his review of “ecological innovation”, the idea of individuals as facilitators of innovation. Knutsson and Thomasson (2014), Georghiou et al. (2014) and Dale-Clough (2015) also refer to the key role of individuals as enablers of PPI.

The key factor **KNOWLEDGE**, defined in this work as the need for awareness, information and training in GPP, SPP and SPP practices, tools and strategies, is referred in the literature as an important factor for GPP, SPP and, most importantly, PPI. In addition: Testa et al. (2016, 2012) referred to the need to raise GPP awareness and training on organizations’ human resources; Smith and Terman (2016) suggested that a high level of professionalism is a driver for GPP in their study performed in the USA; Preuss and Walker (2011) concluded that organizational factors for SPP implementation include the need for information, skills, and knowledge; Grandia (2016) referred to the ability (i.e. know-how) of procurers to show sustainable procurement behavior; other studies on PPI refer to the lack of competencies as a major obstacle (Timmermans and Zabala-Iturriagagoitia, 2013), as well as the need for further training of purchasing managers (Edquist and Zabala-Iturriagagoitia, 2012; Georghiou et al., 2014; Knutsson and Thomasson, 2014; Uyarra et al., 2014).

ORGANIZATIONAL CULTURE is also highlighted as a key factor in the literature. It includes informal organizational factors that define the ability of individuals to engage in GPP, SPP, and PPI, including learning mechanisms, such as lessons learned from GPP, SPP and PPI activities. This key factor is referred to in SPP literature, namely in the conceptual framework developed by Meehan and Bryde (2011), where a link is established between learning and the cultural attributes of an organization. Roman (2017) concluded that the institutionalization of SPP requires a meaningful shift in the organizational culture. Dale-Clough (2015) discussed the importance of embedded organizational learning for stimulating PPI.

The key factor **STRATEGY** is mentioned in SPP and PPI literature. It concerns the potential of procurement to drive an organization’s agenda, and includes the alignment with its corporate strategy, establishing a common vision for solving societal problems (Bratt et al., 2013; Dale-Clough, 2015).

In addition, flexible structures seem to offer a better basis for coping with changing conditions (Preuss, 2007). The key factor **INTERNAL CHANGE** is defined as the management of the composition of the organization, and the adoption of organizational structures that can act as drivers for GPP, SPP, and PPI. This key factor was identified in GPP literature by Testa et al. (2016), and in SPP literature by both Meehan and Bryde (2011) and Preuss and Walker (2011); the latter developed the notion of adaptation groups, referring to the mutual adaptation between organizational and individual factors through a range of processes in small groups, creating their own norms and values. Regarding PPI, Preuss (2007) and Gee and Uyarra (2013) also referred to the internal composition of the organization as a prerequisite for transformation.

Testa et al. (2016), Preuss and Walker (2011) and Dale-Clough (2015), working respectively on GPP, SPP, and PPI, highlighted the importance of **INTERNAL COLLABORATION**. This key factor includes intra-organizational relationships, namely the capacity for collaboration between different departments within the organization, so as to foster GPP, SPP and PPI activities.

The key factor **RESPONSIBILITIES** refers to practices needed to support GPP, SPP, and PPI and to the definition of responsibilities, roles, and functions within the organization, including the involvement of top management in dealing with challenges. This is reported in GPP literature by Testa et al. (2012) but also applies to both SPP and PPI.

Regarding key factors directly related to the procurement process, we have identified the following from GPP and PPI literature:

AGGREGATE DEMAND – procurement practices for bundling demand, in order to exploit purchasing power and provide incentives for innovation (Uyarra et al., 2014).

MARKET RESEARCH – foresight activities that make purchasers and suppliers aware of options beyond their current market relationships, including technical dialogue between purchasers and suppliers (Georghiou et al., 2014).

MONITORING - monitoring activities measuring the development of procurement actions (Amann and Essig, 2015).

SME PARTICIPATION – procurement procedures promoting the ability of small and medium size enterprises (SMEs) to access public sector contracts and thus exploring their potential to deliver innovative solutions (Uyarra et al., 2014).

LIFE-CYCLE COSTS (LCC) – procurement procedures evaluating on the basis of whole-life costs, rather than the cheapest bid (Georghiou et al., 2014; Zhu et al., 2013).

RISK MANAGEMENT – the way risk is perceived, and managed, by public procurers, so as not to prevent GPP, SPP and PPI activities (Uyarra et al., 2014).

FUNCTIONAL CRITERIA/VARIANTS – functional criteria refers to the use of outcome-based requirements in translating the need to solve societal problems (Edquist and Zabala-Iturriagoitia, 2012; Georghiou et al., 2014; Timmermans and Zabala-Iturriagoitia, 2013; Uyarra et al., 2014),

whereas variants refers to procurement procedures that allow alternative solutions to the specification to be proposed by bidders (Georghiou et al., 2014).

IPR MANAGEMENT – the way intellectual property rights (IPR) are allocated within procurement procedures, influencing the incentive for suppliers to propose innovative solutions (Uyarra et al., 2014).

Moving to key factors which go beyond the organizational boundaries, supplier engagement strategies (i.e. changing from policing and compliance to collaborative activities with suppliers, including providing adequate information to firms) is defined here as the key factor **SUPPLIERS' INVOLVEMENT**. This is acknowledged in the literature as an important key factor for both GPP (Rizzi et al., 2014) and SPP (Meehan and Bryde, 2011, 2014; Preuss and Walker, 2011; Walker and Brammer, 2012). This key factor is mentioned specifically in circular procurement (Witjes and Lozano, 2016), considered in the scope of this study as a type of GPP. Regarding PPI, Preuss (2007) highlighted the importance of knowledge deriving from collective interactions across organizational boundaries, as well as innovation arising from multiple links between customers and suppliers. Edquist and Zabala-Iturriagoitia (2012) recommended performing PPI in an interactive way, over a long period of time, promoting the cooperation between procurers and suppliers for the purpose of learning in the procurement process. This key factor is supported by other authors: Rolfstam (2009); Gee and Uyarra (2013); Timmermans and Zabala-Ihurriagoitia (2013); Uyarra et al. (2014); Georghiou et al. (2014); Pelkonen and Valovirta (2015); Amann and Essig (2015), and; Dale-Clough (2015).

As already mentioned, Knutsson and Thomasson (2014) concluded that it is possible for a small local authority to affect the market, provided that there is a network through which the innovation can be disseminated. This underlines the importance of the key factor **NETWORKING**, understood here as inter-organizational relationships beyond buyer-seller interfaces, in particular processes through which similar organizations share best practices, promote interactive learning and spread knowledge, using each other as a reference. The importance of networking is also acknowledged for SPP, by both Preuss and Walker (2011) and Meehan and Bryde (2014), who refer to the importance of mimetic pressures from peer activities between organizations. Moreover, in regard to PPI, networking is acknowledged as even more critical (Edquist and Zabala-Iturriagoitia, 2012; Gee and Uyarra, 2013; Preuss, 2007; Rolfstam, 2009).

However, Meehan and Bryde (2014) concluded, for SPP, that if the network is composed of organizations working in the same sector, there is a tendency for isomorphism and rigidity, and the ability to adapt to changing markets can be lost. This is why it is critical to create and share knowledge within a broad, heterogeneous network (Meehan and Bryde, 2014). In addition, Roman (2017) mentioned the importance of promoting the integration of stakeholders' expectations. Early PPI studies emphasized that the locus of innovation lies in the value chain (Preuss, 2007), and it is generally accepted that the involvement of external stakeholders (including policy-makers, public procurers, suppliers, managers in public agencies, researchers, potential users, non-governmental organizations, and the general public) needs to be considered in the change of perspective that is required, in order to increase the share of PPI (Gee and Uyarra, 2013; Rolfstam, 2009). Similarly,

Edquist and Zabala-Iturriagagoitia (2012) concluded that diversity is of key importance for PPI. This key factor is designated here as **EXTERNAL STAKEHOLDERS**.

These interactions, characterized by on-going iterative engagements and multi-faceted relationships, result in a shared vision that contributes to shape strategies and align policies at local and national levels, referred to as the key factor **VISION**. This key factor is mentioned in the work of both Gee and Uyarra (2013) and Georghiou et al. (2014), in relation to PPI.

Despite the fact that this analysis focused on key factors that allow the institutionalization and operationalization of procurement practices, centered on the organization, that may contribute to support the creation of socio-technical niches, the literature review revealed also key factors at the regime level, as described below.

POLICIES AND REGULATIONS include regulations and policies at the European, national and local levels that impact directly on GPP, SPP and PPI development, e.g. EU procurement regulations. This key factor is reported by Preuss and Walker (2011), for SPP, and by Gee and Uyarra (2013) and Dale-Clough (2015), for PPI. However, it also applies to GPP.

POLICY GUIDANCE, standing for clear policy guidance regarding GPP, SPP and PPI implementation, is referred to by Preuss and Walker (2011) as a key factor for SPP, and by Amann and Essig (2015), for PPI.

Overall, it should be stressed that all of the 21 key factors identified can be applied to GPP, SPP, and PPI, with the exception of IPR management, which only concerns to PPI.

3.3.2. Findings

The literature review results do not support a statistical study. However, a rough analysis reveals that suppliers' involvement is the key factor most frequently reported as important for the development of GPP, SPP and PPI, followed by knowledge and change agents; a second less quoted, but still important group, is comprised of networking, external stakeholders, and internal change. Therefore, it seems that a mix of internal factors, related to the creation of competences and new practices, and external factors, associated with sharing of knowledge, is crucial for ensuring the change process.

In general, the number of key factors cited in the literature increases from GPP to SPP, and is highest in PPI, particularly concerning the key factors functional criteria/variants, suppliers' involvement, networking, external stakeholders, and vision. This suggests that the number of key factors required increases from GPP to SPP and to PPI.

These findings informed the development of the STP Model, as described in section 3.4.

3.4. The Sustainability Transition Procurement Model - STP Model

In this research, we are interested in exploring the role of public procurement as an additional governance mechanism for the transformation of socio-technical systems. Hence, we developed the Sustainability Procurement Model (STP Model), which maps the key factors that enhance the institutionalization and operationalization of GPP, SPP, and PPI (section 3.3.1) within socio-technical transitions theory. The STP Model (figure 3.1) focuses on public organizations and has an operational perspective; that is, it prescribes practices that may influence the transformation of socio-technical systems, incorporating different approaches to public procurement (GPP, SPP, and PPI).

The STP Model was first presented in Cayolla Trindade et al. (2017). Yet, this paper adds substantially to the description of the model made in the previous publication, as (1) it presents the literature review and the rationale that support the model development; and, (2) building on the model, it develops into a more dynamic process, as presented in section 3.5.

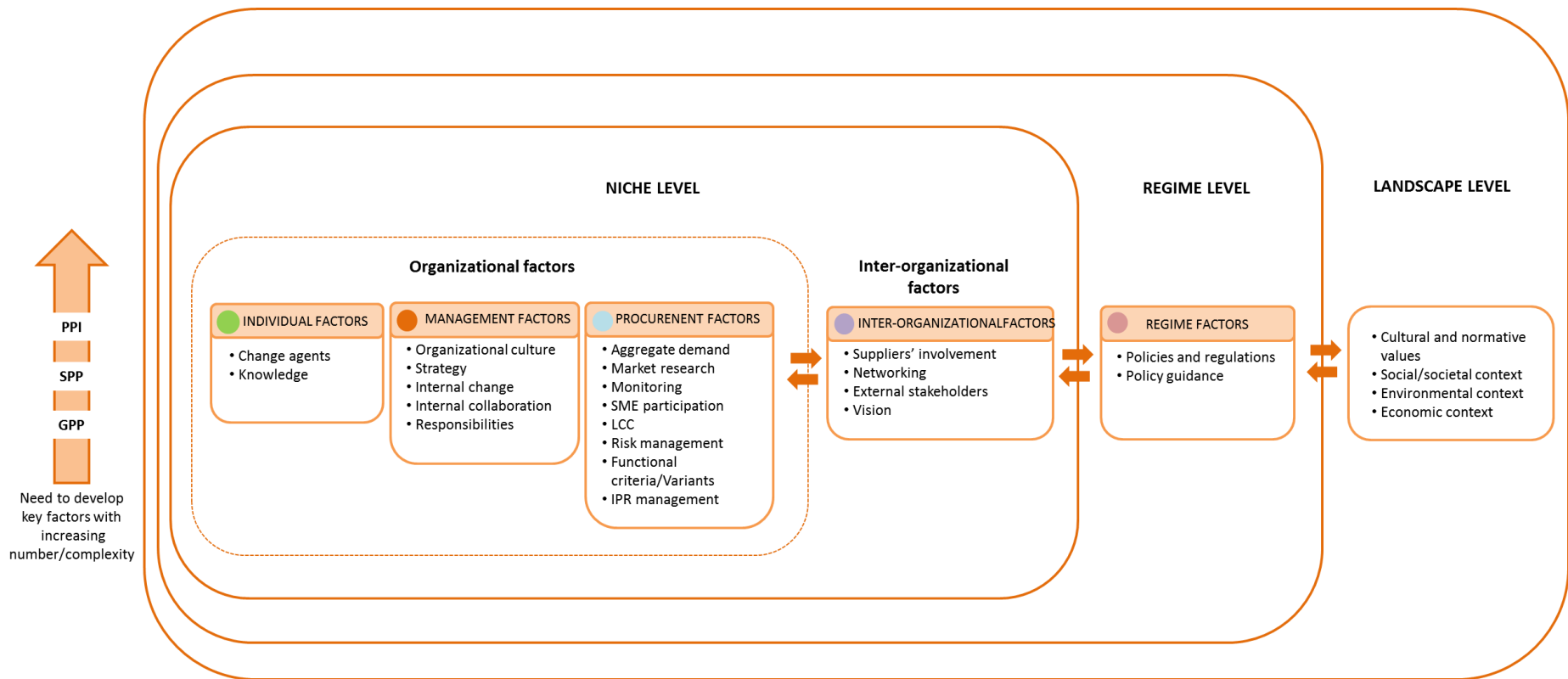


Figure 3.1. The Sustainability Transition Procurement Model - STP Model, adapted from Geels (2011) (Cayolla Trindade et al., 2017).

We started with the MLP theoretical perspective, which provided the rationale for the STP Model. By applying the MLP framework (Geels, 2011, 2004, 2002), the key factors were organized according to the three levels: niche, regime, and landscape. Transition Management and Strategic Niche Management literature (Raven, 2007; Raven et al., 2010; van den Bosch and Rotmans, 2008), provided in-depth insights on niche development processes. Additionally, we used the work done by Gee and Uyarra (2013), as it explores, based on an empirical case, how a major public buyer steered system innovation. These studies allowed us to aggregate the key factors into a multi-level structure organized in levels, building blocks, and categories, which constitute the STP Model, as described below. Our model prescribes practices that support the innovation process by public organizations towards the procurement of new products, services or business models (or different combinations of existing products, services or business models), initiated through the adoption of technical, organizational, socio-cultural and political changes.

3.4.1. Niche level

The niche level of the STP Model supports the emergence of innovations, providing the seeds for systemic changes, as in the MLP perspective. The fundamental role of niche development in transitions justifies that 19 out of the 21 key factors derived from GPP, SPP and PPI literature relate to the niche level.

The empirical study performed by Gee and Uyarra (2013) explored how a major public buyer steered system innovation, concluding that organizational renewal and strategy (and therefore organizational factors), as well as the engagement with multiple stakeholders, namely national bodies and final users, with the aim of aligning planning, market and regulations (thus corresponding to the development of inter-organizational factors) are required to ensure systemic changes. Accordingly, within the STP Model, the key factors at niche level were organized into two building blocks: organizational factors, related to the organization's internal practices, and inter-organizational factors, addressing the organization's external practices regarding its relationships with others, and needed for diffusing innovation (Cayolla Trindade et al., 2017). This is supported by the literature on innovation procurement, as it acknowledges that successful innovation needs explicit knowledge from the organization members and implicit knowledge, located within collective interactions (Preuss, 2007).

Organizational factors

In transitions theory, niche development requires changes in culture, practices, and structures within the social network (van den Bosch and Rotmans, 2008). Yet, as explained above, these changes need to be anchored to similar transformations within the organization.

Accordingly, in the STP Model, the organizational factors' building block corresponds to the organization's culture, practices, structures and strategies needed to support GPP, SPP, and PPI. This building block is organized into three categories: (1) individual factors, concerning individuals and their role within the organization, depicted into two key factors - change agents and knowledge; (2) management factors, addressing organization's culture, practices, structures and strategies, needed to support GPP, SPP and PPI, described by five key factors - organizational culture, strategy, internal change, internal collaboration and responsibilities; and, (3) procurement factors, focusing in procurement practices to support GPP, SPP and PPI, and including the key factors: aggregate demand, market research, monitoring, SME participation, LCC, risk management, functional criteria/variants and IPR management (Cayolla Trindade et al., 2017).

To initiate the process of niche development, the STP Model foresees that organizations need to develop individual factors by encouraging the role of individuals as change agents, as well as promoting adequate awareness, information, and training on GPP, SPP and PPI practices, tools and strategies, to increase individual knowledge. The work done by Gee and Uyarra (2013) provides evidence on the importance of the individual factors' category, as it highlights the role of organizational renewal, related to new members with the necessary motivation, skills, and experience, thus corresponding to the key factors change agents and knowledge.

The process of changing organization's culture, practices and structures is reinforced by the development of the management factors, as they are of primary importance for defining the ability of individuals to engage to GPP, SPP and PPI, and for supporting learning mechanisms (section 3.3.1).

Additionally, the process of changing the orientation of procurement processes towards GPP, SPP, and PPI is materialized through the development of the procurement factors' category, as they correspond to practices that enable a broader view of the procurement function (section 3.3.1).

From the point of view of transitions theory, we intend to contribute to niche development through small-scale experiments on GPP, SPP, and PPI, meaning that the development of individual, management and procurement factors is of most importance to achieve changes in the dominant way societal needs are fulfilled. As the organization moves from GPP to SPP to PPI, the number of factors required and the level of complexity increases.

Inter-organizational factors

As we have seen, the literature on GPP, SPP, and PPI highlights the importance of implicit knowledge located within social networks. In the STP Model, the process of building social networks is described

by the inter-organizational factors' building block and depicted into four key factors: suppliers' involvement, networking, external stakeholders and vision (Cayolla Trindade et al., 2017).

As public organizations move from GPP to SPP and to PPI, they increasingly need to: develop earlier and longer-lasting collaborative activities with suppliers (Edquist and Zabala-Iturriagoitia, 2012); use each other as reference points by working in networks with similar organizations, thus sharing best practices, learning and spreading knowledge (Meehan and Bryde, 2014; Preuss and Walker, 2011); and, involve other external stakeholders, such as policy-makers, public procurers, suppliers, managers in public agencies, researchers, potential users, non-governmental organizations, and the general public (Edquist and Zabala-Iturriagoitia, 2012; Gee and Uyarra, 2013; Rolfstam, 2009). Accordingly, these relationships are addressed by the key factors suppliers' involvement, networking, and external stakeholders. When further developed, these inter-organizational interactions can contribute to changing the existing regime by spreading best practices and knowledge to other actors, creating a common vision (Gee and Uyarra, 2013; Georghiou et al., 2014) – included in the key factor vision (Cayolla Trindade et al., 2017).

In their empirical work, Gee and Uyarra (2013) acknowledge the importance of multi-faceted relationships with national administrative bodies, multiple stakeholders, markets, and end-users to support the system transformations and create a common vision, which is in line with the inter-organizational factors' building block of the STP Model.

In the MLP framework, if networks become larger at the niche level, and involve the participation of powerful actors, they build up an internal momentum (Geels, 2011). These correspond, in the STP Model, to the development of the inter-organizational factors, contributing for broadly accepted expectations, aligning the various learning processes, and potentially resulting in a stable configuration at the regime level. Transition Management and Strategic Niche Management theories (Raven, 2007; Raven et al., 2010; van den Bosch and Rotmans, 2008) also locate niche development processes within social networks – designated by arenas or coalitions, respectively – thus supporting the inter-organizational factors' building block.

3.4.2. Regime level

The regime level of the STP Model, consists, similarly to the MLP perspective (Geels, 2002), of the routine-based behavior of organizations and of other actors involved, represented by two key factors: policies/regulations and policy guidance. Typically, these correspond to regulations from the EU in the area of public procurement, and initiatives concerning the promotion of, and guidance on, GPP, SPP, and PPI. Thus, the regime level in the STP Model addresses short to medium term policies, including regulations, designed to support the incorporation of environmental, social and innovation

considerations in public procurement. Examples are the European Directives on Public Procurement (European Commission, 2014b), which reinforced the possibility of including environmental and social criteria in tenders and defined the new “innovation partnerships” procurement procedures (Cayolla Trindade et al., 2017; European Commission, 1995).

Although the inter-organizational factors’ building block operates essentially at the niche level, Gee and Uyarra (2013) argued that local and national strategies can be shaped and aligned by further developing on-going iterative engagements and multi-faceted relationships. These represent tensions that can undermine current science/technological, user/market and socio-cultural regimes, creating windows of opportunity for niche innovations. For this reason, in the STP Model, the inter-organizational factors’ building block can, in certain cases, break the niche level by actually influencing the existing regime.

3.4.3. Landscape level

In the MLP perspective, the landscape refers to the external macro context (Geels, 2011). Landscape changes, creating pressures on the regime, but the transformation is slow, as it is not influenced in the short term by the niche and the regime levels. Development and events that cannot be controlled by the regime or niche actors (such as macroeconomic developments as recessions, oil prices, and historical shocks, as Chernobyl) put pressure on existing regimes and create windows of opportunities for radical innovations (Raven, 2007).

In the STP Model, we focused on the perspective of the public procurement organization and therefore, unlike the niche and regime levels, the landscape level does not comprise any key factor. Examples of the aspects that form the external context at the landscape level are: long term initiatives, as the Innovation Union (European Commission, 2010a) and the EU Council conclusions on “Eco innovation: enabling the transitions towards a circular economy” (Council of the European Union, 2017), constituting pressures addressed to the national governments and, ultimately, to public procurement organizations; and, the increasing concern from society on unsustainable production and consumption trends, reported by the European Commission studies (European Commission, 2009b), which indicate an additional pressure into regime to change cultural values (Cayolla Trindade et al., 2017). For this reason, in the STP Model, the landscape level corresponds to the perceived environmental, economic and social/societal context, influenced by normative and cultural values, and addressed by public organizations through GPP, SPP, and PPI.

3.5. Discussion: a framework for public procurement in the context of socio-technical transitions

In this section we discuss the relation of the STP Model with different strands of transitions theory, resulting in the proposal of a dynamic process for public procurement as a governance mechanism for transitions– the STP Process.

The STP Model and transitions theory

To position the STP Model within transitions theory, we took the MLP perspective (Geels, 2011), and we used insights on niche development mechanisms from transition management and strategic niche management (Raven, 2007; Raven et al., 2010; van den Bosch and Rotmans, 2008).

The relation between the different frameworks is illustrated in figure 3.2. In all frameworks the social network is the locus of niche development: the MLP perspective refers to the network of actors that support learning processes, articulation of expectations and visions, expanding the base of niche-innovations (Geels, 2011); Strategic Niche Management refers to multi-actor processes in so-called arenas (Raven, 2007); and, Transition Management refers to coalitions, involving a large number of actors to create a broad support (van den Bosch and Rotmans, 2008). In the STP Model, niche formation corresponds to the development of inter-organizational factors based on interactions with a broad range of actors. But, as we have seen, this requires the development of the organizational factors (translated by individual, management and procurement factors).

Therefore, the STP Model has a broader focus, when comparing with transitions theories (figure 3.2), considering niche development mechanisms as a result of changes at the organizational level, as well as from interactions with other actors. Moreover, it gives a thorough picture of the role of public procurement in steering socio-technical transitions on the three levels: on niche level, resulting from the institutionalization and operationalization of GPP, SPP and PPI practices within public organizations; on the regime level, resulting from short to medium term regulations in the area of public procurement, and initiatives concerning the promotion of, and guidance on, GPP, SPP, and PPI; on the landscape level, resulting from long term initiatives addressed to the national governments and, ultimately, to public procurement organizations.

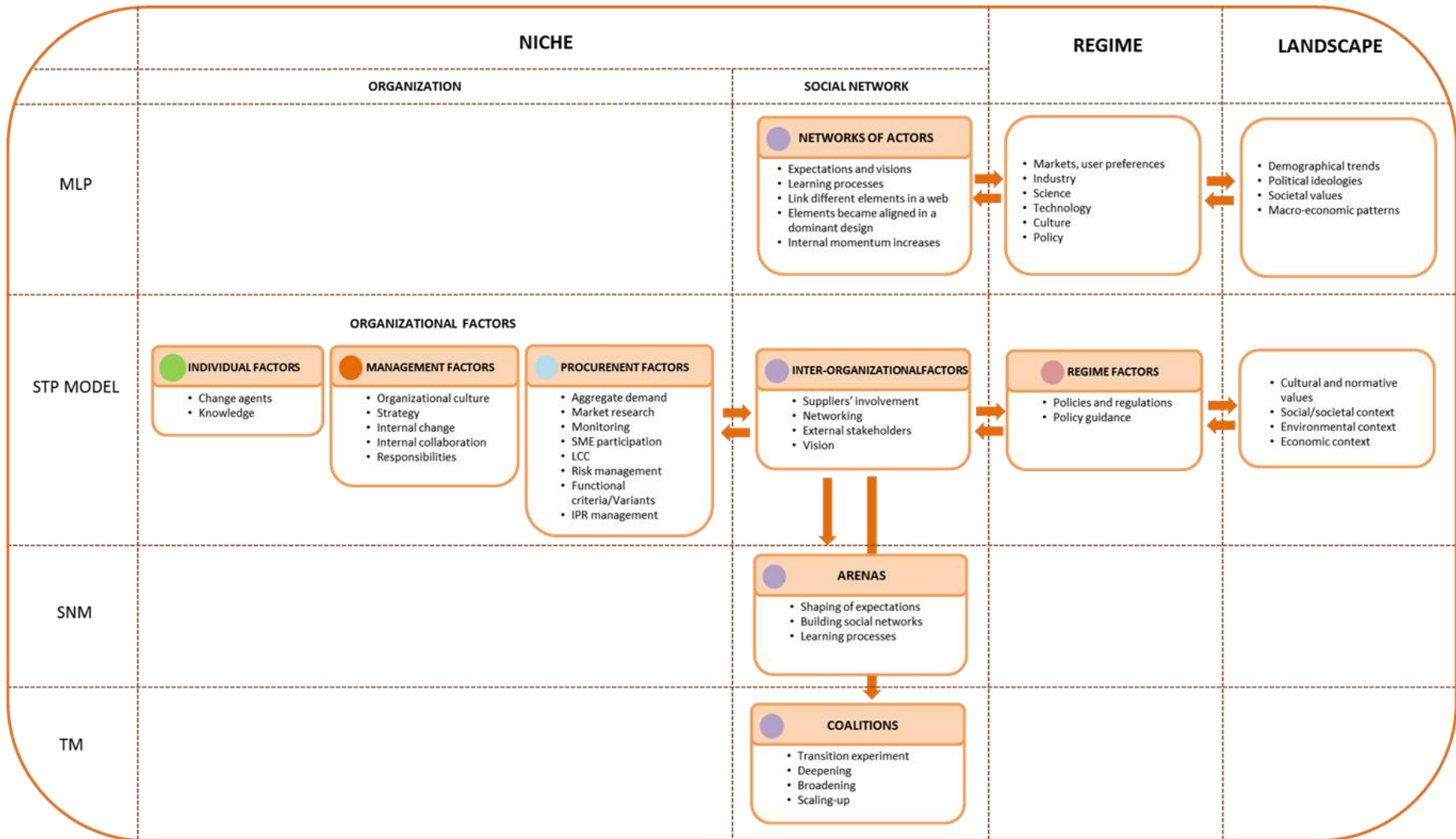


Figure 3.2. The relation between the STP Model, MLP, SNM and TM theories.

Public procurement as a governance mechanism for socio-technical transitions

Drawing upon TM and SNM theories (Raven, 2007; Raven et al., 2010; van den Bosch and Rotmans, 2008), and aiming at introducing a dynamic approach into the STP Model, we propose a transition process using public procurement as a governance mechanism for niche development and, eventually, the transformation of socio-technical systems – the STP Process, illustrated in figure 3.3, and explained below.

In the STP Model, public organizations contribute to niche formation by developing GPP, SPP, and PPI, requiring, in a first moment, the development of organizational factors. Thus, the process of niche development starts at the organization and requires the development of organizational factors that will also support, later on, the evolution of inter-organizational factors.

The institutionalization and operationalization of GPP, SPP and PPI practices increasingly demands the development of inter-organizational factors, building a social network. The new social network induces learning processes, which, in turn, influence organizational factors, producing changes in the organization's internal culture, practices, and structures. Hence, there is a mutual and iterative relationship between organizational and inter-organizational factors.

Additionally, by building social networks, which result from GPP, SPP and PPI practices, public organizations enhance their inter-organizational factors, thus contributing to mutual adjustment, interactive learning and, ultimately, a shared vision. These correspond to the three main niche processes of shaping expectations, building social networks and learning identified by Raven (2007). In other words, the development of inter-organizational factors, when involving a large number of actors to create broader support contributes to the development of coalitions, where deepening, i.e. learning activities about local shifts in culture, practices, and structures take place; and, provided that the aim is fulfilling a societal need in a fundamentally different way, a small-scale experiment can initiate, resulting in a local deviant constellation (van den Bosch and Rotmans, 2008).

Further adapting the work of van den Bosch and Rotmans (2008) to our context, if public organizations have sufficient market power, they can repeat the experiment in different contexts, linking it to other functions or domains, therefore supporting the broadening mechanism. Additionally, public organizations can equally play a significant role in scaling-up, expanding the deviant constellation from “frontrunners” and “niche-players” to incumbent organizations and “regime-players”, by challenging the incumbent suppliers through procurement procedures and other social network processes included in the inter-organizational factors. Moreover, inter-organizational factors, by developing on-going iterative engagements and multi-faceted relationships, can influence regime players at national and local levels by a process of shaping

strategies and by aligning policies at the local and national level, as described by Gee and Uyarra (2013), contributing even more to the scaling up mechanism.

Hence, we argue that, within the STP Model, the development of the organizational and inter-organizational factors blocks potentially contribute to the success of a niche.

This explanation corresponds to the use of public procurement as a governance mechanism for the transformation of socio-technical systems (figure 3.3), as it explores the role of public procurement in the two loci of niche development described by Kemp et al. (2001): protected spaces (niches) and the marketplace. Thus, we propose figure 3.3 as the dynamic process describing the role public procurement as a governance mechanism for transitions – the STP Process. The STP Model, together with the STP Process, constitutes the STP Framework for public procurement in the context of socio-technical transitions.

Although this was not the focus of this study, the STP Model was partially tested by developing three case studies in Portuguese public organizations, described elsewhere (Cayolla Trindade et al., 2017). The case studies, mainly concerned with GPP and SPP practices, illustrated the thoroughly development of organizational factors and, with less degree, inter-organizational factors. Furthermore, these practical studies allowed concluding that GPP and SPP activities support the process of organizational change (by developing organizational factors) and the initial establishment of social networks (by partially developing the inter-organizational factors). These developments correspond, within the STP Process, to organizational changes in culture, practices, and structure, followed by the initial establishment of social networks and deepening mechanisms. Considering the limited experience of the three Portuguese public organizations, this represents a very interesting and promising result, as it allowed demonstrating the initial phase of niche development (corresponding to the lower part of figure 3.3).

Further development of inter-organizational factors would be required to ensure the success of the niche, supported by PPI activities and activities at the tactical level, including the elaboration of images and paths that give direction to the transition experiment and provide a basis for cooperation, as envisioned by van den Bosch and Rotmans (2008).

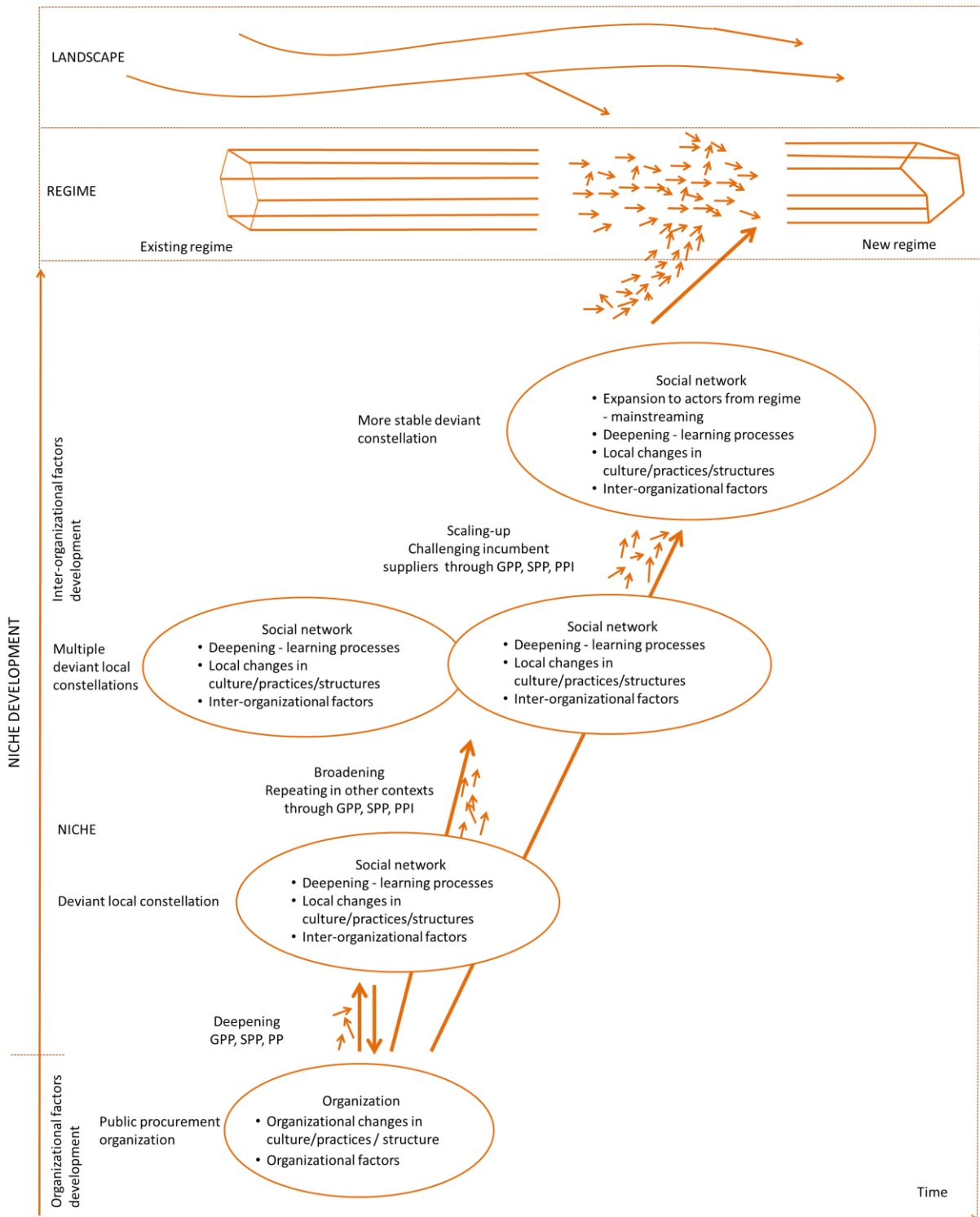


Figure 3.3. The transition process using public procurement as a governance mechanism for the transformation of socio-technical systems – STP Process. Adapted from Geels (2011) and van den Bosch et al (2008).

3.6. Conclusions

This work provides a timely contribution to the debate on the role of public procurement in achieving sustainable development, by linking public procurement to transitions theory.

The first contribution concerns to the integration of different approaches - green public procurement, sustainable public procurement, and public procurement of innovation, under the framework of transitions, giving a broader vision of procurement practices contributing to sustainability.

The second contribution concerns to the STP Model, which focus on public procurement (GPP, SPP, and PPI) and prescribes practices that may influence the transformation of socio-technical systems. It shows that, in order to initiate and strengthen the institutionalization and operationalization of procurement practices that potentially support niche development and eventually lead to socio-technical transitions, public organizations need to move from GPP to SPP and to PPI and tackle an increasing number and more complex key factors, both at the organizational and the inter-organizational levels.

The third contribution concerns to the further development of the STP Model into a dynamic process, describing the role of public procurement as a governance mechanism for niche development in the context of socio-technical transitions - the STP Process.

Both conceptual perspectives are organized in three levels – niche, regime and landscape – providing a comprehensive and systematic framework of the activities that can be developed by organizations and how they can influence the transformation of socio-technical systems: the process of niche development starts at the organization and requires, in a first moment, the development of organizational factors. The institutionalization and operationalization of GPP, SPP and PPI practices increasingly demand the development of inter-organizational factors, building a social network. By building social networks, public organizations contribute to multi-actor processes, which can eventually initiate a small-scale experiment, resulting in a deviant local constellation of culture, practices, and structures that may breakthrough, resulting in a socio-technical transition.

Hence, the study provides a wider perspective on public procurement approaches by including insights from transitions theory and by positioning public procurement as an additional mechanism of niche development that potentially enables socio-technical transitions.

This broader approach means wider possibilities for public organizations in using their procurement power and budgets to fulfill public organizations' needs, ultimately resulting in the long-term change

of an entire system towards sustainability. Hence, the results from this research acknowledge several applications, both for public organizations and policies.

Future research directions include the more practical development of transition experiments involving public procurement organizations, with the aim of studying which conditions enable GPP, SPP and PPI practices to steer niche development and how key factors influence the transformation of socio-technical systems.

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CHAPTER 4. SUPPORTING SUSTAINABLE PUBLIC PROCUREMENT IN THE CONTEXT OF SOCIO-TECHNICAL TRANSITIONS

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SPP TOOLBOX: SUPPORTING SUSTAINABLE PUBLIC PROCUREMENT IN THE CONTEXT OF SOCIO-TECHNICAL TRANSITIONS

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Abstract

Public procurement can shape production and consumption trends and represents a stimulus for both innovation and diversification in products and services, through a direct increase in demand. In recent years, the interest in demand-side policies has grown and several approaches have emerged, such as Green Public Procurement (GPP), Sustainable Public Procurement (SPP) and Public Procurement of Innovation (PPI), representing strategic goals to be achieved through public procurement. In this context, there is a need to guide and support public organizations in the uptake of GPP, SPP and PPI practices. To respond to the challenges raised by the operationalization of such strategies, this paper proposes a new tool—the SPP Toolbox—for guiding public organizations as they re-think the procurement process, raising their ambitions and broadening their vision, thus changing the organizational approach towards culture, strategies, structures, and practices. This toolbox integrates insights from GPP, SPP and PPI objectives and practices, in the context of the emergence of socio-technical transitions. The toolbox coherently links GPP, SPP, and PPI, allowing flexibility in terms of goals, yet promoting an increasing complexity of institutionalized practices and skills - from GPP to SPP and then from SPP to PPI, organized in a framework fully integrated into the organizational strategy.

Keywords: Green Public Procurement; Sustainable public procurement; Public Procurement of Innovation; toolbox.

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4.1. Introduction

The high purchasing power of public organizations and of public authorities in particular is a market factor with enormous potential (Testa et al., 2012), representing 16% of the gross domestic product of the EU (European Commission, 2008a; Rolfstam, 2009) and covering a wide range of goods and services, including: office equipment, building components, transport vehicles, building maintenance, transport services, cleaning, catering and works (Testa et al., 2012). In other words, public procurement can shape production and consumption towards more sustainable trends (Testa et al., 2012), by stimulating innovation in the value chain and promoting the diversification of the products and services mix (Rizzi et al., 2014; Testa et al., 2016).

In recent years, the interest in demand-side policies has grown and several approaches have emerged, such as Green Public Procurement (GPP), Sustainable Public Procurement (SPP), Public Procurement of Innovation (PPI) and, more recently, Circular Procurement (CP) (Deambrogio et al., 2017), representing strategic goals to be achieved through public procurement (Amann and Essig, 2015). At the European level, in particular, GPP has increasingly played a central role in environmental policies (Rizzi et al., 2014), while PPI and CP are also becoming a priority on the European agenda (Edler and Georghiou, 2007; Rolfstam, 2012). The current literature on this topic acknowledges that GPP, SPP, and PPI are able to support innovative activities, as discussed below. However, procurement of innovation challenges currently institutionalized practices and skills, requiring a different approach from that used in the procurement of regular off-the-shelf goods (Rolfstam, 2012, 2009). That is, different types of coordination may be required, in order to enhance the effectiveness of public procurement as a strategic (eco)-innovation policy instrument (Rolfstam, 2009).

It is well established that sustainable development requires large scale transformations in the way societal functions are fulfilled (Geels, 2011), involving a “transition” or “system innovation” away from the prevailing socio-technical system—which includes technology, regulations, user practices, markets, cultural meaning, infrastructures and networks—towards another (Elzen et al., 2004; Smith et al., 2010). Thus, public procurement should seek to contribute to sustainable development—addressing environmental and social consequences (Smith et al., 2010), within the broad vision of inducing socio-technical transitions.

We argue that GPP, SPP and PPI approaches would benefit from considering insights from socio-technical transitions theory. To address this gap, the Sustainability Transition Procurement Model (STP Model) was developed (Cayolla Trindade et al., 2018). This model maps out the key factors that influence the transformation of socio-technical systems towards sustainability, integrating different approaches towards public procurement, i.e. GPP, SPP, and PPI, in a multi-level framework.

Within public organizations, local authorities are particularly relevant, since they have a territorial responsibility for both economic well-being and quality of life of their constituents and hence they are likely to find particular types of unmet needs and market failures, corresponding to a high potential for steering innovative activities (Dale-Clough, 2015). Gee and Uyarra (2013) acknowledged that public authorities can orchestrate system innovation through public procurement. Adding to that, Knutsson and Thomasson (2014) demonstrated that, even for small local authorities, it is possible to influence the market through innovative procurement processes, spreading innovation to other public services through networking.

These contributions justify the focus of our research on the ability of public organizations to re-think the procurement process, fulfilling their potential to shape supply chains and market development (Dale-Clough, 2015; Knutsson and Thomasson, 2014), ultimately, contributing to socio-technical transitions. This re-thinking should address the organization's wider strategies and purchasing and contractual cycles, as well as the range of procurement methods being used (Dale-Clough, 2015).

Despite the high interest in public procurement policies, the uptake of GPP, SPP and PPI practices among European public organizations has been limited (Bratt et al., 2013; Dale-Clough, 2015; Testa et al., 2012). Furthermore, PPI is a costly and time-consuming process, requiring a greater degree of in-house competencies, as a higher effort is needed to develop innovative solutions than for regular forms of procurement (Lember et al., 2011; Timmermans and Zabala-Iturriagagoitia, 2013; Uyarra et al., 2014). In order to overcome this hurdle, additional efforts are required to support local authorities in the process of broadening their ambitions and vision (Dale-Clough, 2015).

Having said that, the aim of this paper is to address this gap and respond to these challenges, by further developing the STP Model into a tool—the SPP Toolbox—which assists public organizations, including public authorities, in the institutionalization of GPP, SPP and PPI practices, changing the organizational approach towards culture, strategies, structures and practices, in the context of the emergence of socio-technical transitions.

We begin by briefly reviewing the concepts of GPP, SPP, and PPI, followed by deepening the context of public procurement (section 4.2). Then, the STP Model is described in section 4.3, which provides the framework to develop the SPP Toolbox. The research methods for developing the SPP Toolbox are described in section 4.4. Building on the STP Model and other frameworks, the SPP Toolbox is explained in section 4.5. The results from the practical implementation of the SPP Toolbox in three Portuguese public organizations are presented in section 4.6, followed by the discussion (section 4.7) and conclusions (section 4.8).

4.2. Background to GPP, SPP, and PPI approaches

This section reviews the concepts of GPP, SPP, and PPI and their contribution to innovation for sustainability while discussing some challenges for tools supporting public authorities in the institutionalization of GPP, SPP and PPI practices.

Green Public Procurement (GPP) is based on the use of environmental criteria in public tendering (Bratt et al., 2013), developing capacity for green supplies and markets (Zhu et al., 2013) and stimulating the innovation capabilities of suppliers (Testa et al., 2016, 2012). It aims to achieve value for money while reducing the environmental impact of purchased products and services over their whole life-cycle (Zhu et al., 2013). GPP is becoming a cornerstone of environmental policies, both at the European Union and Member State level, as well as worldwide (OECD, 2017; UNEP, 2015). Its role in supporting sustainable consumption and production patterns has strongly increased and currently, it is spreading throughout public authorities (Testa et al., 2012). By operating as a market trigger, GPP can act as a strong stimulus for eco-innovation (Testa et al., 2012).

Sustainable Public Procurement (SPP) is the procurement of goods and services incorporating environmental, economic and social concerns into tendering and, therefore, into the procurement process (Roman, 2017; Walker and Brammer, 2012). The approach is therefore very similar to GPP, adding social concerns. According to Bratt et al. (2013), SPP supports sustainable product-service system innovation.

We adopt the definition of Public Procurement of Innovation (PPI) developed by Rolfstam (2009), which defines PPI as the whole range of purchasing activities, carried out by public agencies that lead to innovation. This view is in line with Preuss (2007) and Uyarra and Flanagan (2010), who also proposed a wider scope for the innovation processes, including: product and service innovation through innovation in organizational processes; societal innovation; the recombination of existing goods and services; and, innovation in the delivery of existing services. In the context of our research, we are particularly concerned with PPI for ecological and sustainable innovation. PPI is understood as a tool for stimulating the development of new products—goods, services or systems but it can also refer to public procurement that attempts to open up innovation possibilities, without necessarily targeting new products (Lember et al., 2014; Rolfstam, 2012; Uyarra and Flanagan, 2010). Lember et al. (2014) recognize that PPI induces radical, new-to-the world breakthrough technologies; promotes incremental innovations where existing products are adapted to the local context and are, thus, new to a country or a region; promotes new organizational and/or technological capabilities; and, promotes innovations in mature markets.

Public procurement of innovation requires more radical approaches than GPP and SPP (Piga et al., 2014), resulting in a complex and interactive process where there is a key activity of learning by interaction (Rolfstam, 2012). The most immediate practical implication is that evolving from GPP to SPP and from SPP to PPI requires public organizations in general, and public authorities in particular, to have an improved approach, involving an increasing complexity of institutionalized practices and skills, as has been already demonstrated elsewhere (Cayolla Trindade et al., 2018).

On the other hand, GPP, SPP and PPI practices need to be fully integrated into organizational strategies, in order to allow the significant shift from “purchase-cost” to “life-cycle cost” approaches, as well as to carry out the corresponding cultural, managerial and operational changes required to effectively contribute to sustainability. These particular needs were stressed by Testa et al. (2016) and Amann and Essig (2015) for GPP, by Bratt et al. (2013) for SPP and by Knutsson and Thomasson (2014) for PPI.

Having into consideration the required implementation conditions to overcome the slow uptake of GPP, SPP, and PPI, Testa et al. (2016) argue that the adoption of guidelines and tools can assist organizations in becoming more GPP oriented. The importance of guidelines, toolkits, and documents in promoting GPP and SPP practices has been highlighted by several studies (Meehan and Bryde, 2011; Testa et al., 2016) and also applies to PPI. Furthermore, this can be especially important for small public authorities (Testa et al., 2016).

The lack of guidelines was tackled, at the EU level, by the Buying Green Handbook, published by the European Commission in several languages (European Commission, 2016b) and by the EU training toolkit on GPP (European Commission., 2016). The European Secretariat of ICLEI has also published the Procura+ Manual (Clement et al., 2016, 2007), which is a reference for procurers. The European Commission has launched very recently the “eafip” toolkit to provide support to policy makers in designing PPI strategies and to procurers and their legal departments in implementing such procurements (European Commission., 2015).

A large variety of tools and guides is available in grey literature, namely through the Procurement Forum platform (ICLEI, 2013), which developed a compilation of existing tools and guides. A thorough analysis of such compilation provides an idea of the type of available tools. First, in what regards to format, the tools/guides provide the information in descriptive documents, not allowing to be filled, in an interactive mode (e.g. the Buying Green Handbook). Second, concerning the content, we have identified tools/guides which are very general, applying to all sectors and discussing a wide range of issues (e.g. the Buying Green Handbook, Buying for a Better World UNEP); tools that address just one approach to public procurement- GPP and/or SPP, social procurement (e.g. BuyGreen and Make a Difference, +Sustainable City Council, Buy Fair); tools addressing specific territories, at national,

region or local level; tools that are sector-specific, addressing, for instance, the purchase of vehicles, energy, timber, catering (e.g. Clean Fleets Guide, Guide of Purchasing Electric and Hybrid Vehicles); and, tools addressing specific technical issues – life-cycle costs (LCC), functional specifications (e.g. Climate Information for Green Procurers, Functional Specifications Guide). Even though there is such a diversity of tools and guides, there is evidence of a considerable gap for tools focusing on: (a) the integration of GPP, SPP, and PPI together, as part of an organizational evolution towards more complex forms of procurement; (b) a framework to address the different levels of GPP, SPP and PPI and their role in the socio-technical transitions.

4.3. Background: The STP Model

The Multi-Level Perspective (MLP) framework on sustainability transitions (Geels, 2002) is recognized as the main approach for the understanding of major system level shifts in social, economic and technological practices at a necessary scale to meet the present challenges of sustainability (McMeekin and Southerton, 2012). The MLP theory considers that transitions result from non-linear interactions at three levels: niche, regime, and landscape (Geels, 2011, 2002). Niches are “protected spaces,” such as R&D laboratories, subsidized demonstration projects, or small market niches, where users have special demands and are willing to support emerging innovations that deviate away from existing regimes (Geels, 2011). Regimes are formed by socio-cultural, user/market, science/technological practices, and rules, referring to the “meso” context. Landscapes, on the other hand, refer to the external macro context, such as demographical trends, political ideologies, societal values and macro-economic patterns (Geels, 2011, 2002). Overall, regimes are embedded within landscapes and niches are embedded within regimes (Geels, 2002). Transitions are characterized by the interaction between the three levels: niche-innovations build up internal momentum; whilst, changes at the landscape level create pressure on the regime; and, destabilization of the regime creates windows of opportunity for niche innovations (Geels, 2011).

This theory focuses on the development of radical innovations by producers and on the role of political governance, thus neglecting the potential of trajectories in consumption processes that are also of critical importance to orchestrate a system transition (McMeekin and Southerton, 2012). Despite this focus, the MLP associates the category of “special users,” described as early adopters that engage intensively in modifying and developing the innovation ready for market release, to processes of radical socio-technical innovation (McMeekin and Southerton, 2012). This is also supported by Raven (2007), who locates radical transformation of regimes in early niche markets, constituted by early adopters with different preferences than mainstream users, often willing to pay

a higher price to particular benefits they gain from innovation. This type of approach is the core of GPP, SPP, and PPI.

Gee and Uyarra (2013) demonstrated, by using an empirical case, the potential of public bodies to orchestrate system innovation by actively managing the required interdependencies between technologies, institutions, and practices, thus establishing public procurement as an additional governance mechanism for the transformation of socio-technical systems. These studies demonstrate the relation between socio-technical transitions and consumption and specifically public procurement, providing ground to the development of a model that incorporates insights from GPP, SPP and PPI practices into the MLP framework.

The STP Model, presented in more detail elsewhere (Cayolla Trindade et al., 2018), maps out the key factors that influence the transformation of socio-technical systems towards sustainability (figure 4.1), integrating different approaches towards public procurement, i.e. GPP, SPP and PPI, building on Geels’ multi-level perspective (MLP) (2011, 2004, 2002). The STP Model is focused on public procurement organizations and addresses each of the three interdependent levels that are structuring the MLP framework: niche, regime, and landscape. Each level is composed of one or more building blocks, each one having related key factors.

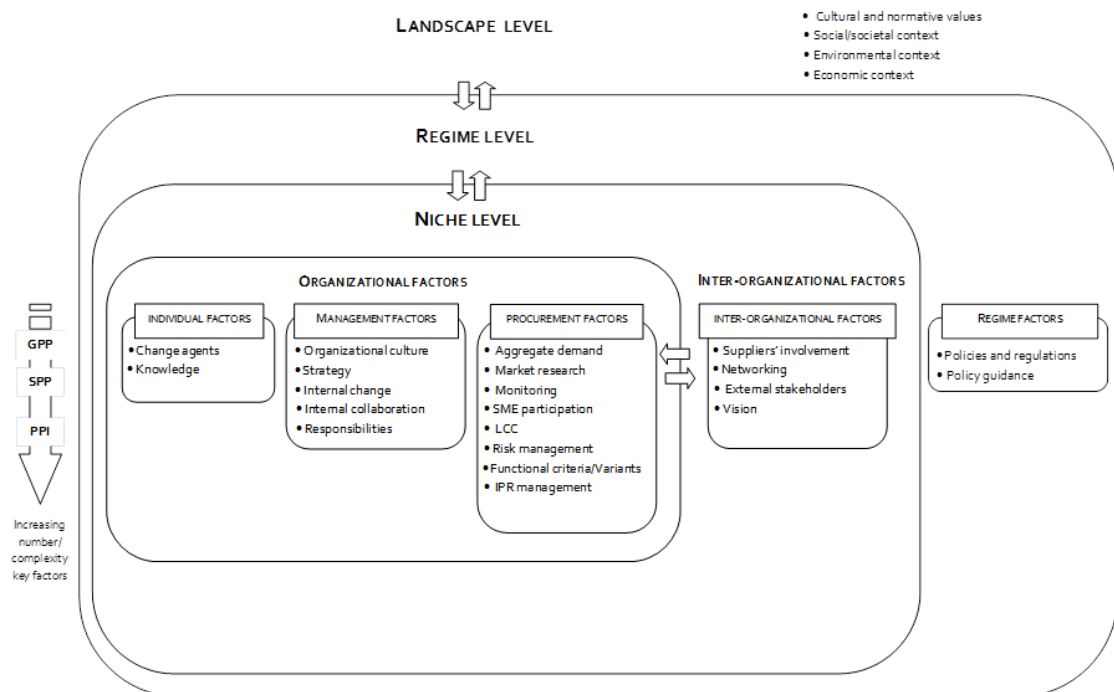


Figure 4.1. The Sustainability Transition Procurement Model (STP Model).

In the MLP framework, the niche level provides the seeds for systemic changes, supporting the emergence of innovations (Geels, 2011, 2004, 2002). Niche development can happen in special geographical locations or in specific domains, acting as a vehicle for learning, building new social networks (for instance producers, scientists, users, policy makers) and improving the innovation, so that it gains momentum for diffusion to other niches or even replaces dominant regime practice (Raven et al., 2010). In Strategic Niche Management (SNM) theory, success or failure of a niche can be explained by analyzing the interactions between three main niche processes: (i) shaping of expectations—articulating expectations and visions in order to attract resources and new actors and provide direction to the process; (ii) building social networks—new combination of actors, in order to promote the emergence of new social networks; and, (iii) learning processes—social embedding to increase chances on successful diffusion (Jain et al., 2017; Raven et al., 2010). In the STP Model, the niche level is characterized by the organization's internal practices (organizational factors), as well as by external practices concerning its relationships with others, which are required for spreading innovation (inter-organizational factors).

The organizational factors block is divided into three categories: (1) individual factors, accounting for the role of the individuals within the organization and encompassing two key factors (change agents and knowledge); (2) management factors, referring to the organization's culture, strategies, structures and practices required for supporting GPP, SPP and PPI and encompassing five key factors (organizational culture, strategy, internal change, internal collaboration and responsibilities); and (3) procurement factors, which focus on practices that support GPP, SPP and PPI, encompassing the following key factors: aggregate demand, market research, monitoring, SME (small and medium size enterprises) participation, LCC (life-cycle costs), risk management, functional criteria/variants and IPR (intellectual property rights) management.

The inter-organizational factors block relates to implicit knowledge located within collective interactions, which can be oriented towards suppliers, similar organizations and/or other external stakeholders. Accordingly, this block encompasses four key factors: suppliers' involvement, networking, external stakeholders, and vision. Moving from GPP to SPP to PPI, the organization increasingly needs to: develop earlier and longer-lasting collaborative activities with suppliers (Edquist and Zabala-Iturriagoitia, 2012); work in networks with similar organizations that use each other as reference points, sharing best practices, promoting interactive learning and spreading knowledge (Meehan and Bryde, 2014; Preuss and Walker, 2011); and, engage with other external stakeholders, such as managers in public agencies, policy-makers, public procurers, potential users, suppliers, researchers and non-governmental organizations (Edquist and Zabala-Iturriagoitia, 2012; Gee and Uyarra, 2013; Rolfstam, 2009). These relationships are addressed in the key factors suppliers' involvement, networking, and external stakeholders. Furthermore, inter-organizational

interactions spread knowledge and best practices to other actors, creating a common vision (Gee and Uyarra, 2013; Georghiou et al., 2014), hence contributing to change the existing regime —this referring to the STP Model’ vision key factor. Thus, the three main niche processes described above (shaping of expectations, building social networks and learning processes) correspond to the inter-organizational building block. The multi-faceted relationships and on-going iterative engagements can shape local and national strategies and align policies at national and local levels, thus influencing the regime level, as demonstrated by Gee and Uyarra (2013).

In the STP Model, as in the MLP perspective (Geels, 2002), the regime level consists of the routine-based behavior of organizations and of other actors involved, encompassing two key factors: policies/regulations and policy guidance. Thus, the regime level includes short to medium term policies and regulations which favor the introduction of environmental, social and innovation considerations in public procurement. The European Directives on Public Procurement (European Commission, 2014b) constitute an example, allowing for environmental and social criteria and defining new procurement procedures such as the “innovation partnerships,” which acknowledge a strong link between procurement and innovation (European Commission, 1995).

The landscape level is translated, in the STP Model, into the perceived social/societal, environmental and economic context, influenced by cultural and normative values. Long term European initiatives such as the Innovation Union (European Commission, 2010a) and the comprehensive product policy as recently referred by the EU Council conclusions on “Eco innovation: enabling the transitions towards a circular economy,” includes a call on the Member States to “...make active use of the product sustainability and circularity criteria in the process of green procurement...” (Council of the European Union, 2017). Based on previous experience, those will most likely consist of landscape pressures addressed to the national governments and to the public procurement organizations. At a more general level, the concern on unsustainable production and consumption patterns has grown in society, as demonstrated by European Commission studies (European Commission, 2009b), corresponding to a change in cultural values and adding pressure to the regime.

In short, the STP Model captures the institutionalization and operationalization of GPP, SPP, and PPI at different levels, from an organization’s perspective. The niche level includes the key factors that need to be developed, not only within the organization but also between organizations; the regime level refers to the policy key factors that can be triggered by public organizations; and, the landscape level is the wider context of public organizations, involving a number of societal aspects (Cayolla Trindade et al., 2018). The alignment of the various successful developments at the niche level, reinforced by changes at the regime level, as well as by pressure from the landscape level, will determine whether a regime shift will occur (Kemp et al., 2001), contributing to a system innovation

or socio-technical transition, oriented towards delivering sustainable responses to the societal issues perceived at the landscape level.

4.4. Research approach

Addressing the drivers and gaps identified in sections 4.1, 4.2 and 4.3, this research proposes a new tool—the SPP Toolbox—to support the development of a sustainable procurement strategy, oriented towards GPP, SPP, and PPI. The SPP Toolbox aims to guide and support public organizations, including public authorities, as they re-think the procurement process, helping them to raise their ambitions and broaden their vision, thus changing the organizational approach towards culture, strategies, structures, and practices, in the context of the emergence of socio-technical transitions.

The approach taken in the SPP Toolbox was adapted from the GPP Management Model, proposed by the European Commission (European Commission, 2008b) and ICLEI (Clement et al., 2016, 2007), which is comprised of five phases: (1) preparation; (2) target setting; (3) developing an action plan; (4) implementing the action plan; (5) monitoring progress and reporting results. The use of a Deming cycle type of tool offers a simple, flexible and comprehensive approach, facilitating the integration with the existing management systems (European Commission, 2008c). Additionally, the SPP Toolbox assembles a range of perspectives, as well as practical skills, concerning the key factors mapped out at the niche level of the STP Model (figure 4.1.).

The toolbox was initially focused on GPP and SPP. It was developed from the existing literature and prototype versions were then tested and applied in three public Portuguese organizations which operate at the local level: Torres Vedras (Municipality of Torres Vedras), Loures (Municipality of Loures) and LIPOR (Intermunicipal Waste Management Company of Greater Porto, Portugal), generating three case studies.

The research method was based on multiple case studies, as it allows the researcher to analyze different contexts for each of the cases, i.e. to analyze within each setting and across settings. In a multiple case study, we are examining several cases to understand the similarities and differences between cases (Baxter and Jack, 2008). The exploratory case study is developed in line with the grounded theory approach, which assumes that the natural occurrence of social behavior within real-world contexts is best analyzed by deriving “bottom-up” grounded categories and concepts (Yin, 2011), i.e. it implies the discovery of theory from data. The research presented in this paper assumes this iterative process of travelling back and forth between the theory and the evidence.

The strategy for selecting the cases considered the following criteria: public organizations that illustrated different sizes, organizational structures, purchasing power and with some experience in GPP, SPP or PPI. Willingness to participate was also an important factor that shaped the final selection of cases. Torres Vedras is a medium-sized city, located in a rural area, with 79,500 inhabitants. Its municipality employs 550 people. The municipality of Loures, by contrast, is part of the Lisbon Metropolitan Area and has 200,000 inhabitants and employs about 2100 people. Finally, LIPOR is the inter-municipal waste management enterprise of the Oporto region, employing 191 people. All three organizations have a procurement department, but purchasing activities are more centralized in Loures and LIPOR than in Torres Vedras. With reference to their experience in GPP, SPP, and PPI, all the three organizations had some previous experience, but limited to GPP. LIPOR, in particular, implemented the SA 8000 social accountability management system and, therefore, has applied a code of conduct for all suppliers and subcontractors, since 2009. The three organizations thus represented different situations and were considered adequate examples for testing the SPP Toolbox. The case studies were implemented in the period 2012–2014, via regular meetings held in the three organizations' premises, with the aim of implementing the six steps of the SPP Toolbox.

In addition, the development of the SPP Toolbox involved a participatory process, through the consultation of key Portuguese public procurement stakeholders (i.e. municipalities, central public administration and other public organizations) in several events organized at the National Laboratory of Energy and Geology (LNEG), including: (1) Portuguese SPP Network meetings, held on the 15 March 2012 (22 participants), 23 November 2012 (14 participants) and 9 April 2014 (18 participants); (2) one meeting especially dedicated to getting feedback from the organizations participating in the three case studies, held on the 20 June 2013; and (3) a one-day workshop on GPP, held on the 21 May 2014 (48 participants). The method for gathering feedback from participants included the step-by-step presentation of the SPP Toolbox, followed by discussion and comments, which were then recorded in the form of minutes. Additionally, a questionnaire was handed out at the end of the meeting, which assessed the participants' view of each step of the SPP Toolbox, based on the following topics: relevance, implementation difficulty/capability, positive/negative aspects and measures to overcome obstacles. The questionnaire also asked respondents to evaluate the toolbox as a whole.

Results from the three implementation case studies, as well as the participatory process, fed into an iterative design process, whereby collected suggestions and feedback were built progressively into the next version of the tool. Changes were tracked using version control.

From 2015–2016, the SPP Toolbox was further improved to better accommodate the key factors mapped out at the niche level of the STP Model, as well as PPI approaches.

4.5. The SPP Toolbox

The SPP Toolbox is a step-by-step tool developed to operationalize the STP Model (figure 4.1) in public organizations, including public authorities (available online at <http://sppbizzi.eu/en/login>). The tool is aimed at procurement officers, officers from other departments and top-level decision makers belonging to public organizations, such as local authorities, regional authorities, and central government bodies.

The SPP Toolbox targets procurement organizations and their transformative potential for contributing to the niche formation process through the use of GPP, SPP and PPI approaches.

Therefore, the SPP Toolbox assembles a range of perspectives, as well as practical skills, concerning the key factors mapped out at the niche level of the STP Model, as shown in figure 4.2.

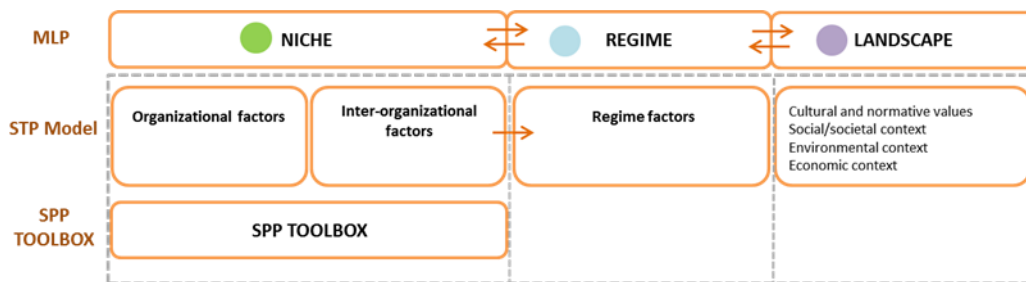


Figure 4.2. The scope of the SPP Toolbox.

The SPP Toolbox is mainly focused on sustainability and, for this reason, the term “sustainable procurement” is widely used. However, the goal is that the organization defines and implements a sustainable procurement strategy (SPP strategy) oriented towards GPP, SPP, and PPI. The SPP strategy is composed of the SPP vision, policy, targets and the action plan.

The SPP Toolbox is a Deming Cycle type of tool and it encompasses six steps: (1) preparatory steps; (2) SPP policy and targets; (3) develop the action plan; (4) implement the action plan; (5) monitoring & reporting; and, (6) revision. An outline of the SPP Toolbox is presented in figure 4.3, illustrating the main activities to be performed in each of the six steps. Each step will be presented in detail in the following sections.

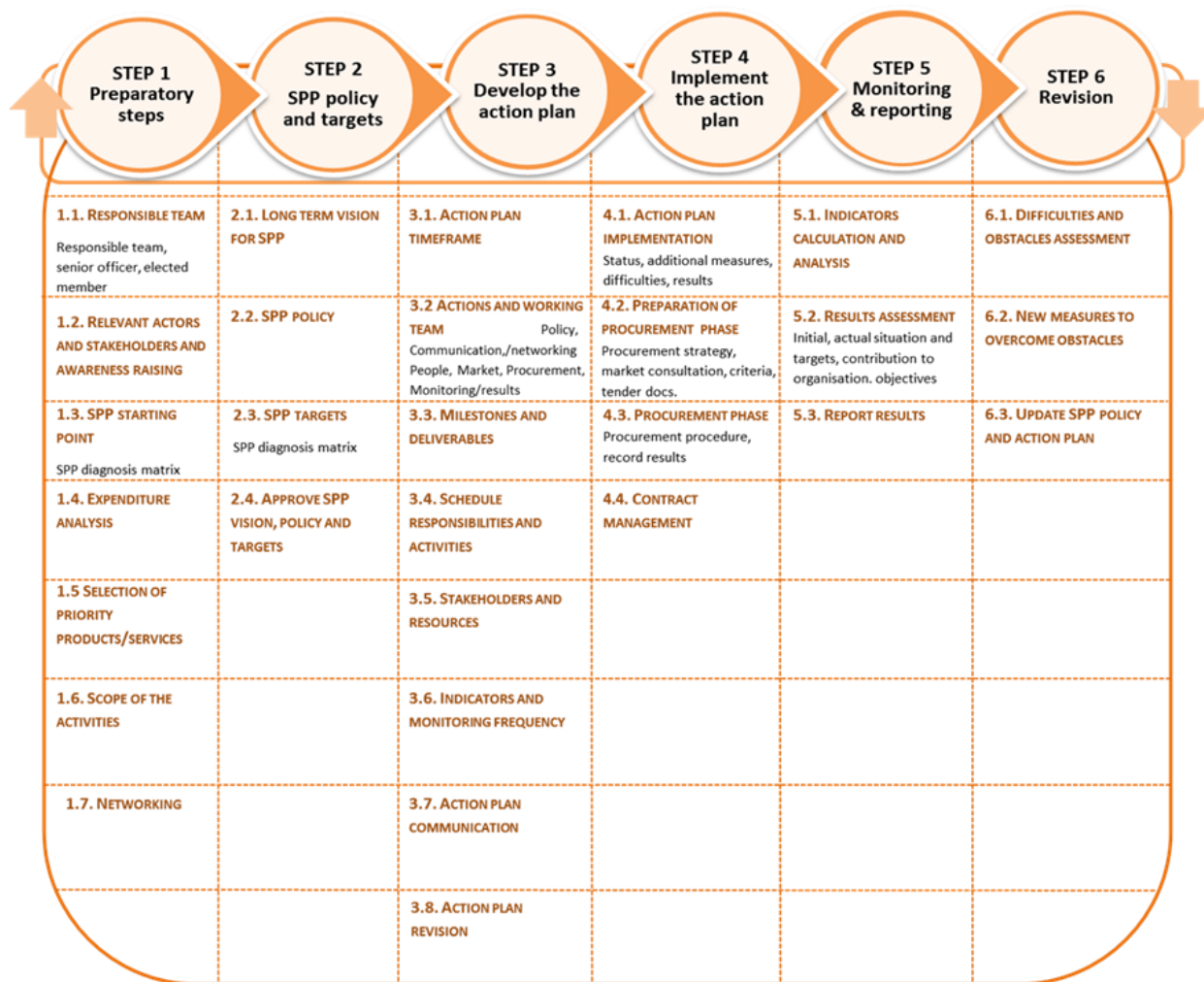


Figure 4.3. The SPP Toolbox cycle.

A distinct feature of the SPP Toolbox is its form format, allowing the collection and registration of information along the six steps.

Step 1: Preparatory steps

This step involves preliminary activities, including getting support from top management and different departments for GPP, SPP and PPI activities. In order to create an appropriate Sustainable Procurement Strategy and implement it effectively, a responsible team needs to be defined, comprised of management, technicians and legal experts and coordinated by a senior officer and an elected member. The responsible team will be in charge of implementing the SPP Toolbox within the organization, while the elected official is responsible for maintaining a political commitment to SPP. A list of relevant internal and external actors is essential for defining the responsible team, as well as for stakeholder consultation and involvement in the subsequent steps of the SPP Toolbox. Additionally, the scope of activities is defined, e.g., the decision as to whether to apply the system to the whole authority, or just to some departments.

The organization's starting point regarding its procurement practices is captured using the SPP Diagnosis Matrix (table 4.1), adapted from the UK Sustainable Procurement Task Force Flexible Framework (Defra, 2011; Scottish Procurement Directorate, 2009). The Flexible Framework is a widely used self-assessment mechanism which allows organizations to measure and monitor their progress on sustainable procurement over time. The framework was designed so that it could be used by all organizations. Although it covers activities and reporting requirements which are mandatory for all UK central government bodies (Defra, 2011), thus corresponding to the regime level, in the Portuguese context it constitutes a good practice, that can be applied to procurement organizations, thus currently it operates mostly at niche level. Some adaptations were introduced, both at themes and contents level.

The SPP Diagnosis Matrix, described in table 4.1, allows public organizations to determine the level of development, from 1 to 5, of their procurement practices and skills across six different dimensions: policy, vision, and targets; communication and networking; people; market; procurement; monitoring and results.

An important aspect to consider in Step 1 is the decision about which product/service groups to focus on. This decision depends on a number of factors. Within the SPP Toolbox, the definition of priority products/services is informed by: the expenditure analysis, resulting in the identification of the planned procurement actions, economic value and contract period; the analysis of the organization's, local, national and European policies and strategies, as well as its alignment with the procurement actions; the SPP potential of each product/service; and, the view of internal stakeholders, based on discussions with relevant actors regarding their perception of the most important products/services. The SPP potential of each product/service results from the weighting of several aspects, including: the availability of sustainability criteria; the existence of sustainable alternatives in the market; the environmental and social impact of the product/service; the importance of the purchase for the market; and, the potential for PPI. After deciding on the priority products/services, the responsible team defines the requirements that apply to all products/services to be procured, as, for example, the application of a code of conduct for suppliers. The result is a list of priority products/services, i.e. a list of priority procurement needs, as well as a list of general requirements.

Additionally, Step 1 starts the implementation of the inter-organizational factors block, including the search for and engagement with: active networks of suppliers ("suppliers' involvement" key factor); public procurers ("networking" key factor); and, other stakeholders, such as managers, policy-makers, potential users, researchers and non-governmental organizations (external stakeholders key factor).

Table 4.1. The SPP Diagnosis Matrix.

Level	Policy, Vision, and Targets	Communication and Networking	People	Market	Procurement	Monitoring and Results
5	Sustainable procurement policy in place, action plan, and targets regularly reviewed, with a commitment from top management. Sustainable procurement policy is part of a wider sustainable development strategy.	Networking with similar organizations, with potential suppliers and other stakeholders, including public agencies, policy-makers, potential users, researchers, NGO and the general public. This iterative engagement results in a common vision that will be communicated to staff, suppliers and key stakeholders, shaping local and national strategies and policies.	Sustainable procurement champion and a working team identified. Regular advanced training for key procurement staff. Performance objectives include sustainable procurement factors. These can include benefits achieved.	Supply chain improvement program in place, including sustainability audits. Achievements are formally recorded and best practices shared with other organizations.	Sustainability considered at an early stage and in all later stages of the procurement process. PPI is considered for key contracts. Actions to minimize risks, aggregate demand, promote SME participation and manage IPR in the procurement process. Functional criteria/variants are considered in the procurement process.	Assessment of the contribution of procurement actions to the organization's sustainable development objectives.
4	Sustainable procurement policy in place and endorsed by top management.	Communicated to staff, suppliers and key stakeholders. Networking with similar organizations, with potential suppliers and other stakeholders, including public agencies, policy-makers, potential users, researchers, NGO and the general public.	Sustainable procurement champion and a working team identified. All procurement staff has received basic training in sustainable procurement.	Collaborative activities with suppliers, through a program of supplier engagement, initiated with top management involvement, geared towards continuous sustainability improvements. Program involves two-way communication between procurers and suppliers.	Inclusion of sustainability criteria in key contracts. Life-cycle costs (LCC) approach adopted in some contracts. Market research activities to consider alternatives.	Indicators are defined and monitored systematically, to assess the implementation regarding policy, communication, people, procurement processes, market, and monitoring actions.

Level	Policy, Vision, and Targets	Communication and Networking	People	Market	Procurement	Monitoring and Results
3	Existing sustainable procurement objectives but no sustainable procurement policy in place.	Communicated to staff and suppliers. Networking with similar organizations.	Sustainable procurement champion. Key procurement staff has received basic training in sustainable procurement.	Key suppliers identified based on expenditure analysis and sustainability impact and targeted for engagement.	Key sustainability objectives (derived from organization plans and policies) and expenditure analysis used for prioritization of contracts.	Some indicators are monitored but not systematically.
2	Pockets of excellence within purchasing driven by individual personalities.	Communication to staff regarding SPP. Attendance of some GPP/SPP/PPI events.	No assigned responsibilities for sustainable procurement. Some individuals with basic training in SPP.	Some <i>ad hoc</i> working with suppliers based on compliance.	Expenditure analysis undertaken and some contracts include general sustainability criteria. Contracts awarded on the basis of value-for-money, not lowest price.	Indicators were defined but not monitored.
1	No sustainable procurement policy in place, or activity undertaken by the organization.	No communication practices within the organization regarding SPP.	No assigned responsibilities for sustainable procurement. No awareness/training in SPP.	No liaison with suppliers regarding sustainability issues.	Contracts do not include sustainability aspects. Compliance with legal requirements.	Results are not monitored.

Step 2: SPP policy and targets

The main objective of Step 2 is the development and approval of a high-level policy statement, to provide the organization with an official commitment to SPP implementation, outlining the key goals and targets which the authority aims to achieve and against which progress can be judged (European Commission, 2008d).

The first task is thus the development of the organization's long-term vision for sustainable procurement, involving meetings with top management and relevant actors. The SPP policy, providing a statement of commitment, scope, timeframe, broad goals, and targets, is developed using the same method. During this step, targets are defined, using the SPP diagnosis matrix, by assessing the situation that the organization wants to achieve by the end of the timeframe, within each of the six dimensions.

Step 3: Develop the action plan

The purpose of Step 3 is to develop an action plan to provide clear and practical details as to how the targets set in the SPP policy will be achieved, i.e. the roadmap for the activities that will be implemented afterwards (table 4.2). The first task is then to establish the timeframe for the SPP action plan, taking into account the SPP policy timeframe defined previously.

The SPP action plan consists of actions defined for attaining each target, set earlier in Step 2, within the six dimensions. Each action is then further defined in terms of its: description, division into sub-actions (if necessary), milestones, deliverables, planning, indicators and monitoring frequency. In addition, a working team is created, with assigned responsibilities for implementing actions, identification of relevant internal and external stakeholders and necessary human, financial and organizational resources. As regards the "procurement" dimension, the tasks concern the definition and planning of procurement procedures.

Step 4: Implement the action plan

This step refers to the actual implementation of the SPP action plan, covering the six dimensions: policy, vision, and targets; communication and networking; people; market; procurement; monitoring and results. The main objective is to assess whether the actions scheduled previously are being implemented or not, identify any problems encountered and develop corrective measures. An important feature is the recording of difficulties, obstacles, and lessons learned which constitutes a mechanism for organizational learning to support GPP, SPP, and PPI. Finally, results from the implementation of each action are recorded.

As regards to procurement, Step 4 includes the definition of the procurement strategy, market consultation, sustainable criteria and drafting of tender documents, followed by tender publication,

evaluation, awarding the contract and contract management. The definition of the procurement strategy is fundamental in determining which goals are targeted by the procurement action—environmental, social, or innovation, as well as the level of ambition, which leads to the choice of the most appropriate approaches—GPP, SPP or PPI, and tools, as life-cycle costing (LCC). Eventual conflicts and trade-offs when combining different objectives are solved at this stage. Ultimately, these will be a matter of political decision. Step 4 also includes the recording of tender results, which is a significant mechanism for organizational learning.

Table 4.2. Example of an action plan.

Theme	Action	Deadline	Responsibilities
Procurement	Develop a document with the guidelines of the Strategic Plan and have it approved.	Dec-13	Logistics Division
	Annual definition of the number/percentage of procedures that include sustainable factors or clauses.	2014-2017	Logistics Division
	Tender for the contracting of security and surveillance services, with the inclusion of environmental and social criteria.	Jul-13	Logistics Division
	Tender for the contracting of school transport service, with the inclusion of environmental and social criteria.	Sept-13	Logistics Division
	Tender for the contracting of urban pest control service, with the inclusion of environmental and social criteria.	May-13	Logistics Division
Procurement	Tender for the contracting of school transport service, with the inclusion of environmental and social criteria.	Set-14	Logistics Division
	Tender for the contracting of communications services (fixed, mobile and data), with the inclusion of environmental and social criteria.	Apr-14	Logistics Division
	Tender for the contracting of cleaning services for the municipal facilities, with the inclusion of environmental and social criteria.	Oct-14	Logistics Division
People	Communication of performed actions (meetings, news, others) in the intranet and website of the municipality.	2014-2017	Logistics Division
	Training in sustainable procurement for the procurers.	2014-2017	Logistics Division / Human Resources Management Division
Market	Organization of an awareness seminar aimed at suppliers, in order to call their attention to good practices in sustainable procurement.	2014-2017	Logistics Division
	Meeting with suppliers for experience exchange.	2014-2017	Logistics Division

Step 5: Monitoring & reporting

The purpose of Step 5 is the assessment of the results of the SPP strategy against the defined targets and the organization’s sustainable development objectives. Step 5 also involves reporting these results, both internally and externally. Hence, this step comprises the calculation of indicators and assessment against their correspondent objectives. Each indicator, with the corresponding description and calculation method, was defined earlier in the action plan, established in Step 3. Taking these results into account, the contribution of the actions, defined in the SPP action plan,

towards the established targets, is assessed. This allows the definition of the organization's situation, after implementing the SPP action plan, across the six dimensions, using the SPP diagnosis matrix. Hence, the initial situation is compared with both the targets and the current situation, to determine the organization's evolution. Finally, the contribution of the SPP activities (i.e., during the SPP policy or SPP action plan timeframe) towards the organization's sustainable development objectives is also evaluated. These results are then compiled in a report and communicated to relevant internal and external stakeholders.

Step 6: Revision

Step 6 involves reviewing the SPP activities and the SPP policy, focusing on barriers, corrective actions, and further improvements, hence constituting an additional mechanism for organizational learning. Then, once all six steps of the SPP Toolbox have been completed, the process is repeated again, initiating a new cycle of organizational improvement.

To summarize, implementing the SPP Toolbox in a public organization will result in the following: an approved SPP vision, policy and targets; the SPP action plan, with actions scheduled and implemented in a given timeframe across the six dimensions (policy, vision and targets; communication and networking; people; market; procurement; monitoring and results); a report describing the contribution of the SPP activities towards achieving both the defined targets and the organization's sustainable development objectives; and, a graphical representation of the organization's evolution, from the initial to the current situation, against the defined targets. These elements will be presented in more detail in the next section.

4.6. Testing the SPP Toolbox: three case studies

The case studies were implemented in the period 2012–2014 and the activities were supported by an European funded project. In order to introduce the necessary activities for the SPP Toolbox operationalization, regular meetings were held in each organization's premises, with the aim of explaining the methodology, planning the activities to be performed until the next meeting and gather and discuss results. Further support was given by regular e-mail and skype communication. Additionally, the three organizations participated in a network of Portuguese public procurers, exchanging experiences and attending a series of training on GPP, SPP, and PPI. Engagement activities with suppliers provided information on what requirements could be introduced in the tenders.

As referred in section 4.4, the toolbox was initially focused mainly on GPP and SPP. It did not exclude PPI, or explicit this option. Each of the three public organizations followed the six steps envisioned in

the SPP Toolbox, to develop the SPP vision, policy, and targets, operationalized through the SPP action plan. This allowed flexibility in the objectives to be achieved, according to the characteristics, experience, and knowledge of each organization, which, in turn, was reflected in the results attained, as detailed in the following sections.

In what regards to regime, this period was characterized, at European level, by an increasing focus on GPP and SPP, translated in the evolution of the procurement directives from 2004 to 2014 (European Commission, 2014b), highlighting the possibility of using environmental and social criteria, whilst opening up the link between procurement and innovation. At the national level, an opposite shift was occurring, corresponding to the end of the first National GPP Action Plan 2008-2010 (Presidência do Conselho de Ministros, 2007) - which was not replaced until 2016 - and to the economic crisis, which focused tenders' evaluation on economic criteria (purchase price), thus counteracting the trend for an increasing number of public authorities adhering to GPP and SPP. Thus, in Portugal, the regime was characterized by GPP practices, unlike SPP and PPI. During this period, the European landscape has evolved, with the release of long term policies exerting an increasing pressure on public procurement, and calling for the inclusion of innovation goals, for example (European Commission, 2010a), as discussed in section 4.1.

Case study 1: Torres Vedras

Torres Vedras had some prior *ad hoc* experiences with GPP, supported by a top politician; this stimulus was crucial for the decision to implement the SPP Toolbox. A general GPP commitment approved by the municipal council already existed; the head of the procurement department participated in GPP training activities; and, there were occasional contacts with suppliers. The scope of the activities implemented in Torres Vedras covered all departments of the municipality, except the Municipal Water and Sanitation Services. Torres Vedras developed the SPP vision, policy, and targets, operationalized through the SPP action plan within the timeframe 2013-2020. The main results from the SPP Toolbox implementation were: (1) implementation of a procurement procedure for the acquisition of urban pest control services, with the inclusion of sustainability criteria and the contract subsequently being awarded to a company that fully met all requirements; (2) definition of sustainability criteria for the procurement of school meals and uniforms; (3) consultation meetings with suppliers in the sectors of construction works, professional clothes and food/catering, regarding the main obstacles faced by suppliers in complying with the EU GPP criteria, as well as strategies to meet such requirements; and, (4) definition of a code of conduct for suppliers, which was approved by the council.

Figure 4.4 represents the development of the municipality during the period of implementation of the case study (2012-2014) and the results set for 2020 (the horizon of the SPP policy).

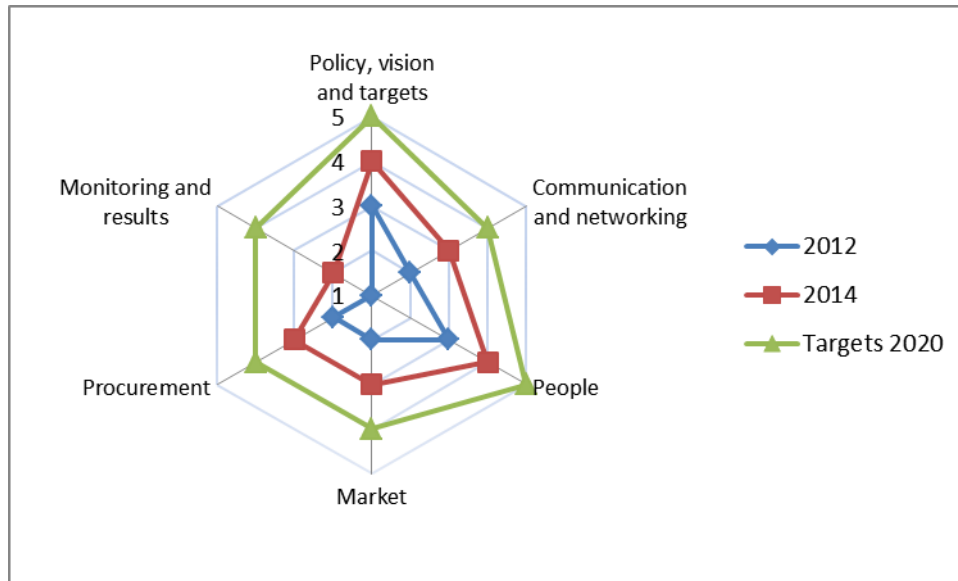


Figure 4.4. Evolution of SPP Diagnosis Matrix for Torres Vedras.

Case study 2: Loures

Loures had some prior *ad hoc* experiences with GPP. In this case, middle management - the head of the procurement department - acted as a champion within the organization. As in Torres Vedras, the head of the procurement department attended GPP training sessions. As described earlier, procurement activities are highly centralized in Loures, highlighting the importance of the procurement department. The scope of activities in Loures covered all departments of the municipality and the action plan timeframe was 2013-2017. Loures developed the SPP vision, policy, and targets, operationalized through the SPP action plan. Additionally, the municipality conducted the following activities within the pilot project: (1) definition of sustainability criteria for surveillance services, school transportation and pest control services; (2) procurement procedures for the acquisition of surveillance services, school transportation and pest control services (public tenders), integrating the sustainability criteria defined previously, including the application of the code of conduct for suppliers, developed in another project; and, (3) consultation meetings with suppliers of food and catering, in order to identify the main obstacles to complying with SPP procedures and strategies for meeting such requirements. An interesting outcome, at the organizational level, was the definition of SPP targets for the evaluation of personnel performance indicators working on the public procurement department.

Figure 4.5 shows the development of Loures Municipality, during the participation in the case study and the target situation in 2017 (the horizon of the SPP policy).

After 2014, Loures municipality made some efforts in the direction of PPI, developing a tender for rental of low-carbon multifunction devices, with energy efficiency criteria beyond the latest Energy Star requirements.

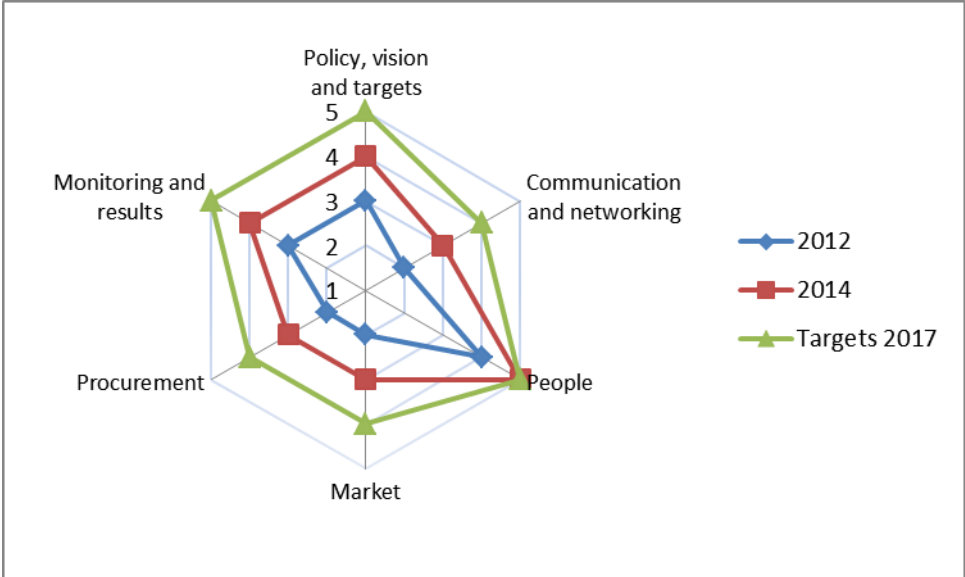


Figure 4.5. Evolution of SPP Diagnosis Matrix for Loures.

Case study 3: LIPOR

Due to its organizational culture, which recognizes sustainability as a core activity, LIPOR also had *ad hoc* experiences in GPP/SPP. Since 2009, they implemented the SA 8000 social accountability management system and applied a code of conduct for all suppliers and subcontractors. LIPOR developed the SPP vision, policy, and targets, operationalized through the SPP action plan. The scope of activities chosen covered all departments of the organization, yet the SPP action plan was mainly focused on cleaning services. The following activities were developed within this scope: (1) definition of sustainability criteria for cleaning services procurement; (2) development of tender documents for the procurement of cleaning services following a restricted procedure with prior qualification, allowing for the selection of suppliers; (3) inclusion of SPP and functional criteria for cleaning services, as well as social criteria, including a commitment to comply with the Code of Conduct for Suppliers and Subcontractors; (4) market dialogue activities with cleaning services suppliers, in order to communicate LIPOR’s objectives and to assess the supplier’s ability to comply with the sustainability criteria, defined in the new cleaning services contract; and, (5) development of a contract monitoring plan, to verify the progress against the criteria defined in the contract (namely technical/service capabilities, material resources, human resources, audits and corrective measures). The SPP Diagnosis Matrix for LIPOR (figure 4.6) tracks the progress achieved and the expected results for the 2017 horizon.

After 2014, LIPOR has consolidated the experience and knowledge acquired, acting as the front-runner in the Portuguese local authorities' panorama, by using LCC and highly demanding energy efficiency criteria in the rental of low-carbon multifunction devices, as well as tendering the supply of electricity from 100% renewable sources.

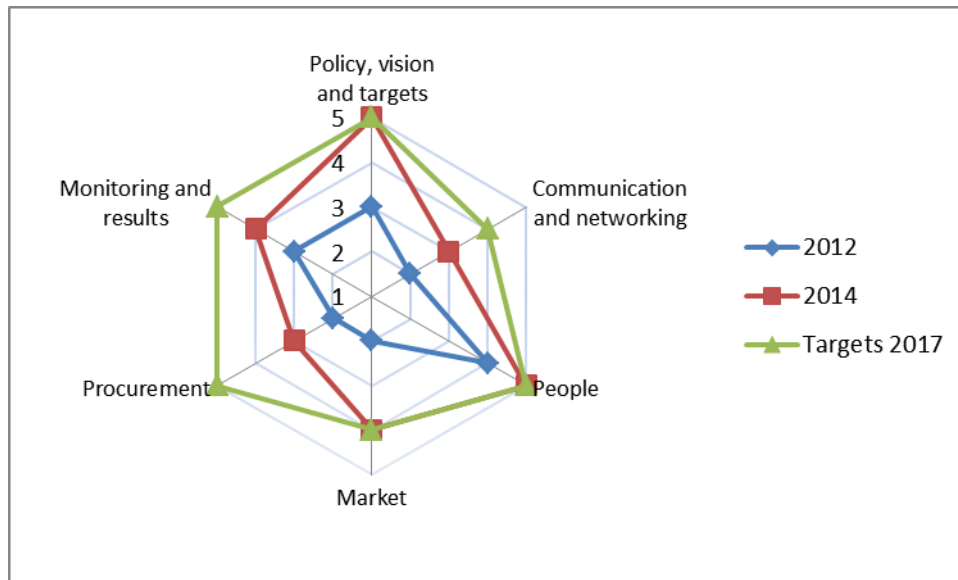


Figure 4.6. Evolution of SPP Diagnosis Matrix for LIPOR.

4.7. Discussion

The potential of the SPP Toolbox to stimulate niche formation is discussed below using two different perspectives: matching the SPP Toolbox with the STP Model and analyzing the results from the case studies.

4.7.1. Operationalizing the SPP Toolbox in the STP Model

With the aim to foster the transformative potential of procurement to contribute to socio-technical transitions for sustainability through niche formation and therein using the GPP, SPP, and PPI approaches in particular, a new tool to guide public organizations has been developed.

The development of the SPP Toolbox involved a participatory process: the tool was presented and discussed in meetings with key Portuguese stakeholders, including the organizations participating in the three case studies. In general, the SPP Toolbox was assessed as a relevant and useful

management tool, with an adequate structure and flexibility. However, it was pointed out that the main barriers to implementing the SPP Toolbox are the mind-sets of the organizations, shaped by the current regime and landscape, along with the time and resources needed.

Designing and developing the SPP Toolbox required assembling a broad range of perspectives, for completeness, while combining it with a logical structure, through the use of the GPP Management Model, proposed by the European Commission (2008b) and ICLEI (Clement et al., 2016, 2007). Furthermore, it required developing practical skills concerning key factors proposed at the niche level of the STP Model, as mentioned in section 4.5, namely: individual factors, management factors, procurement factors and inter-organizational factors.

Individual factors focus on the role of individuals within the organization and the key factors identified were “change agents” and “knowledge.” Change agents refer to willingness to change, motivation, ambition, commitment and the role of individuals as champions, facilitators and leaders (Dale-Clough, 2015; Georghiou et al., 2014; Grandia, 2016, 2015; Knutsson and Thomasson, 2014; Meehan and Bryde, 2011; Preuss, 2007; Preuss and Walker, 2011; Roman, 2017; Testa et al., 2016) and are developed in Step 1, while defining the responsible team. Change agents are then further operationalized in the “people” dimension of the SPP Diagnosis Matrix, which involves the definition of targets related to personnel performance indicators (Step 2), action plan definition (Step 3) and implementation of the action plan (Step 4). The “knowledge” key factor, which accounts for skills and training (Edquist and Zabala-Iturriagoitia, 2012; Georghiou et al., 2014; Grandia, 2016; Knutsson and Thomasson, 2014; Preuss and Walker, 2011; Smith and Terman, 2016; Testa et al., 2016, 2012; Timmermans and Zabala-Iturriagoitia, 2013; Uyarra et al., 2014), is also developed in a similar way in the “people” dimension of the SPP Diagnosis Matrix.

Management factors cover organizational culture, strategy, internal change, internal collaboration, and responsibilities. Organizational culture maps out informal cultural attributes of the organization (Dale-Clough, 2015; Meehan and Bryde, 2011; Roman, 2017), developed in Step 2, in the definition and approval of the SPP policy. This is also reflected in the setting of targets for the “policy, vision and targets” dimension of the SPP Diagnosis Matrix (Step 2), which is then translated into the action plan in Step 3. Step 4 is particularly important for the operationalization of this key factor, as it includes the collection of difficulties and lessons learned during the implementation of the action plan, contributing to the embedded organizational learning and hence to this key factor. Additionally, organizational culture is reinforced in Step 6, regarding new measures for overcoming any obstacles identified. Strategy is developed in the priority products and services definition in Step 1 and across the whole of Step 2, including the “Policy, vision, and targets” dimension of the SPP Diagnosis Matrix, which is then translated into the action plan, in Step 3, and implemented in Step 4. These steps fully operationalize the procurement strategy, allowing alignment with the corporate strategy and the

development of an internal vision for solving societal problems (Bratt et al., 2013; Dale-Clough, 2015). The key factor “internal change” is related to the promotion and management of a flexible organizational structure (Gee and Uyarra, 2013; Meehan and Bryde, 2011; Preuss, 2007; Preuss and Walker, 2011; Testa et al., 2016) and it is therefore developed within the definition of the responsible team, in Step 1, which involves creating an adaptation group to facilitate the process of change. Internal collaboration concerns the promotion of relationships between the organization’s various departments (Dale-Clough, 2015; Preuss and Walker, 2011; Testa et al., 2016) and it is applied while defining the relevant actors, in Step 1 and stakeholders and resources, in Step 3. Finally, the key factor “responsibilities” (Testa et al., 2012) is developed in the responsible team definition (Step 1), together with responsibilities and planning (Step 3).

Procurement factors focus on practices for supporting GPP, SPP and PPI, including: aggregate demand (Uyarra et al., 2014), market research (Georghiou et al., 2014), monitoring (Amann and Essig, 2015), SME participation (Uyarra et al., 2014), life-cycle costs (LCC) (Georghiou et al., 2014; Zhu et al., 2013), risk management (Uyarra et al., 2014), functional criteria/variants (Edquist and Zabala-Iturriagoitia, 2012; Georghiou et al., 2014; Timmermans and Zabala-Iturriagoitia, 2013; Uyarra et al., 2014) and IPR management (Uyarra et al., 2014). All these key factors, excluding monitoring, are operationalized in Step 4, during the preparation of the procurement strategy. The definition of the procurement strategy is a fundamental task, as it defines the level of ambition of each procurement action regarding GPP, SPP or PPI. In addition, procurement factors were already considered in the definition of targets in Step 2, using the “procurement” dimension of the SPP Diagnosis Matrix. The targets are then translated into the action plan, in Step 3, and implemented, in Step 4. The key factor “monitoring” is developed in a similar way: it is considered in Step 2 (targets definition), using the “monitoring and results” dimension of the SPP Diagnosis Matrix and then further developed in Step 3 (action plan), Step 4 (contract management) and, finally, Step 5, which is specifically dedicated to the calculation of indicators and the assessment of results.

Inter-organizational factors relate to implicit knowledge located within collective interactions, which can be oriented towards suppliers, similar organizations, and other external stakeholders. Accordingly, this block encompasses the following key factors: suppliers’ involvement (Amann and Essig, 2015; Dale-Clough, 2015; Edquist and Zabala-Iturriagoitia, 2012; Gee and Uyarra, 2013; Georghiou et al., 2014; Meehan and Bryde, 2011, 2014; Pelkonen and Valovirta, 2015; Preuss, 2007; Preuss and Walker, 2011; Rizzi et al., 2014; Rolfstam, 2009; Timmermans and Zabala-Iturriagoitia, 2013; Walker and Brammer, 2012; Witjes and Lozano, 2016), networking (Edquist and Zabala-Iturriagoitia, 2012; Gee and Uyarra, 2013; Knutsson and Thomasson, 2014; Meehan and Bryde, 2014; Preuss, 2007; Preuss and Walker, 2011; Rolfstam, 2009) and external stakeholders (Edquist and Zabala-Iturriagoitia, 2012; Gee and Uyarra, 2013; Meehan and Bryde, 2014; Preuss, 2007; Rolfstam, 2009; Roman, 2017). These are developed in the networking section of Step 1. They are

then further implemented in Step 2, targets definition, applying the SPP Diagnosis Matrix (“communication/networking” and “market” dimensions) and then translated into the action plan, in Step 3 and implemented, in Step 4. “Vision” is another key factor referring to the inter-organizational factors block. It concerns the spreading of knowledge and best practices to other actors, creating a common vision, eventually shaping local and national strategies (Gee and Uyarra, 2013; Georghiou et al., 2014). This key factor is developed in the networking section of Step 1, as well as in Step 2 (targets definition), applying the SPP Diagnosis Matrix (“communication/networking” dimension). It is then translated into the action plan in Step 3, and implemented, in Step 4. The inter-organizational factors can eventually influence the regime level, by shaping local and national strategies and aligning policies at national and local levels, as demonstrated by Gee and Uyarra (2013).

The development of practical skills concerning the key factors proposed at the niche level of the STP Model in each step of the SPP Toolbox, described above, is illustrated in figure 4.7. It shows that all key factors are operationalized coherently within the SPP Toolbox structure: Steps 1-6 and the SPP Diagnosis Matrix.

Being mainly anchored at the organization level, the SPP Toolbox does not operationalize regime and landscape factors - as envisioned in the STP Model. However, it addresses the regime and landscape levels in Step 1, during the analysis of the organization’s local, national and European policies and strategies, aligning them with the procurement actions. Furthermore, regime and landscape are taken into account in Step 2, during the development of the organization’s long-term vision for sustainable procurement and also in the definition of targets in Step 2, using the “policy, vision and targets” dimension of the SPP Diagnosis Matrix. In both steps, pressures from the landscape, as the perceived social/societal, environmental and economic context, influenced by cultural and normative values can be integrated and further developed into the organization’ procurement strategy (Step 4). On the other hand, the use of the SPP Toolbox can contribute to change the regime and landscape factors in the long term, by mainstreaming GPP, SPP and PPI strategies, as assumed in the MLP framework.

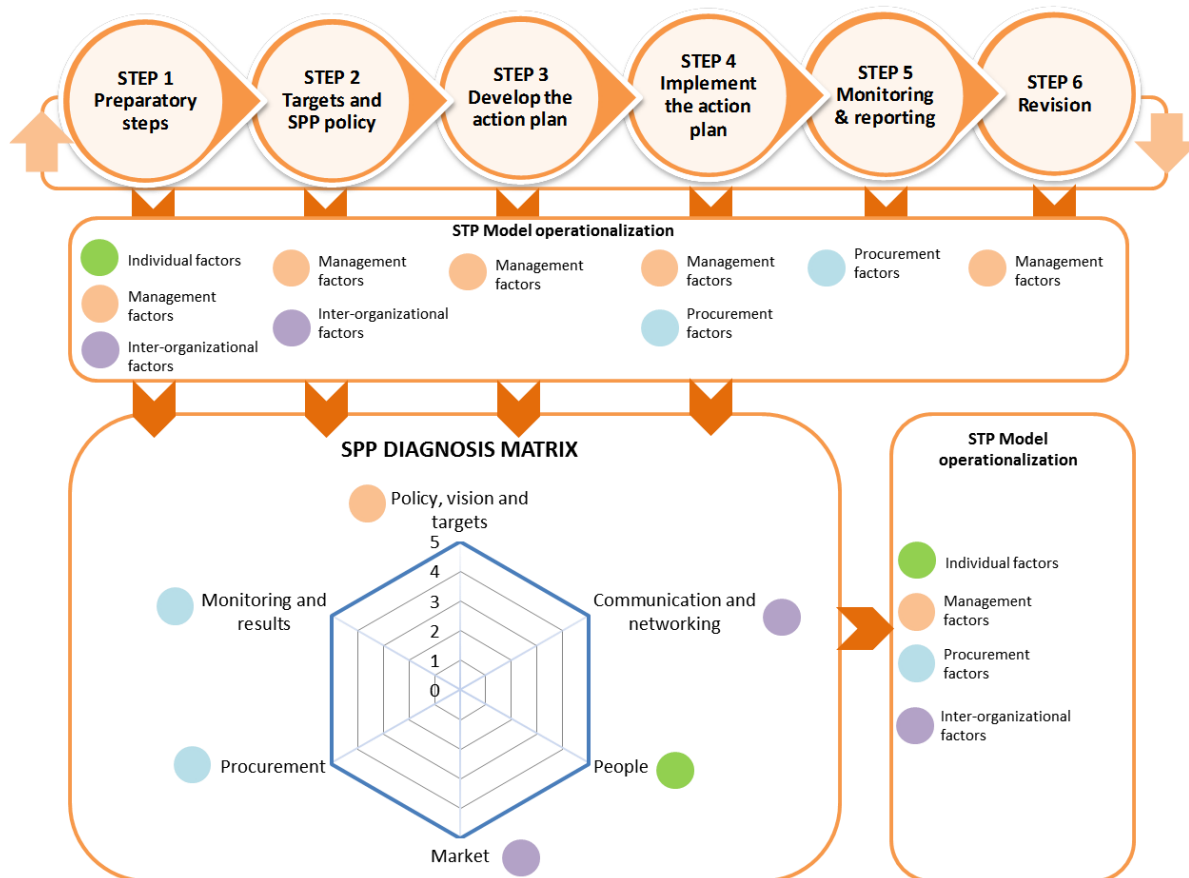


Figure 4.7. Matching the SPP Toolbox and the STP Model.

4.7.2. Results from case studies

The results of the case studies presented in section 4.6 reveal that, despite the differences between the three public organizations and their starting point, all three achieved relevant improvements across the six dimensions of the SPP Diagnosis Matrix: policy, vision, and targets; communication and networking; people; market; procurement; monitoring and results. This means that the tool efficiently develops the six dimensions, with a good degree of flexibility, allowing adaptation to different organizational situations. The flexibility of the SPP Toolbox is reinforced by the possibility of restricting the scope of activities to just a part of the organization and by orientating the SPP action plan to a specific action, or group of actions, as in the case of LIPOR.

In order to track the key factors development in the three case studies, the results were translated into organizational factors and inter-organizational factors, displayed in table 4.3. The analysis of this information supports the following findings: (1) organisational factors were well developed in the three cases, achieving a similar situation by the end of the project, in spite of the different starting

point of each organization; (2) regarding the evolution of GPP to SPP and PPI approaches, by the end of the project (2014), Torres Vedras and Loures positioned in GPP/SPP practices, while LIPOR started the first steps towards PPI, by developing functional criteria in one tender; after 2014, Loures and LIPOR raised their ambitions by challenging the incumbent suppliers and expanding the experience to LCC, in the case of LIPOR; these experiments placed those local authorities in a better position to move forward to PPI; this might confirm the need for public organizations to gain experience, starting with GPP and then moving towards SPP and ultimately to PPI; (3) in what concerns to inter-organizational factors, relationships with incumbent suppliers changed for all case studies, due to early market engagement activities, similarly to networking activities, hence establishing the first steps for a shared vision. Thus, inter-organizational factors development, which is the basis for niche formation, was still in an inception phase, with the initial establishment of social networks. Expectations and visions, as well as learning processes, would need much more development, in order to ensure a success trajectory, as explained in section 4.3.

These results compare to Gee and Uyarra (2013) findings on the factors required for system change. The empirical study has shown that there is a need to develop both organizational factors (organizational renewal, strategy) and inter-organizational factors (engagement with national bodies, multiple stakeholders, including final users, aligning planning, market and regulations), to ensure systemic changes. Comparing these findings with the results from the three case studies, we can conclude that Torres Vedras, Loures, and LIPOR did develop organizational factors and addressed inter-organizational factors in an incipient way. Niche formation would need much development of inter-organizational factors, namely by expanding the social network, creating a shared vision and embedding learning processes.

The case studies also showed that, besides the negative effect of the national regime, the three public authorities were able to integrate issues that formed the wider landscape at European context, as well as from the European regime, illustrating the importance of the influence of bottom-up and top down approaches.

Table 4.3. Key factors development for three case studies.

	Individual Factors	Management Factors	Procurement Factors	Inter-organizational Factors
Torres Vedras				
2012	<p>Key factor change actors: Top management commitment to GPP.</p> <p>Key factor knowledge: Head of procurement department with training in GPP.</p>	<p>Key factor organizational culture: General GPP policy, no targets; No organizational learning. Key factor strategy: No procurement strategy: Key factor internal change: No flexible organizational structure. Key factor internal collaboration: No internal collaboration. Key factor responsibilities: No responsibilities.</p>	<p>Occasional tenders with GPP criteria.</p>	<p>Key factor suppliers' involvement: Seldom contacts with suppliers. Key factor networking: No networking.</p>
2014	<p>Key factor change actors: Top management commitment to GPP/SPP and responsible team for SPP. Key factor knowledge: Responsible team with training in GPP/SPP/PPI.</p>	<p>Key factor organizational culture: GPP/SPP policy with targets approved by top management; Lessons learned from tenders. Key factor strategy: Procurement strategy aligned with corporate strategy. Key factor internal change: Flexible organizational structure—responsible team and working team. Key factor internal collaboration: Collaboration between procurement, environmental departments and other internal stakeholders. Key factor responsibilities: Responsibilities within the responsible team.</p>	<p>Action plan with planned GPP/SPP tenders; Tender -urban pest control services with SPP criteria; SPP criteria definition— school meals; uniforms. Code of conduct for suppliers; Market research activities for priority products/services; Monitoring of indicators defined within the action plan.</p>	<p>Key factor suppliers' involvement: Early market engagement—construction works, professional clothes and food/catering. Key factor networking: Networking activities with other public authorities.</p>
Loures				
2012	<p>Key factor change actors: Middle management commitment to GPP— champion. Key factor knowledge: Head of procurement department with training in GPP.</p>	<p>Key factor organizational culture: No GPP policy, no targets; No organizational learning. Key factor strategy: No procurement strategy: Key factor internal change: No flexible organizational structure. Key factor internal collaboration: No internal collaboration. Key factor responsibilities: No responsibilities</p>	<p>Occasional tenders with GPP criteria</p>	<p>Key factor suppliers' involvement: Seldom contacts with suppliers. Key factor networking: No networking</p>
2014	<p>Key factor change actors: Top management commitment to GPP/SPP and responsible team for GPP/SPP. GPP/SPP personnel performance indicators. Key factor knowledge: Responsible team with training in GPP/SPP/PPI.</p>	<p>Key factor organizational culture: GPP/SPP policy with targets approved by top management; Lessons learned from tenders. Key factor strategy: Procurement strategy aligned with corporate strategy. Key factor internal change: Flexible organizational structure—responsible team and working team. Key factor internal collaboration:</p>	<p>Action plan with planned GPP/SPP tenders. Tenders – surveillance services; school transportation; pest control services with SPP criteria; Code of conduct for suppliers; Market research activities for priority</p>	<p>Key factor suppliers' involvement: Early market engagement—food/catering. Key factor networking: Networking activities with other public authorities.</p>

Individual Factors	Management Factors	Procurement Factors	Inter-organizational Factors
	Collaboration between procurement, environmental departments and another department in criteria definition for tenders. Key factor responsibilities: Responsibilities within the responsible team.	products/services; Monitoring of indicators defined within the action plan.	
LIPOR			
2012	Key factor change actors: Top and middle management commitment to GPP. Key factor knowledge: Head of procurement department with training in GPP.	Occasional tenders with GPP criteria.	Key factor suppliers' involvement: Seldom contacts with suppliers. Key factor networking: No networking.
2014	Key factor change actors: Top management commitment to GPP/SPP and responsible team for GPP/SPP. Key factor knowledge: Responsible team with training in GPP/SPP/PPI.	Action plan with planned GPP/SPP tenders; Tenders – cleaning services with SPP/PPI criteria – functional criteria; Code of conduct for suppliers; Contract monitoring plan; Market research activities for priority products/services; Monitoring of indicators defined within the action plan.	Key factor suppliers' involvement: Early market engagement—cleaning services. Key factor networking: Networking activities with other public authorities.

4.8. Conclusions

The purchasing power of public authorities is a market factor with a very powerful potential to contribute to sustainable development (Testa et al., 2012) but it is often orientated towards off-the-shelf products (goods, services). The procurement of existing products should be partially replaced by the procurement of results, in terms of solving societal problems and satisfying needs (Edquist and Zabala-Iturriagoitia, 2012). Furthermore, this solving of societal problems and thus public procurement should be framed in terms of contributing to socio-technical transitions towards sustainability.

This paper proposes a new tool—the SPP Toolbox, for guiding and supporting public organizations as they re-think the procurement process, raising their ambitions and broadening their vision, thus changing the organizational approach towards culture, strategies, structures, and practices. It targets procurement organizations and their transformative potential, enabling to assemble a range of perspectives in a single tool.

First, the toolbox integrates insights from GPP, SPP and PPI approaches, allowing different practices, according to the organization's vision, procurement strategy and the level of ambition that was defined. This allows for flexibility in terms of goals, yet promoting an increasing complexity of institutionalized practices and skills—from GPP to SPP and then from SPP to PPI. The results from the SPP Toolbox testing, based on three case studies, suggest that public organizations need to follow a learning curve by gaining experience, starting with GPP and then moving towards SPP and ultimately to PPI. As shown both in the cases of Loures and LIPOR, this is an iterative process that builds on experience and vision broadening.

Second, the toolbox follows a systemic approach embedded into the organizational strategies and the management cycle. The integration of new procedures into organizational strategies allows that the considerable cultural, managerial and operational changes required contribute effectively to sustainability. These results are in line with previous work from Testa et al. (2016); Amann and Essig (2015) for GPP, from Bratt et al. (2013) for SPP, and from Knutsson and Thomasson (2014) for PPI.

Third, it includes insights from socio-technical transitions framework, considering public procurement as an additional mechanism for niche formation, through the three main niche processes: (i) shaping of expectations—articulating expectations and visions in order to attract resources and new actors and provide direction to the process; (ii) building social networks—new combination of actors, in order to promote the emergence of new social networks; and, (iii) learning processes—enabling social embedding to increase chances of successful diffusion (Jain et al., 2017; Raven et al., 2010). This is supported by Gee and Uyarra' (2013) empirical study, which has shown

that there is a need to develop both organizational (organizational renewal, strategy) and inter-organizational factors (engagement with national bodies, multiple stakeholders, including final users, aligning planning, market, and regulations), to ensure systemic changes.

The three case studies illustrate the improvement of the organizational factors, which are of primary importance for supporting the process of organizational change. The development of inter-organizational factors, which are the basis for niche formation, was still in an inception phase, corresponding to the initial establishment of social networks. Expectations and visions, as well as learning processes, would need much more development, in order to ensure a success trajectory and influence the regime. Hence, a thoroughly development of PPI activities would be needed, in order to strengthen the three main niche processes. This shows the interdependence between GPP/SPP and PPI activities to ensure systemic changes: GPP and SPP activities ensure the development of the organizational factors and the first steps of inter-organizational factors, while PPI ensures even more the development of organizational factors, but mainly, the development of inter-organizational factors. In this way, despite the focus at niche level of the SPP Toolbox, the full implementation of the inter-organizational factors can eventually influence the regime, as represented in figure 4.8.

The main contribution of this study lies in the fact that it provides a tool that assembles a range of perspectives (figure 4.8), guiding and supporting public organizations, as they re-think the procurement process.

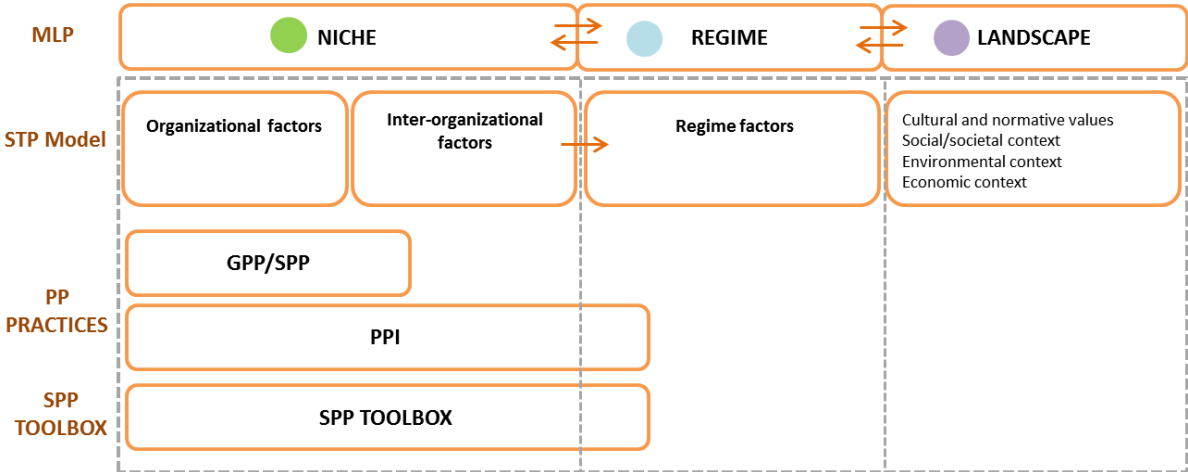


Figure 4.8. The relation between the MLP perspective, STP Model, PP practices and SPP Toolbox.

To sum up, the main contribution of this study lies in the fact that it provides a tool for guiding and supporting public organizations, as they re-think the procurement process. The SPP Toolbox incorporates different approaches at different levels, including procurement practices (GPP, SPP, and PPI) and individual, management and inter-organizational dimensions, into one tool. This allows for

flexibility in the objectives to be achieved, which can be developed in increasing degrees of complexity. Furthermore, this study operationalizes a theoretical approach—the STP Model (based on a literature review on GPP, SPP, and PPI, within the context of the emergence of socio-technical transitions) - into a practical tool. Thus, it provides crucial insights, contributing to the progress in this field.

This work constitutes a timely contribution to the debate regarding the role of the public sector in achieving sustainable development, given that insufficient attention that has been paid, up to now, to how public organizations can effectively orchestrate the emergence of new socio-technical systems using public procurement as an additional governance mechanism (Gee and Uyarra, 2013).

Future studies might seek to extend the application of the SPP Toolbox, through further cases, especially focused on PPI, fully developing inter-organizational factors and relating them to the niche formation process.

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Author Contributions

Paula Cayolla Trindade conceived and designed the SPP Toolbox and wrote the paper. Paula Antunes and Paulo Partidário have provided overall guidance for the research and have significantly contributed to the structure and revision of the paper.

Conflicts of Interest

The authors declare no conflict of interest. Part of this research was funded by LIFE+ programme (contract number LIFE 09 ENV/PT/50). The founding sponsors had no role in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript and in the decision to publish the results.

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CHAPTER 5. DISCUSSION

DISCUSSION

As we have seen, the challenge of sustainable development calls for substantial changes in the development path and consequently in the actual production and consumption patterns. Hence, there is a need for large scale transformations in the way societal functions are fulfilled (Geels, 2011), involving a “transition” or “system innovation” away from one socio-technical system — towards another (Elzen et al., 2004; Smith et al., 2010).

Given the significance of public procurement in the demand-side measures and its high market factor potential (European Commission, 2008a; Rolfstam, 2009; Testa et al., 2012), it is increasingly being recognized as a key strategic approach for achieving sustainability and innovation goals. Despite this interest, the literature on transitions theory neglects the potential role of public procurement in the governance of system transitions. On the other hand, the slow uptake of GPP, SPP, and PPI by public organizations overshadows their full potential.

Then, to address these weaknesses, the purpose of this research was to investigate the role of public procurement as a governance mechanism for the transformation of socio-technical systems, addressing the following four research sub-questions:

RQ#1 - Which key factors, accounting for changes in culture, structures, and practices, favor the successful implementation of GPP, SPP and PPI, contributing to sustainability?

RQ#2 –How to depict these key factors into socio-technical transitions theory by developing an analytical framework?

RQ#3 – How to develop an operational tool to support public organizations in the process of re-thinking the procurement process in the context of socio-technical transitions?

RQ#4 – What are the lessons learned from the cases of public organizations implementing the practical tool?

To answer to these research questions, we explored the link between the fields of public procurement and transitions theory at the conceptual and operational levels, using an exploratory qualitative approach complemented by case study research and grounded theory.

5.1. Summary of findings

In this section, the research questions will be discussed through a reflection on the findings presented in chapters 3 and 4, and outlined in figure 5.1. That is, we will discuss how public organizations can re-think the procurement process, raise their ambitions and broaden their vision by changing the organizational approach towards culture, structures, and practices, whilst contributing to sustainability transitions, using an analytical framework, which was then used to develop a more operational approach.

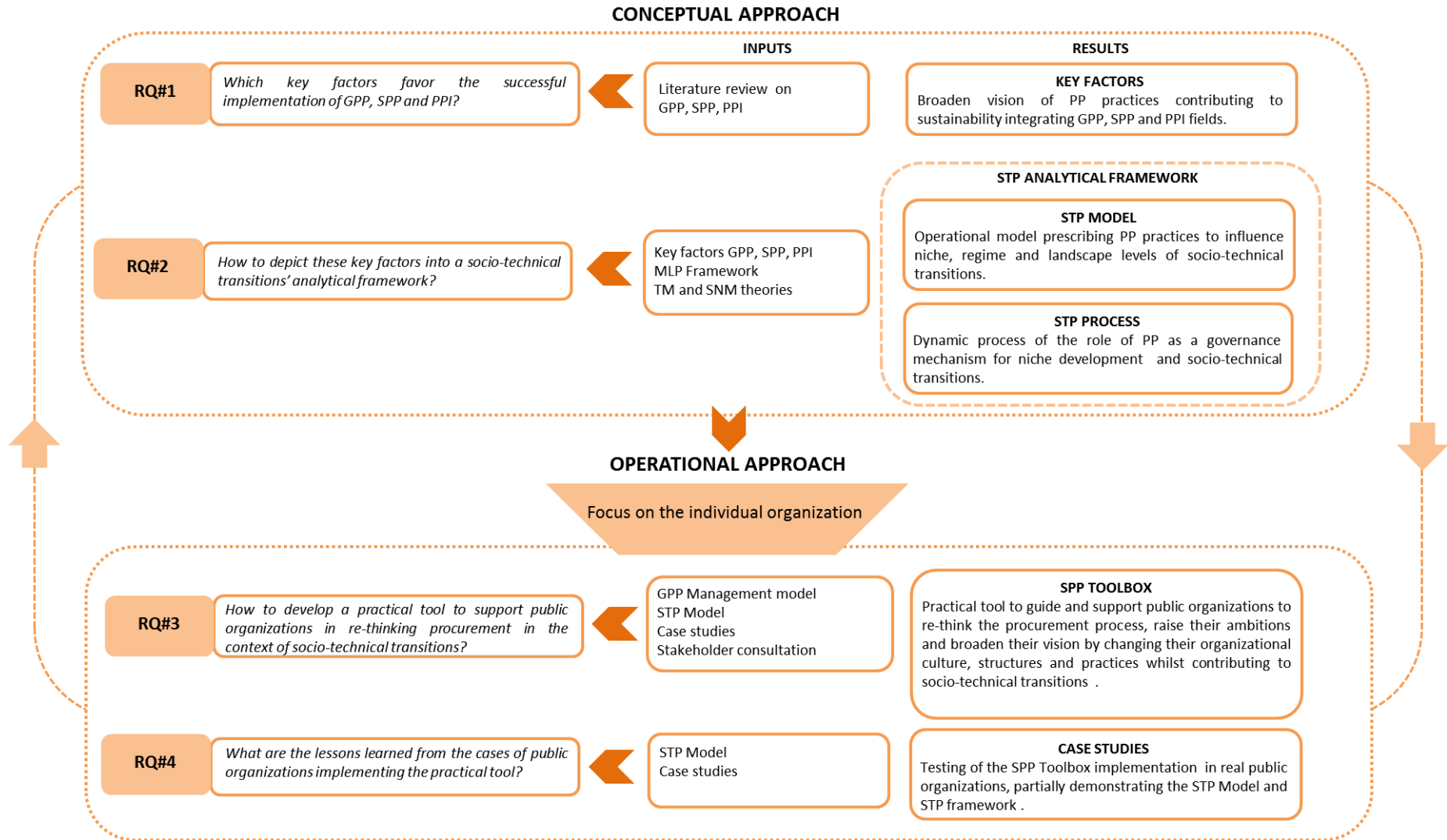


Figure 5.1. The process of answering the research questions.

The literature on GPP, SPP, and PPI formed the analytical basis to investigate which key factors or dominant elements enable technical, organizational, economic, institutional, socio-cultural and political changes in public procurement practices, whilst favoring the successful implementation of GPP, SPP, and PPI. The systematic identification of key factors across the fields of GPP, SPP, and PPI, which are usually discussed independently, allowed the integration of the three strands of literature into a broader vision of procurement practices contributing to sustainability, thus responding to RQ#1.

As the MLP perspective (Elzen et al., 2004; Geels, 2011, 2002) provides a framework for socio-technical transitions which organizes analysis and prescribes policy interventions (Smith et al., 2010), it was chosen as the main theoretical framework for this study, complemented by the work done by Raven (2007), Raven et al (2010), van den Bosch and Rotmans (2008), and Gee and Uyarra (2013) on TM and SNM theories, as discussed earlier. Building on these studies, the key factors were organized into a multi-level structure - the Sustainability Transition Procurement Model (STP Model). By organizing the key factors and relating them to socio-technical transitions' theory, the STP Model provides the answer to RQ#2.

The STP Model prescribes practices that influence the transformation of socio-technical systems, integrating different approaches to public procurement, i.e. GPP, SPP, and PPI, in a three-level structure (niche, regime, and landscape) and, in each level, in building blocks. This structure allows a comprehensive and systematic overview of which key factors should be strengthened in each level.

Drawing upon insights from the MLP, TM and SNM theories (Raven, 2007; Raven et al., 2010; van den Bosch and Rotmans, 2008) and on the STP Model, the research proposed the STP Process to describe the role of PP as a governance mechanism for niche development in the context of socio-technical transitions (figure 3.3). It explores the role of public procurement in the two loci of niche development considered by Kemp et al. (2001): protected spaces (niches) and the market place, responding also to RQ#2, yet introducing a dynamic perspective. The STP Model, together with the STP Process, constitutes the STP Framework for public procurement in the context of socio-technical transitions.

Considering the need to guide and support individual public organizations in the uptake of GPP, SPP and PPI practices within the context of socio-technical transitions, a new tool – the SPP Toolbox – was proposed in chapter 4, addressing RQ#3. The approach taken in the development of the SPP toolbox was based on the STP Model and on the GPP Management Model, recommended by the European Commission (European Commission, 2008b) and ICLEI (Clement et al., 2016, 2007). Furthermore, the SPP Toolbox resulted from an iterative design process, whereby collected suggestions and feedback from three case studies' implementation and from a stakeholder

consultation process were built progressively into the next version of the tool. The SPP toolbox (figure 4.3), integrating insights from GPP, SPP and PPI practices into socio-technical transitions theory, supports public organizations, as they re-think the procurement process, raise their ambitions and broaden their vision, changing the organizational approach towards culture, strategies, structures, and practices.

Case studies provided insights to answer RQ#4, as they illustrated the application of the SPP toolbox – and therefore of a part of the STP Model and of the STP framework - in real public organizations, revealing the degree to which, and how, the development of the key factors prescribed in the analytical framework influence the organizational approach towards culture, strategies, structures and practices, in the context of socio-technical transitions.

In the following sections, we will discuss in detail the results obtained through the conceptual and operational approaches.

5.2. Analytical framework for public procurement as a mechanism for socio-technical transitions

This section answers the central research question - how can public procurement contribute to sustainability transitions? – building upon the results of our research. The question will be answered using the analytical framework developed within the research, constituted by the STP Model and the STP Process, and addressing each of three levels in detail. To facilitate the analysis, the STP Model, the STP Process and the SPP Toolbox are represented in one integrative figure (figure 5.2).

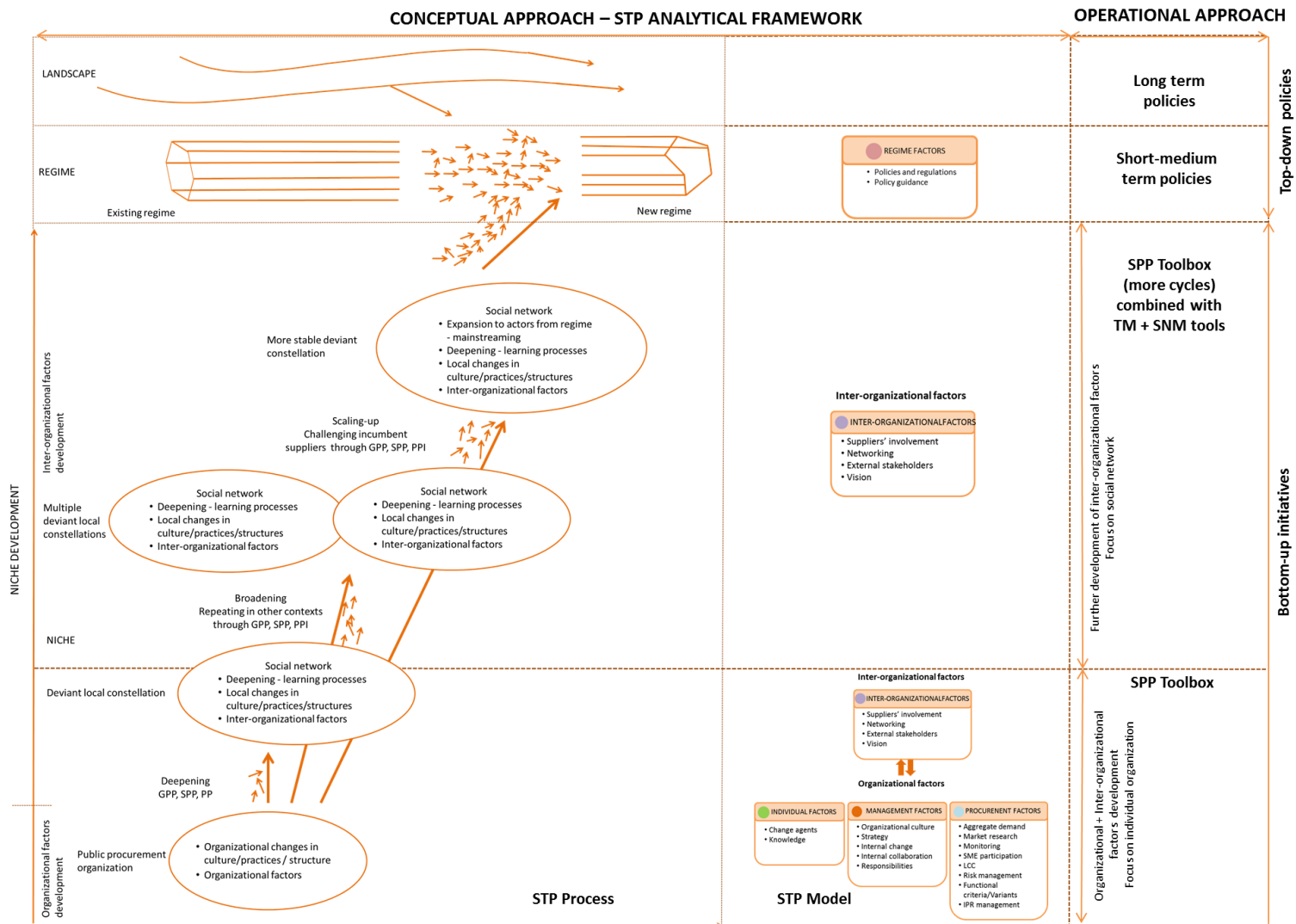


Figure 5.2. Results from the conceptual and operational approaches.

5.2.1. Niche level

As already said, the STP Model identifies key practices that public organizations may employ to re-think the procurement process, raising their ambitions and broadening their vision. This requires public organizations to have a stronger engagement in the procurement process, involving an increasing degree of complexity of institutionalized practices and skills (from GPP to SPP, and from SPP to PPI) and by changing their organizational approach towards culture, strategies, structures, and practices.

The niche development process is thoroughly explored within the STP Model, as it constitutes a fundamental part of transitions. Besides the need to increasingly advance their procurement practices, moving from GPP to SPP and PPI, the STP Model points out that public organizations require, in a first moment, the development of organizational factors. That is, organizations need to: (1) foster individual factors, encouraging the individual willingness to change, as well as their motivation, ambition, commitment and leadership (key factor change agents); and, ensure that their members have adequate awareness, information, and training on GPP, SPP and SPP practices, tools and strategies, increasing the key factor knowledge; (2) develop the management factors, by expanding the cultural attributes of the organization, enabling embedded learning mechanisms (key factor organizational culture); develop the potential of procurement to drive the organization's agenda (key factor strategy); enhance the adoption of flexible organizational structures, acting as drivers for GPP, SPP and PPI (key factor internal change); promote intra-organizational relationships (key factor internal collaboration); define responsibilities, roles and functions (key factor responsibility); and, (3) develop the procurement factors, including practices to support GPP, SPP and PPI, as aggregate demand, market research, monitoring, SME participation, life-cycle costs (LCC), risk management, functional criteria/variants and IPR management.

This process of institutionalization and operationalization of GPP, SPP, and PPI practices increasingly calls for the development of inter-organizational factors, i.e: to enhance earlier and longer-lasting collaborative activities with suppliers (key factor suppliers' involvement); work in networks with similar organizations that use each other as reference points, sharing best practices, promoting interactive learning and spreading knowledge (key factor networking); and, engage with other external stakeholders, such as managers in public agencies, policy-makers, public procurers, potential users, suppliers, researchers and non-governmental organizations (key factor external stakeholders). Hence, within the STP Model, the development of the organizational factors, followed by inter-organizational factors, is of crucial importance to the success of a niche.

These inter-organizational relationships promote the building of a social network, as illustrated in the STP Process. The new social network induces learning processes, which, in turn, influence

organizational factors, producing changes in the organization's internal culture, practices, and structures. Thus, there is a mutual and iterative relationship between organizational and inter-organizational factors. As within the STP Model, the development of the organizational factors in a first moment, followed by inter-organizational factors, are of crucial importance to the success of a niche.

In addition, public organizations, by developing GPP, SPP, and PPI activities, increasingly need to involve a large number of actors to create broader support, contributing to establish social networks, where deepening, i.e. learning activities about local shifts in culture, practices, and structures takes place. The key factor vision provides direction to the social network, eventually aiming at fulfilling societal needs in a different way, initiating a small scale experiment that eventually results in a local deviant constellation (van den Bosch and Rotmans, 2008).

If the public organization has sufficient market power, it can use new procurement procedures to repeat the experiment in different contexts, linking it to other functions or domains, therefore supporting the broadening mechanism.

Public organizations can equally play a significant role in scaling-up, supporting the process of institutional expansion from "frontrunners" and "niche-players" to incumbent organizations and "regime-players". In one hand, they can use their market power to challenge incumbent suppliers through procurement procedures (key factor suppliers' involvement); on the other hand, by developing their inter-organizational factors (key factors networking and external stakeholders) they can spread the new, deviant constellation of culture, practices, and structures to other social networks. As an example, inter-organizational factors, by developing multi-faceted relationships and on-going iterative engagements, can influence regime players at national and local levels, shaping local and national strategies and aligning policies, as described by Gee and Uyarra (2013), also contributing to the scaling up mechanism.

5.2.2. Regime level

In the STP Model, the regime level concerns to the routine-based behavior of organizations and of other actors involved, encompassing two key factors: policies/regulations and policy guidance. Typically, these include initiatives at European, national, and regional level, including regulations in the area of public procurement, and initiatives concerning the promotion of, and guidance on, GPP, SPP, and PPI. Thus, the regime level in the STP Model includes short to medium term policies and regulations favoring the introduction of environmental, social and innovation considerations in public procurement. The European Directives on Public Procurement (European Commission, 2014b)

constitute an example, allowing for environmental and social criteria and defining new procurement procedures such as the “innovation partnerships”, which acknowledge a strong link between procurement and innovation (European Commission, 1995).

As pointed out above, although the inter-organizational key factors operate essentially at a niche level, in certain cases, the multi-faceted relationships and on-going iterative engagements can shape local and national strategies and align policies at national and local levels. Hence, whilst increasing the influence and stability of the deviant constellation of culture, practices and structure through deepening, broadening and scaling-up mechanisms (van den Bosch and Rotmans, 2008), these tensions can destabilize current socio-cultural, user/market, and science/technological regimes, creating windows of opportunity for niche innovations, influencing the regime level, as represented in the STP Process.

5.2.3. Landscape level

The landscape level is translated, in the STP Model, into the perceived social/societal, environmental and economic context, being influenced by cultural and normative values, which change very slowly, creating pressure on the regime.

Long term European initiatives such as the Innovation Union (European Commission, 2010a) and the comprehensive product policy as recently referred by the EU Council conclusions on “Eco innovation: enabling the transitions towards a circular economy”, includes a call on the Member States to “...make active use of the product sustainability and circularity criteria in the process of green procurement...”. In addition, at a more general level, the concern about unsustainable production and consumption patterns has grown in society, as demonstrated by European Commission studies (European Commission, 2009b). Worldwide, the UN Sustainable Development goals of the 2030 Agenda for Sustainable Development recognize that ending poverty must go hand-in-hand with strategies that build economic growth, addressing a range of social needs including education, health, social protection, and job opportunities, while tackling climate change and environmental protection (United Nations, 2016). Public procurement approaches (GPP, SPP and PPI) in the context of transitions can contribute directly to the objectives 1 – gender equality, 8 – decent work and economic growth, 9 – industry, innovation and infrastructure, 10 – reduced inequalities, 11 – responsible consumption and production, 13-climate action and 17 – partnerships for the goals. In a more expanded timescale, those initiatives and cultural changes will most likely consist of landscape pressures addressed to the national governments and to the public procurement organizations, representing additional tensions to the regime level, also illustrated in the STP Process.

5.3. Implementing public procurement as a mechanism for socio-technical transitions

Having answered to the central question from a conceptual approach, in this section we aim to complement it with a discussion from an operational standpoint, focusing on the individual organization and therefore corresponding to the early stages of niche development of the analytical framework. With this purpose, the SPP Toolbox was developed and tested in case studies.

The SPP Toolbox is a step-by-step tool targeting procurement organizations and their transformative potential for contributing to the niche formation process through the use of GPP, SPP and PPI approaches. As we will further discuss, it operationalizes partially the STP Model.

The SPP Toolbox is a Deming Cycle type of tool and it encompasses six steps: (1) preparatory steps; (2) SPP policy and targets; (3) develop the action plan; (4) implement the action plan; (5) monitoring & reporting; and, (6) revision. Designing and developing the SPP Toolbox required assembling a broad range of perspectives while combining it with a logical structure. Furthermore, it demanded the practical development of skills concerning the key factors proposed at the niche level of the STP Model: individual factors, management factors, procurement factors and inter-organizational factors.

Being mainly anchored at the organizational level, the SPP Toolbox does not operationalize regime and landscape factors—as envisioned in the STP Model. However, it addresses the regime and landscape levels in a scattered way: in the analysis of the organization’s local, national and European policies and strategies, aligning them with the procurement actions; in the development of the organization’s long-term vision for sustainable procurement; and, in the definition of targets.

Furthermore, pressures from the landscape, as the perceived social/societal, environmental and economic context, influenced by cultural and normative values, can be integrated and further developed into the organization’s procurement strategy. Thus, the SPP Toolbox potentially supports the change of the regime and landscape factors in the long term, by contributing to mainstreaming GPP, SPP and PPI strategies.

The niche level of the STP Model was tested by applying the SPP Toolbox to three case studies in Portuguese public organizations with limited experience in the implementation of GPP and SPP practices. Although it has not been possible to cover PPI practices, these experiments placed local authorities in a better position to move forward to PPI. Despite only referring to GPP and SPP practices, the case studies illustrated the thorough development of organizational factors, apart from their different starting point. The development of the inter-organizational factors was still in an inception phase, corresponding to the early establishment of social networks. This might confirm the

need for public organizations to gain experience, starting with GPP, then moving towards SPP, and ultimately to PPI.

In practical terms, the further development of the inter-organizational factors would need the realization of more than one implementation cycle of the SPP Toolbox. That is, the repetition of the SPP Toolbox cycles would result in an increasing experience of public organizations, moving from GPP to SPP and ultimately to PPI, whilst strengthening inter-organizational factors, as well as social networks. This process would provide the necessary conditions for the emergence of deviant local constellations, reinforcing the deepening mechanisms and initiating broadening and scaling-up mechanisms. Additionally, to ensure a success trajectory that eventually influences the regime, activities at the tactical level would be needed, as mentioned earlier (van den Bosch and Rotmans, 2008).

To conclude, the case studies have demonstrated the development of organizational changes in culture, practices, and structure, followed by the early establishment of social networks and deepening mechanisms. Considering the limited of experience of the three Portuguese public organizations, this represents a very interesting and promising result, demonstrating the early stages of niche development of the STP Process (figure 5.2).

5.4. Challenges for public procurement in the context of transitions

The relation between the instruments developed, both at the conceptual and operational level is illustrated in figure 5.2. First, we are concerned with the individual organization's perspective, that is, the lowest part of figure 5.2., corresponding to the early stages of niche development of the analytical framework. It shows that the operationalization of public procurement in the context of transitions needs the development of a full menu of changes within culture, structures, and practices, which constitutes a challenge for public organizations: moving from GPP to SPP and PPI; fostering organizational factors; and, establishing mature inter-organizational activities.

This study provides a step-by-step roadmap, starting with the implementation of the SPP Toolbox by public organizations, which provides an adequate framework to evolve from GPP to SPP to PPI, as well as organizational and inter-organizational factors, including the early establishment of social networks; the further development of social networks needs more time to perform more cycles within the SPP Toolbox, and might include the use of other approaches in the field of transition experiments, such as activities at the tactical level, including the elaboration of images and paths that

give direction to the transition experiment, as referred in the framework developed by van den Bosch and Rotmans (2008).

From a bottom-up perspective, the process of implementing public procurement in the context of socio-technical transitions depends upon a higher effort of public organizations. To overcome this hurdle, additional efforts are required, as the development of guidance and policies to support local organizations in the process of broadening their ambitions and vision.

5.5. Limitations

Although the research has reached its aims, there were some unavoidable limitations.

First, within our knowledge, this is the first attempt to link public procurement and transitions theory, from a conceptual approach. During the literature review, the only study identified in this area referred to the empirical study done by Gee and Uyarra (2013), discussed earlier. Therefore, it is likely that there are still a lot of gaps in the knowledge base that need to be filled in, both at the conceptual and operational levels.

At the conceptual level, the main limitations relate to the following aspects: (1) a stronger focus of the study on the niche development processes than on regime and landscape processes, as niches are crucial for transitions; yet, this did not prevent the proposal of a framework including the three levels; (2) the organization of the key factors within niche, regime and landscape levels that constitutes the STP Model may represent an oversimplification, which is justified at this stage of the investigation; (3) trying to not over complicate the analytical framework, it does not integrate activities at tactical level preconized by TM (van den Bosch and Rotmans, 2008); (4) the conceptual development of the analytical framework should be reinforced by empirical results, which are not available at this stage of the research.

At the operational level, the main limitations concern the SPP Toolbox and its focus on the individual organizations and on activities within the organization itself, somehow neglecting activities between organizations, which may hinder deepening, broadening and scaling up mechanisms.

Adding to that, still on the operational level, and concerning the case studies, the main limitations relate to the following: (1) during case studies development, it was not possible to organize PPI activities and therefore only one part of the analytical framework was tested; (2) for time reasons, case studies refer to the first implementation cycle of the SPP Toolbox, resulting in a low

development of deepening, broadening and scaling up mechanisms; (3) the case studies were developed in three Portuguese public organizations, confining the testing scope of the SPP Toolbox.

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CHAPTER 6. CONCLUSIONS AND FINAL REFLECTIONS

CONCLUSIONS AND FINAL REFLECTIONS

The main purpose of this thesis was to investigate and illustrate how public procurement can contribute to socio-technical transitions. To explore this, the thesis focused on key factors for GPP, SPP and PPI implementation, organizing them in a framework of transitions for sustainability. The case study approach was combined with grounded theory and applied to the Portuguese public organizations. This resulted in the production of two inter-related research papers that contributed to answer the main question and related research sub-questions (chapter 1).

6.1. Main conclusions

This research pioneers a new strand of public procurement and transition studies, which is proposed to be named as “Sustainability Transitions Procurement - STP”. As shown in this thesis, linking up transitions theory with public procurement studies is an exciting and promising area of study, opening up new perspectives for implementation and setting up a greater ambition for the contribution of public procurement towards sustainable development goals.

The research aimed at exploring the link within the fields of public procurement and transitions theory at conceptual and operational levels. In this section, we will draw up our main conclusions.

First, the thesis adds to the procurement literature by integrating, for the first time, GPP, SPP and PPI insights into a broader vision of procurement practices contributing to sustainability. The combination of different approaches provides an adequate framework for the re-thinking the procurement process, as it allows to consider: 1) which factors are the foundation for the necessary changes of procurement practices within public organizations; 2) the need for public organizations to gain experience, starting with GPP, and then moving towards SPP, and ultimately to PPI; 3) different approaches from public organizations, according to their characteristics, experience, and knowledge.

Second, the thesis adds to procurement and transitions literature by developing the STP Model, which integrates different approaches to public procurement and prescribes practices that influence the transformation of socio-technical systems. As the STP Model is organized in three levels – niche, regime, and landscape - it gives a comprehensive and systematic overview of key factors and how they can influence the transformation of the current socio-technical system into a more sustainable one. The role of procurement, being it normal procurement, environmentally-driven, sustainability-

driven or innovation-driven is framed by the ultimate goal of contributing to socio-technical transitions towards sustainability.

Third, the STP Model evolved into a more dynamic process, describing the role of public procurement as a governance mechanism for niche development in the context of socio-technical transitions - the STP Process, adding to procurement and transitions literature. The STP Process shows how public procurement organizations can effectively steer niches that may breakthrough through organizational and inter-organizational factors development, complemented by the mechanisms of deepening, broadening and scaling-up.

Fourth, the thesis operationalizes part of the STP Model into a practical tool - the SPP toolbox, to support public organizations in the process of re-thinking the procurement process. The SPP Toolbox incorporates different approaches at different levels, including procurement practices (GPP, SPP, and PPI) and individual, management and inter-organizational dimensions, into one tool. This allows for flexibility in the objectives to be achieved, which can be developed in increasing degrees of complexity.

Finally, this thesis provides empirical evidence that public organizations of different types – regarding dimension, organizational structure, purchasing power and level of experience – are able to implement the SPP toolbox, improving their performance for most of the key factors, both at organizational and inter-organizational levels. Furthermore, these also provided ground for the partial confirmation of the STP analytical framework, corresponding to the early stages of niche development.

6.2. Practical implications

Despite its complexity, this new and broader approach means wider possibilities for public organizations in using their procurement power and budgets to fulfill public organizations' needs, ultimately resulting in the change an entire system. Hence, the results from this research support several lessons and recommendations, addressing public organizations and public policies.

6.2.1. Public organizations

The STP Model constitutes a useful tool for organizations to detect possible gaps in their procurement policies and activities, motivating the re-thinking of the procurement process, raising

their ambitions and broadening their vision, whilst motivating the shift to more complex forms of procurement - from GPP to SPP, and ultimately to PPI.

The same applies to the SPP Toolbox, in which procurers and decision makers need to evaluate the implications of what they are doing in a specific phase for the resulting activities, possibilities, and constraints in later stages. Furthermore, the toolbox allows for flexibility in terms of goals, according to the characteristics, experience, and knowledge of the organization. This flexibility is crucial for small public organizations, and to organizations without prior experience in this field.

This research highlights the need for the development of organizational and inter-organizational factors, in order to achieve the most potential for change. However, this process has to be supported by an increase in competencies and knowledge of practitioners. Specifically, while developing the social network, there is a need for specialized, multi-disciplinary competencies, meaning that good internal and external collaboration is crucial for the success of the process of change of culture, strategies, structures, and practices. These two complementary perspectives, focusing on the individual organization and on the social networks, contribute to an even greater broadening of the scope of action of procurement organizations.

To conclude, the challenge to public organizations is to use procurement strategically, by managing activities at different levels, within a longer timescale, as envisioned in figure 6.1.

6.2.2. Public policies

To achieve sustainability, the operationalization of the STP concept needs bottom-up activities, championed by public organizations of all dimensions, combined with top-down activities, at the policy level, as illustrated in figure 6.1.

As we have seen, long term initiatives, as well as short to medium term regulations in the area of public procurement are available at the European level. GPP is increasingly playing a central role in environmental policies (Rizzi et al., 2014), while PPI is also becoming a priority on the European agenda (Edler and Georgiou, 2007; Rolfstam, 2012). These different approaches to public procurement (GPP, SPP, PPI, PCP, CP) need be conciliated under the context of sustainability transitions. Therefore, procurement, environmental and innovation policies should be linked together, within the broader aim of promoting the move of procurement practices from GPP to SPP and to PPI, whilst supporting the development of organizational and inter-organizational factors.

Thus, the implementation of the new procurement procedure innovation partnership (European Commission, 1995), corresponding to the contractual relationship formed between a public body and one or more businesses which enables the public body and the businesses to work together to develop new products, works or services, not already available on the market, needs to be oriented towards the ultimate aim of fulfilling a societal need in a fundamentally different way, initiating a small scale experiment and, eventually, a local deviant constellation.

From another point of view, although the recent increase in activities to foster networks of organizations supported by the European funding schemes, there is still a considerable gap in the development of top-down activities centered on assisting public organizations to establish social networks with the goal of exploring deepening, broadening and scaling up mechanisms. Thus, the establishment of networks of public organizations and other stakeholders is a central aspect to be taken into account in European and national policies related to public procurement.

Moreover, the importance of the SPP Toolbox in providing guidance on the development of public procurement in the wider context of socio-technical transitions should be highlighted, as it fills a gap for practical tools in this field. The case studies illustrated the importance of guidance on the results obtained with the practical implementation of the SPP toolbox, which can be especially important for small public authorities (Testa et al., 2016).

At the European level, the STP concept opens an opportunity to effectively contribute to the recent concepts of strategic procurement (European Commission, 2015) and circular procurement (European Commission, 2017b), establishing a clear link to Circular Economy (Council of the European Union, 2017).

At the national level, the STP approach needs to be operationalized, as the new Action Plan for Circular Economy and the National Strategy for Green Procurement (Governo de Portugal, 2017a, 2017b) explicit the use of public procurement, representing an opportunity to include this wider scope. Specifically, the role of framework agreements in supporting the STP concept has to be envisioned, complemented by initiatives located within local authorities.

All in all, this research hopes for a broader perspective on public procurement, ultimately aiming to long term system changes towards sustainability. This broader concept has to be operationalized both at European and national levels (figure 6.1) through a series of changes in policies: from the focus on organizations to a focus on social networks; from a low level of integration, to the integration of GPP, SPP and PPI into one broader approach - the Sustainability Transitions Procurement (STP); from the focus on practices to the focus on the combination of practices, strategies and structures; from the development of organizational factors to the development of a

combination of organizational and inter-organizational factors; and, from the use of GPP, SPP, functional criteria and LCC practices to the use of a combination of operational and strategic tools at the organizational and social network levels.

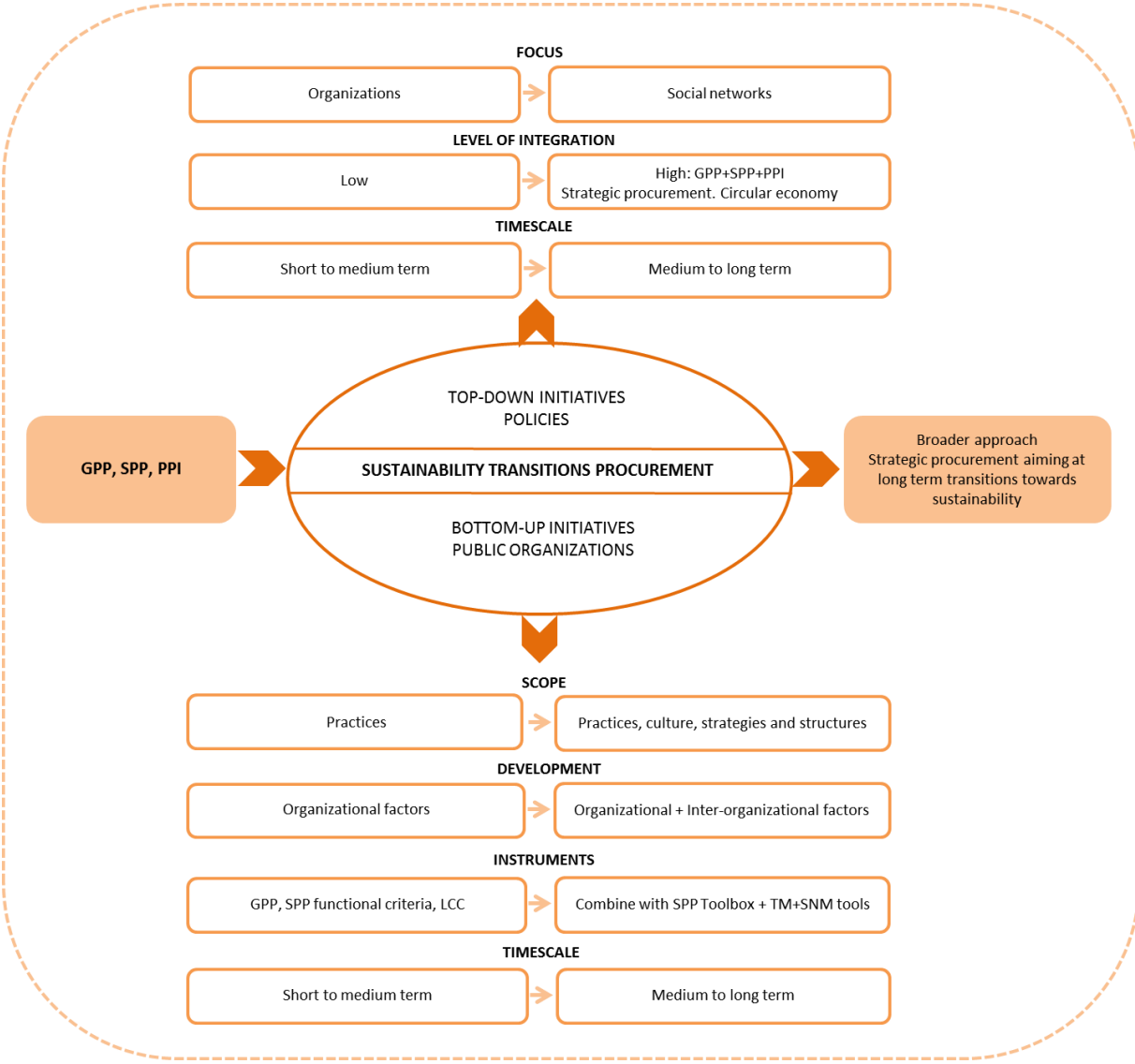


Figure 6.1. Bottom-up and top-down initiatives to operationalize Sustainability Transitions Procurement (STP).

6.3. Further research

As already said, this research opens up a new strand for public procurement and transition studies, and therefore it is likely that there are still a lot of gaps in the knowledge base that need to be filled, both at conceptual and operational levels. Thus, the study presented within this thesis points out

possibilities for further research in order to draw more extensive conclusions about public procurement contribution to socio-technical transitions.

This being said, as already acknowledged in section 5.5, the organization of the key factors within niche, regime and landscape levels, as well as the interactions between the key factors that constitute the STP Model need to be further explored with future empirical research.

Additionally, the STP Process presented in figure 3.3 needs to be further tested with empirical results, namely case studies from other European countries with advanced GPP, SPP and PPI activities. Furthermore, the usefulness of the integration of activities at tactical level preconized by TM (van den Bosch and Rotmans, 2008) needs to be investigated.

Another research direction concerns the need to further develop activities and interactions between organizations within the SPP Toolbox, in order to determine the emergence of deepening, broadening and scaling up mechanisms. The testing should also include cases referring to the implementation of several cycles of the SPP Toolbox.

Overall, the STP Model, the STP Process, and the SPP Toolbox need further verification from empirical studies with a wider range of public organizations, including other national public organizations and from other EU countries.

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ANNEX A. SUMMARY OF THE LITERATURE REVIEW

Table A.1. Summary of the literature review for GPP, SPP and PPI.

Literature Author	Problem setting	Type of study	Analysis	Method	Level/unit of analysis
GPP					
Testa et al. (2012)	Determinants and drawbacks of GPP adoption.	Empirical	Analysis of database of 156 public authorities - Italy - Emilia Romagna, Lazio, Liguria- based on interviews.	Quantitative analysis	Public authorities/ purchasing/environmental managers
Zhu et al. (2013)	Relationship between GPP drivers and adoption of GPP practices.	Empirical	Primary data collected from 193 Chinese government officials – interviews.	Quantitative analysis	Municipal government - public authorities
Rizzi et al. (2014)	Interactions between green SME networks and GPP opportunities.	Empirical	The business environment for the end-of-life tire recovery in road construction.	Case study approach	Supply chain businesses in road construction sector
Testa et al. (2016)	Analysis of which factors drive GPP in public tenders.	Empirical	Primary data from a survey on Italian municipalities - Tuscany, Italy - online questionnaire.	Quantitative analysis	Public authorities
Smith and Terman (2016)	Effect of administrative professionalism and interest group presence in GPP adoption.	Empirical	Data from GPP practices on US counties websites.	Quantitative analysis	Counties
Witjes and Lozano (2016)	Link between procurement and supply practices, based on a service oriented system. Proposal of a framework to include technical and non-technical specifications of product/service combinations that improve resource usage efficiency through recovery.	Theoretical	Framework linking SPP and business models.	Grounded theory	

Literature Author	Problem setting	Type of study	Analysis	Method	Level/unit of analysis
SPP					
Meehan and Bryde (2011)	Factors for decision-making towards SPP implementation.	Empirical	Survey on SPP practices in 44 UK Housing associations – questionnaire.	Quantitative analysis	UK Housing Associations
Preuss and Walker (2011)	Conceptual framework of psychological barriers to implement SPP.	Empirical	Interviews.	Qualitative/ quantitative analysis	UK local government and health care authorities
Walker and Brammer (2012)	Relationship between SPP and e-procurement.	Empirical	Survey on over 280 public procurement practitioners from 20 countries.	Quantitative analysis	Public authorities worldwide
Bratt et al. (2013)	Assessment of the process of GPP criteria development as a basis for making this process supportive of sustainable product and service innovation. Proposal of process changes.	Empirical	Participation in meetings, analysis of documentation, interviews.	Case study approach	Swedish governmental expert body
Meehan and Bryde (2014)	Proposal and testing of operational measures of social capital and their relationship with SPP.	Empirical	Survey on 153 procurement professionals in organizations providing social housing - online questionnaire.	Quantitative analysis	Procurement professionals in organizations providing social housing
Grandia (2015)	Analysis of the role of change agents.	Empirical	Expert survey in 7 SPP projects in 2 Dutch national government organizations - interviews, internal documents and publicly accessible information.	Case study approach	Organizations from Dutch national government
Grandia (2016)	Testing whether behavior acts as a mediator between knowledge, commitment to change and the application of SPP.	Empirical	Survey amongst public procurers of Dutch national government.	Quantitative analysis	Public procurers of Dutch national government
Roman (2017)	Exploring the conditions under which a given organization is more likely to	Empirical	Survey in US public agencies.	Quantitative analysis	US public agencies

Literature Author	Problem setting	Type of study	Analysis	Method	Level/unit of analysis
	prioritize SPP practices and how leadership style of top leader determines SPP implementation.				
PPI					
Preuss (2007)	Contribution of purchasing function to ecological innovation in the upstream supply chains of manufacturing companies.	Empirical	Semi-structured interviews to purchasing managers of 50 companies.	Case study approach	UK companies' purchasing managers
Rolfstam (2009)	Development of an innovation theory-based approach for PPI by elaborating an institutional focus. The approach applied brings in the endogenous or informal institutions perspective in order to understand the institutional set-up enabling PPI.	Empirical	Background interviews with 12 experts in public procurement; interviews with key persons from the 3 case studies.	Case study approach	3 case studies of PPI (1 in Norway, 2 in England)
Edquist and Zabala-Iturriagoitia (2012)	Characteristics of different kinds of PPI, how PPI has been used and its relationship to other public innovation policy instruments. Clarification on what should be regarded as innovation procurement and categorization according to 3 dimensions (user, procurement process, cooperative nature of the process). Main stages of PPI processes.	Empirical	Detailed description of case studies.	Case study approach	6 case studies of PPI (4 in Sweden, 1 in Norway, 1 in US)
Gee and Uyarra (2013)	Exploring how a public buyer transformed the Greater Manchester waste system, drawing from ideas on system innovation, transition management and public	Empirical	19 semi-structured interviews with key actors at local and national policy level and private sector.	Case study approach	City-region waste management system

Literature Author	Problem setting	Type of study	Analysis	Method	Level/unit of analysis
Timmermans and Zabala-Ihurriagagoitia (2013)	procurement. Role of PPI in the promotion of knowledge-intensive entrepreneurship (entrepreneurial activities that are innovative, have significant knowledge intensity and develop innovative opportunities in diverse sectors). Introduction of the concept of coordinated unbundling as a strategy to facilitate PPI.	Theoretical	Framework to organize PPI around coordinated unbundling.	Exploratory study	
Uyarra et al. (2014)	Understanding how key conditions or mechanisms in the procurement process (related to processes, competencies, procedures and relationships) influence suppliers' ability to innovate and to recap the benefits of innovation.	Empirical	Survey of UK public sector suppliers - heads of public sector contracts and company managers.	Quantitative analysis	Heads of public sector contracts and company managers (public sector suppliers
Knutsson and Thomasson (2014)	Analysis on how competition in local markets can be affected through innovation in the public procurement (innovation-friendly procurement) process within small local authorities by responding to: 1) how innovation in the procurement process can be accomplished and, 2) how innovation in the procurement process influences the market.	Empirical	Data on Swedish food industry (statistical databases). Interviews with responsible of procurement of food from the local authority and tender documents.	Case study approach	Swedish local authority
Georghiou et al. (2014)	Study on the range of policy interventions to support the use of procurement for innovation and on the degree to which they correspond to corrections of	Empirical	Dedicated survey of 800 public sector suppliers in the UK.	Quantitative analysis	Policy instruments

Literature Author	Problem setting	Type of study	Analysis	Method	Level/unit of analysis
Pelkonen and Valovirta (2015)	identified deficiencies in the process. Comparison with the perceptions of firms. Study on whether the characteristics of services and service innovation are compatible with processes and requirements of public procurement.	Empirical	Procurement of social care services for substance abusers at the City of Helsinki, Finland.	Case study approach	Procurement process
Amann and Essig (2015)	The study reviews literature on complexity, time consumption, and risk, representing important hindrances for the procurement of innovation from public buyers' perspective across EU member states.	Empirical	Data of European contracting authorities from tender electronic daily (TED) database.	Quantitative analysis	EU tenders
Dale-Clough (2015)	Conceptualization of the local authority procurement environment, using it as a framework for analyzing the potential for PPI, representing three distinct modes of public procurement: functional procurement, tactical procurement and strategic procurement.	Empirical	Interviews in three cities (UK, Spain, Poland).	Qualitative approach	External and internal procurement environment