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Open Service Innovation Platform in a Smart City

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Abstract: The knowledge of how a city can drive innovation of companies and third sector organizations for its own needs is scarce so far. The present article addresses this knowledge gap. The purpose is to develop and propose a conceptual model for open service innovation platform in a Smart City. This is a preliminary model and it functions as a starting point for a following empirical study of this area in the future. Cities are increasingly adopting the ideas of the Smart City concept in their visions and development efforts. A handful of characteristics is usually associated to the concept of smart City. They include innovation and knowledge, high-tech and creative industries, utilization of networked infrastructures, business-led urban development, social and relational capital in urban development, and environmental sustainability. This article argues that a true Smart Cities takes the initiative and actively facilitates and guides the innovation of companies and third sector organizations in order to reach new services which on the one hand solve the city's problems, and on the other hand enable profitable business to companies. However, the knowledge of this area is still in its infancy. Both scientific knowledge and management practices are needed. Pre-commercial procurement is an example of recent approaches to steer the development of solutions of private companies towards concrete public sector needs, and this article sees its potential in the context innovation platforms in public sector. As a result, this article contributes by proposing a preliminary model for open service innovation platform in a Smart City. The model illustrates the evolution and transformation of city's problem through innovation platform into a service providing a solution to the city's problem and revenues to the company. It also illustrates the portfolio of innovation projects in the platform and their synergies, as well as connections and synergies to other innovation platforms in home country and abroad. Moreover, it proposes four different options how an innovation platform may be positioned in the city's administration.

Keywords: Smart City, innovation platform, service innovation, open innovation, public procurement, pre-commercial procurement

1. Introduction

More people live in urban areas than in rural areas in the world. The urban population of the world has grown rapidly since 1950, from 746 million to 3.9 billion in 2014. In 2014, 54% of the world's population lived in urban areas, while in 1950, 30% of the world's population was urban. By 2050, 66% of the world's population is projected to be urban (United Nations, 2014). For this reason, policymakers, administration of cities, companies, the third sector, and citizens themselves need to develop new approaches for responding and utilizing the opportunities of the urbanization development. According to Bakıcı, Almirall and Wareham (2012), international competitiveness is today driven by the innovativeness of cities. Small towns turn into metropolises with major installations of ICT infrastructures and can reposition themselves on the global stage. These cities provide new locations for businesses and ecosystems. Indeed, innovation is in the heart of the successful transformation into a Smart City. Smart City is defined in multiple ways, but in general, a Smart City involves implementation and deployment of information and communication technology infrastructures to support social and urban growth through improving the economy, citizens' involvement and governmental efficiency (Hollands, 2008).

Open innovation (Chesbrough, 2003a; 2003b) has become a popular topic in this area (Huizingh, 2011). The public sector has also adopted the open innovation paradigm (Walker, 2003; Osborne and Brown, 2005). An increasing number of non-profit organisations are adopting the ideas of open innovation (Bommert, 2010). They take advantage of a growing number of citizen networks and new types of online intermediaries (e.g. ChallengePost.com) to enhance public value. (Lee et al., 2012). The emergence of the open innovation approach has been influenced by changes in thinking about the fundamental importance of organization's internal and external knowledge environments (Huang and Rice, 2013).

Various participation, development and innovation platforms are increasingly being adopted by both private companies and public sector. However, the knowledge of management of innovation platforms is scarce so far. According to Scholten and Scholten (2012), the academic research stresses the relevance of external complementary innovation for platform success, it lacks understanding to guide platform owners in directing external innovational efforts in cooperative platform ecosystems to co-create and deliver value while ensuring the overall quality, reliability and consistency of the 'whole' solution. The lack of knowledge on innovation platforms is even greater in the context of Smart City services. Indeed, there is hardly any knowledge of the intersection

of these two research areas: Smart Cities and innovation platforms. There is a clear need to increase the knowledge in this theme, and the present article addresses this evident knowledge gap. The purpose of this article is to develop and propose a conceptual model for open service innovation platform in a Smart City. This preliminary model functions as a starting point for a following empirical study. In this paper, the term “innovation platform” is defined as an approach that systematically facilitates external actors’ innovation with purpose to develop solutions to platform owners’ own problems and needs.

First, it discusses and reviews the literature on smart cities and platforms. Then, based on the literature, it proposes a model of open service innovation platform in a Smart City. After that, it draws the final conclusions.

2. Smart City concept

The term Smart City has become popular, particularly among urban policy makers. However, what makes a city to be “smart” remains rather unclear. Moreover, there are several similar concepts that may cause confusion, such as wired cities (Dutton, 1987), technocities (Downey and McGuigan, 1999), digital cities (Komninos, 2008), creative cities (Florida, 2005; Creative Cities Network, 2015), and knowledge-based cities (Carillo, 2006). Since a precise definition lacks, cities have a self-congratulatory tendency to label themselves “smart”—what city does not want to be smart or intelligent? Hollands (2008). Next, some main aspect of this concept are discussed.

Hollands (2008) made a critical review on the smart city concept and identified the following characteristics associated to the concept.

- The utilization of networked infrastructures to improve economic and political efficiency and enable social, cultural and urban development (Komninos, 2006; Eger, 1997)
- Emphasis on business-led urban development (Brenner and Theodore, 2002; Quilley, 2000; Harvey, 1989; Gottdiener, 2001; Klein, 2000; Monbiot, 2000)
- Enhancement of social inclusion (Siemiatycki, 2002; Phipps 2000; Harvey, 2000)
- High-tech and creative industries as drivers of growth (Florida, 2002; Eger, 2003a, 2003b; Hall 2000; Scott 2000; Landry and Bianchini, 1995; Landry, 2000)
- Attention on the role of social and relational capital in urban development (Eger, 2003b; Carley et al. 2001; .Poelhekke, 2006)
- Consideration of environmental sustainability (Gleeson and Low, 2000; Inoguchi et al., 1999)

Smart Cities emphasize the role of ICT infrastructure, although much research has also been carried out on the role of human capital/education, social and relational capital, and environmental interest as important drivers of urban growth. (Caragliu et al., 2011). European Smart Cities project (2015) presented six axes connecting traditional regional and neoclassical theories of urban growth and development. They are called as

- Smart economy
- Smart mobility
- Smart environment
- Smart people
- Smart living; and
- Smart governance (Caragliu et al., 2011)

Zygiaris (2013) puts forward the following qualities of Smart Cities

- *Efficient, sustainable and liveable.* These aspects of urban development have been associated with Smart Cities in several reports dealing the vision of Smart Cities (Toppeta, 2010; Cozens, 2008; Greenburg, 2004; Marshall and Toffel, 2005; McGeough and Newman, 2004)
- Intellectual ability addressing several *innovative socio-technical and socio-economical aspects of growth* (Atkinson and Castro, 2008; Belisent, 2010; Shapiro, 2003)
- *Green.* Meaning urban infrastructure for environment protection and reduction of CO₂ emission (Atkinson and Castro, 2008; Belisent, 2010; Adams, 2006)
- *Interconnected.* Referring to broadband economy (Bell et al., 2009; Gillett et al., 2004; Ergen, 2009)

- *Intelligent*. Meaning the capacity to produce added value information from the processing of city's real-time data from sensors and activators (Chee-Yee and Kumar, 2003; Leon, 2006)
- *Innovating and knowledge*. Refer to the city's ability to raise innovation (Shapiro, 2003; Komninos, 2002; 2006)

Komninos (2006) defined Smart Cities as territories with high capacity for learning and innovation, which is built-in the creativity of their population, their institutions of knowledge creation, and their digital infrastructure for communication and knowledge management. According to Fu (2007), *a high concentration of skilled workers* can promote the creation, diffusion, acquisition, and accumulation of knowledge across individual workers, geographic space, and time. People benefit from being close to a dense, skilled, labour market where, through different channels, they can learn from others without compensation. This is explained with the concept of localized knowledge spillovers which enhance cities to be "Smart Café Cities" (ibid.). In general, local human capital externalities are considered to be one of the predominant reasons for the existence of cities (Henderson, 1974, Fujita and Ogawa, 1982, Lucas, 2001). Tranos and Gertner (2012) argue that Smart City policy agenda should be informed by and address the structure of transnational urban networks since this can affect the efficiency of such local policies. The significance of global network structure is essential as cities do not exist in a vacuum. The urban development is heavily based on urban interdependencies found at a global scale.

3. Platforms

An open product or service platform refers to a context where multiple components of products, systems, or services are used in common or reused across implementations (Katz and Shapiro, 1994, Marschak, 1962, Bourdeau,, 2010). A platform may include physical components, tools and rules to facilitate development, a collection of technical standards to support interoperability, or any combination of these things (Boudreau, 2010; Baldwin and Woodard, 2009; Cusumano and Selby, 1995; Gawer and Cusumano, 2002; Franke and von Hippel, 2003; Kim and Kogut, 1996; Meyer and Lehnerd, 1997; Robertson and Ulrich, 1998; Simpson, Siddique and Jiao, 2006; Spulber, 2008; Wheelwright and Clark, 1992). This kind of approach to product platforms is clearly more dominated by the logics of technology development in private sector.

In Smart Cities, "innovation platforms" are also called as "participation platforms" referring to something in which governments, businesses and citizens can communicate and work together, and track the evolution of the city. They are typically driven by local municipalities on behalf of platform users. They reflect the full range of city actors including individuals, civil society groups, small businesses in the retail service, and manufacturing sectors and larger businesses established in the city (EU, 2014).

It should be noted that "innovation in platform-based business" means something different than "innovation platform." According to Scholten and Scholten (2012), innovation management in platform businesses refers to an ongoing process that (a) systematically identifies, evaluates and defines the strategic innovation goals of platform and ecosystem evolution; (b) implements innovation strategy both within the company and within the platform ecosystem, and finally monitors and controls strategy implementation

Indeed, a brief look at literature reveals that the use of the term "platform" or "innovation platform" is incoherent. They may refer to a virtual or physical space, management approach, or network of actors.

4. Model of open service innovation platform in a Smart City

Next, based on the above literature analysis, an open service innovation platform is proposed for a Smart City. "Innovation platform" was defined as an approach that systematically facilitates external actors' innovation with purpose to develop solutions to platform owners' problems and needs. It is an approach for attracting, facilitating, and orchestrating other organizations' innovation to solve platform owners' problems. It is primarily a way to organize, rather than a virtual or physical space, even though they may be means used to facilitate the innovation of external organizations.

The city owns or at least controls the innovation platform. In most cases, it is part of the city organization. The other actors involved include anyone capable giving relevant input to the innovation process. They cover representatives from cities and municipalities, SMEs and large companies from one or different industries, citizens, end users, and third sector organizations. The actors may come from one or various geographic locations, even worldwide.

The idea of open service innovation platform is illustrated in Figure 1. The platform is used to transfer the problems and needs of a city into profitable business of external companies. Cities have a number of problems and needs. To fulfil the needs and solve the problems they have two options, either provide the solution themselves or buy it from outside. The platform is aimed to the latter purpose. It facilitates and guides in a systematic companies and 3rd sector organizations to innovate and develop services for solving the city's problems.

The platform enables developing targeted solutions to the city's problems. Very often, companies have services and products that are developed primarily to the needs of other companies or consumers, and they do not fit to the city's needs, at least in optimal way or without modifications. The purpose of the platform is to make companies and third sector organizations to innovate more effective and efficient services for the city's use. In turn, companies and third sector organizations have the opportunity to get a deep insight into the city's real needs and environment, develop services that are competitive with the city in question, and build long-term profitable business with the city. Also, since cities' problems are very similar, the developed services may easily open up new business with other cities in home country and abroad.

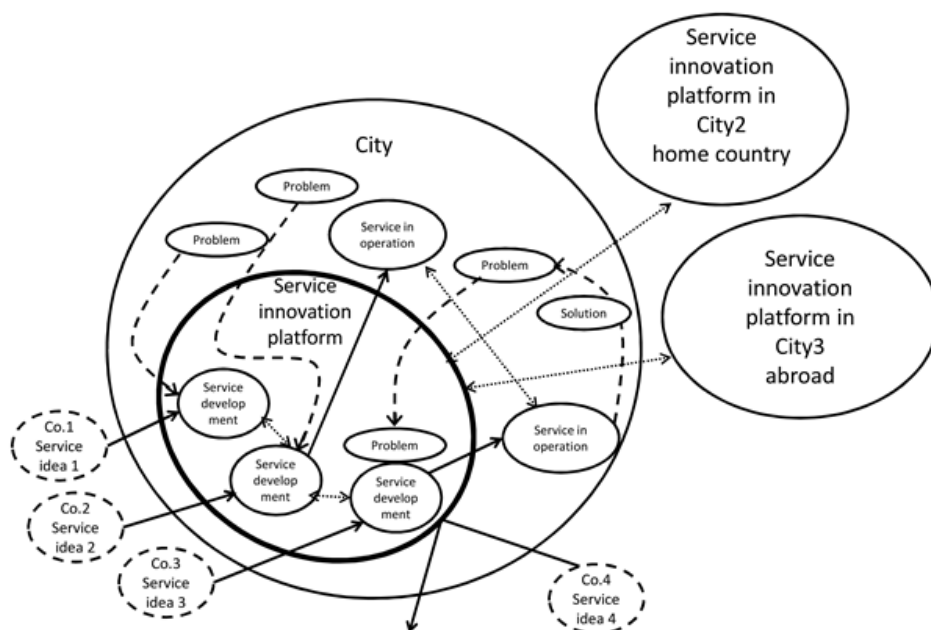


Figure 1: Open service innovation platform in a Smart City

Next, the approach of Open service innovation platform in a Smart City is explained in more detail. First, the city identifies its problems and decides which of them it wants to bring to the platform to be shown to external companies and third sector organizations. The problem may exist now or is anticipated to exist in the future. The platform needs to be well connected with companies and third sector organizations to inform them about the city's problems that require solutions. The city needs to communicate the business potential related to the problem. If the potential business seems attractive enough companies propose getting into the platform to develop a solution. Some of the interested companies is accepted, others are rejected.

In practice, the acceptance may materialize in pre commercial procurement agreement between the city and the company. Pre-commercial procurement is the procurement of research and development of new innovative solutions before they are commercially available (EU 2015, Pre-commercial procurement). Pre-commercial procurement refers to the procurement of (expected) research results and is a matter of direct public R&D investments, but no actual product development. Moreover, it does not involve the purchase of a (non-existing) product, and no buyer of such a product is therefore involved. This type of procurement may also be labelled "contract" research, and may include development of a product prototype (Edquist and Zabala-Iturriaga, 2012). According to Edler and Georghiou (2007), pre-commercial procurement is applicable for innovative products and services for which further R&D needs to be done. The risk related to innovation process is shared

between the company and the city. Products and services are still in the pre-commercial phase, the products and services delivered are not “off the shelf”. The procurement is actually an R&D service contract, given to a future supplier in a multi-stage process, from exploration and feasibility to R&D up to prototyping, field tests with first batches and then, finally, commercialisation. The justification for this approach stems from the argument that R&D-intensive procurement needs more intensive interaction and cannot be judged on the basis of written specifications and proposals (Edler and Georghiou, 2007). Pre-commercial procurement enables public procurers to:

- Share the risks and benefits of designing, prototyping, and testing new products and services with the suppliers
- Create optimum conditions for the wide commercialisation and take-up of the results of R&D
- Pool the efforts of several procurers
- Develop innovative solutions for the societal challenges of the future
- Encourage companies to invest in highly qualified R&D in Europe
- Act as a "seal of approval" confirming the market potential of new emerging technological developments, thereby attracting new investors (EU 2015, Pre-commercial procurement)

After this, the service innovation process takes place. Once there is a clear understanding on who (the city in question) is the problem owner and also very likely a potential becoming customer, the company may address their specific needs. Also, the city has motivation to join to co-creation innovation process, since the service is developed primarily for them. The innovation process also likely to involve various other stakeholders, such as citizens and end-users.

Once the innovation process is over, the service will be implemented in the city. In other words, it changes from development (pre-commercial) phase to production (commercial) phase. It solves the city's problem and generates revenues to the company. It shifts from innovation to operation mode.

An important aspect of the service innovation platform is the management of the portfolio of innovation projects in the platform. The city is able to seek synergies between them and thus get more impact to itself. Moreover, it is possible to create synergies between existing services –those in operation- and new services being developed. This all enables better long-term planning of service production and procurement in the city.

An essential aspect of the service innovation platform is the connection to other innovation platforms in home country and overseas. This is important for transfer of ideas, and quick adaptation of breakthroughs achieved in other smart cities. Connections to other innovation platforms are important also because they help in building scalability in the services being developed in the platform.

An important question deals with how an open service innovation platform relates to the city administration and how it is governed. There are several alternative for that. Choosing the right requires careful case specific analysis. Next, four alternatives are presented (Figure 2). They are:

- In the central administration
- In departments
- In departments + connecting round table
- External

Option 1. The service innovation platform is subordinated to the central administration of city. In this case, it is likely to have more freedom and it may be able to develop and experiment various visionary and future-oriented services. The success of this option depends highly on how supportive and visionary the top management of the city is. In this option, sectorial departments may perceive to be left outsiders.

Option 2. In the second option, each department has its own innovation platform. This option has the potential to result in services which more precisely respond to the needs of each department. On the other hand, due to the silos, it may lack the synergies between the departments. Services addressing cross departmental problems may be difficult to be designed in this option.

Option 3. The third option adds a connecting round table to the Option 2. The purpose of the round table is to share ideas, practices and visions of the service innovation of each department. This provides synergies to the service innovation. This requires, however, that the round table truly functions.

Option 4. In the fourth option, the innovation platform is externalized. If the external innovation platform has a large partner network and expertise, the city may gain from this option. On the other hand, the city may have lesser control to the platform, it may become “distant” from city’s grassroots operation, and also the communication may be more challenging.

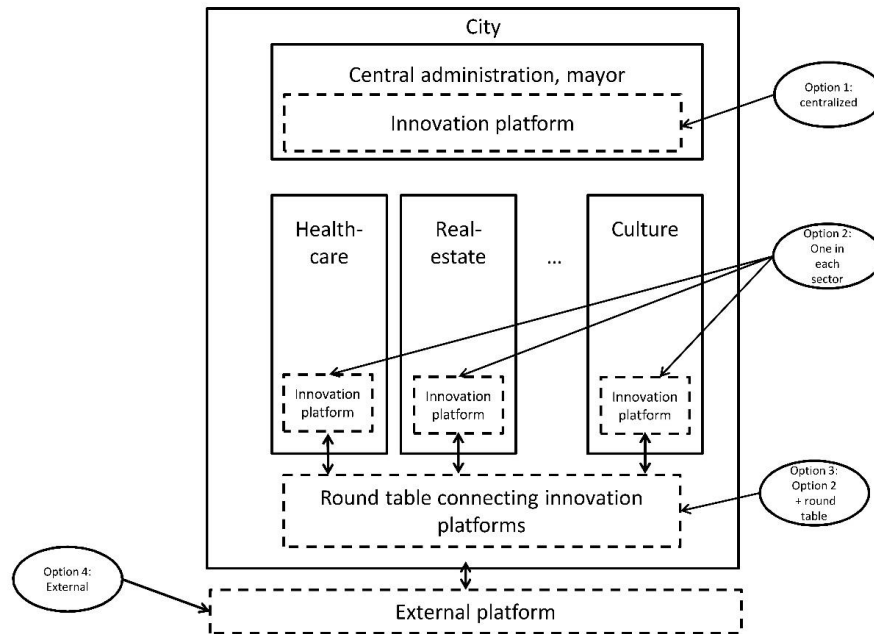


Figure 2: Innovation platform in the city organization

5. Conclusions

The purpose of this paper was to develop and propose a conceptual model for open service innovation platform in a Smart City. This was relevant, since the knowledge of how a city can drive innovation of companies and third sector organizations for its own needs scarce so far. The present article addresses this knowledge gap. As an outcome, this article contributed by proposed a preliminary model for open service innovation platform in a Smart City. The model illustrated the evolution and transformation of city’s problem through innovation platform into a service providing a solution to the city’s problem and revenues to the company. It also illustrated the portfolio of innovation projects in the platform and their synergies, as well as connections and synergies to other innovation platforms in home country and abroad. Moreover, it proposed four different options how an innovation platform may be positioned in the city’s administration. They were: in the central administration, in departments, in departments + connecting round table, or external location.

Several needs for further research stem from the current paper. Indeed, the whole model and all its individual elements should be empirically examined, further developed, piloted, and validated. This has a great potential for scientific contribution, as well as managerial guidelines and policymaking suggestions. The content of each element, their interfaces, and external connections need empirical analysis and development. The potential to apply principles of pre-commercial procurement in the context of innovation platforms of a city deserves further research and development. Moreover, the question how an innovation platform relates to a city’s administration and decision making processes needs more empirical research and development. Moreover, the terms “platform” and “innovation platform” require more conceptual development, because their use is incoherent in the literature.

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