Capturing and sharing knowledge across Smart City projects

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1. Introduction

The notion of 'smart city' has been gaining attention around the world, and is emerging as a major response to the challenges cities are facing (Nam et al. 2011) such as increasing population, climate change and severe budget reductions. The European Union (EU) Smart Cities agenda offers new horizons for innovation. Several investments such as the 'Lighthouse Smart Cities' programs (EU Smart Cities, 2018) have begun to pilot the next generation of smart low carbon solutions for cities. However, EU does not have sufficient budget to fund all projects for piloting smart city innovation and is keen that cities should learn from Lighthouse Cities and replicate good practices. Although a wide range of smart initiatives have been established in Europe and globally, there is often little or no cooperation between those programs for replication. This is mainly because many projects die after the pilot stage and the lessons learned from previous projects never scale up to inform subsequent implementations (Winden, 2016; Winden and van den Buuse, 2017). As theory claims, knowledge sharing within projects predicts a variety of desirable outcomes including increased productivity, decreased task completion time, increased organizational learning, innovativeness (e.g., Argote and Ingram, 2000; Argote et al., 2003; Cummings, 2004; Hansen, 2002) and sustained competitive advantage (Nonaka and Takeuchi, 1995).

Smart city initiatives tend to run for a long period of time and share similar characteristics to programs or portfolios for replication. They are mainly strategic initiatives often focusing around the context of construction and mobility. Examples of operational projects within such initiatives include the construction of new energy-efficient buildings, the retrofit of existing buildings and the development of sustainable transport infrastructures, amongst others. As a result, some studies such as Lee et al. (2013) have called for further research to develop knowledge management tools that support smart city initiatives. This study responds to this call by identifying formal mechanisms and processes that influence knowledge transfers on smart city projects. Undoubtedly, there is a growing need to explore how cities can leverage good practices and smart outcomes in a way that knowledge sharing and lessons learning can be effective to facilitate replication.

The key aim of the study is to explore how can cities share knowledge and learn from each other to facilitate replication of low carbon Smart Cities. It will explore the barriers and challenges to knowledge sharing and learning across a series of complex projects and programs. Although, managing project knowledge has often been discussed amongst scholars and practitioners in the field, particularly through the PMI Global Congress and other PM networks (Maylor 2010; Olonoff, 2000; Levin, 2010; Ritchie, 2007), little attention has been given to this particular context of public procurement projects (Neirotti et al. 2014). New practices are often left undocumented and academic studies rarely provide opportunities to be applied in such complex, knowledge-intensive settings. Therefore, this research seeks to answer the question, *"How can cities share knowledge and learn from each other for replicating low carbon smart city projects?"*

In the next section, we provide a theoretical background and subsequently introduce the method. Finally, the anticipated contributions from our study are highlighted.

2. Theoretical background

Sharing knowledge and learning within and between local authorities is paramount in a journey to replicating low carbon Smart Cities. Knowledge sharing is a key construct in the literature and has been previously studied by a number of authors in various different contexts (Ancona and Caldwell, 1992; Argote and Ingram, 2000; Dushnitsky and Lenox, 2005; Gupta and Govindarajan, 2000; Levin and Cross, 2004). As organizational effectiveness is built upon employees' knowledge, their involvement in knowledge sharing (e.g., face to face, virtual Communities of Practice, etc.) has become one of the most prominent strategies for organizations looking to manage their knowledge assets effectively. Extant literature recognizes a set of variables that may also moderate (i.e., enable or prevent) knowledge sharing in organizations. Examples include constructs such as trust (e.g., image Wasko and Faraj, 2005), organizational rewards (e.g., Bock et al., 2005), knowledge self-efficacy (e.g., Jarvenpaa and Staples, 2000) and the 'knowledge-creating' company (Nonaka, 1991). Similar to the concept of the 'knowledge-creating' company (Nonaka, 1991), we explore how 'knowledge creating' cities are likely to look like through the use of the SECI model, namely 'Socialization, Externalization, Combination, Internalization' (Nonaka and Takeuchi, 1995).

We look at the interaction between tacit and explicit knowledge that exists within local authorities (Hansen et al., 1999; Zander and Kogut, 1995) and argue that four modes of

knowledge conversion are needed for creating and managing knowledge. Specifically, socialization allows tacit knowledge form one person to be passed to the other (Nonaka and Takeuchi, 1995). Tacit knowledge is considered as more than 'know how' and can include intuitions, hunches and insights. It does not become explicit and hence, cannot be leveraged and used by the whole organization. We posit that apprenticeships as a system of training new generation practitioners can really help in sharing organizational values and experiences. Managing knowledge has become a strategic aspect of organizations and managers are beginning to recognize the importance of its role in strategic planning.

Nevertheless, there is not yet a clear understanding of what managing knowledge is in the context of strategic planning and management (Aliaga, 2000). Primary process for successful innovation, and thus the creation of new knowledge, which is particularly important in the context of fostering 'knowledge-creating' cities, is externalization. New knowledge is formed and made explicit in a form that can be shared around local authorities through dialogue and the use of figurative language, metaphors, narratives, images and creative inferences where individuals share their mental models and reflect and analyze their own understandings (Nonaka and Takeuchi, 1995). Explicit to tacit knowledge conversion is also key in ensuring that knowledge becomes part of an individual's knowledge and builds on the assets of the organization. This usually occurs through experience (learning-by-doing), training and mentoring and the spaces that encourage such conversions are often characterized by reflection (Ibid.).

3. Approach

The first stage of the research is to conduct a comprehensive literature review on knowledge management and organizational learning in low carbon Smart City projects to develop a theoretical underpinning. Next, a theoretical model will be designed to be used for the empirical research based on network theory, absorptive capacity and Nonaka's SECI model. From an epistemological point of view, critical realism is likely to be followed as a line of enquiry. The research plans to apply mixed methods, i.e. both qualitative and quantitative. The primary data will be collected with the help of semi-structured interviews and questionnaires with the project management professionals involved in smart city programs. Feedback on the proposed replication framework will be gained from the research participants and other members of the Smart City Network. Thematic analysis will be carried to analyze the qualitative data. Concepts already identified in the literature will be grouped into constructs to analyze how different local authorities exchange lessons learned, aiming at

capturing insights, experiences and current best practice. Feedback from practitioners will be requested to show how knowledge is shared and exchanged across the network and also provide a better insight in the dynamics of KM in such cross-functional and knowledge-intensive project settings. The quantitative data will be analyzed using Structural Equation Model (SEM) to test the proposed framework.

4. Anticipated contributions

For practice, we believe this study also has direct application for programme and portfolio managers in local authorities, particularly those who work on sustainability projects. Specifically, a framework and tool kit for replicating low carbon Smart Cities will be developed. Theoretically, this study will increase our understanding of the SECI model and demonstrate how it can be used to explain knowledge sharing in the case of low carbon smart city projects.

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