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To the smart city and beyond? Developing a typology of smart urban innovation

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Abstract

The smart city is an increasingly popular topic in urban development, arousing both excitement and skepticism. However, despite increasing enthusiasm regarding the smartness of cities, the concept is still regarded as somewhat evasive. Encouraged by the multifaceted character of the concept, this article examines how we can categorize the different dimensions often included in the smart city concept, and how these dimensions are coupled to innovation. Furthermore, the article examines the implications of the different understandings of the smart city concept for cities' abilities to be innovative. Building on existing scholarly contributions on the smartness of cities and innovation literature, the article develops a typology of smart city initiatives based on the extent and types of innovations they involve. The typology is structured as a smart city continuum, comprising four dimensions of innovation: (1) technological, (2) organizational, (3) collaborative, (4) experimental. The smart city continuum is then utilized to analyze empirical data from a Norwegian urban development project triggered by a critical juncture. The empirical data shows that the case holds elements of different dimensions of the continuum, supporting the need for a typology of smart cities as multifaceted urban innovation. The continuum can be used as an analytical model for different types of smart city initiatives, and thus shed light on what types of innovation are central in the smart city. Consequently, the article offers useful insights for both practitioners and scholars interested in smart city initiatives.

KEY WORDS: Urban development, smart city, innovation, typology, case study.

Introduction

Smart cities are often considered to represent ideas of holistic and sustainable development (e.g. Caragliu, Del Bo, & Nijkamp 2011), either focusing on technology, human resources, or collaborative governance, or all three combined, as the defining feature (Meijer & Bolívar 2015). However, the definitions and practical applications of the smart city concept are both unclear and multifaceted. Despite the growing appeal of this concept, the notion of the “smart city” has been under scrutiny for issues related to excessive focus on technology, the pervasive role of experts, and issues of privacy protection, among others (Joss, Cook, & Dayot 2017). Although it might not induce fear, like Tolkien’s fire-breathing dragon Smaug (in *The Hobbit*), the smart city has in many ways become a conceptual hot potato. Critiques against the concept of the smart city have been rising, exemplified by Hollands (2008) asking the real smart city to please stand up, or Shelton, Zook, & Wiig (2015) suggesting we instead focus on how and from where smart city policies arise, and how these policies affect cities embracing smart city strategies. Despite critical objections, there is no escaping the demands and popularity of the topic, and the idea that smart innovations and experiments contain the prospect of improving conditions in urban areas (de Jong et al. 2015). The smartness of (smart) cities is therefore not in question in the article at hand; the focus is rather to improve the understanding of this conceptual hot potato.

With the increase in scope and popularity, there has naturally also been a surge in contributions aimed at elaborating the understanding of the smart city (cf. Neirrotti et al. 2014; Angelidou 2015; Monfaredzadeh & Berardi 2015; Ahvenniemi et al. 2017; Anthopoulos 2017). While many contributions have indeed been valuable in adding to the understanding smart cities, few address the concept from the perspective of innovation. The ones that do tend to focus on (the role of) technological innovations, or the impact of the use of technology in smart urban development, rather than the scope of innovations present in the smart city. While dichotomizing smart with sustainable, or similarly related concepts, or examining the ambiguity or the de facto utility of smart city initiatives has its merits, the need for a more nuanced typology of smart urban innovation is still present.

As emphasized by Karvonen, Evans, & van Heur (2014), urban actors (both public and private) are now looking to innovation for solutions to contemporary urban complexities. Furthermore, the majority of empirical contributions on smart city initiatives tend to focus on cities of a

large(r) size, which can also be viewed as the exceptions (Shelton et al. 2015). Therefore, Barcelona, London, Seoul, and San Francisco might not, despite their innovativeness, be the most applicable or easiest examples to follow for the non-metropolitan, more ordinary city (cf. Bakıcı, Almirall, & Wareham 2013; Batty 2013; Lee, Hancock, & Hu 2014; Angelidou 2015; Anthopoulos 2017; Grimaldi & Fernandez 2017). As many scholars have pointed out before me, there is a divergence in the multifaceted approaches that scholars and practitioners have to the concept (Albino, Berardi, & Dangelico 2015; Angelidou 2015; de Jong et al. 2015; Shelton et al. 2015; Anthopoulos 2017; Joss et al. 2017). However, my intent is not to provide an encompassing and unifying definition of the smart city. The purpose is rather to examine contexts where cities have initiated innovative urban development projects that are explicitly labelled smart, and to take a closer look at what cities are actually doing in terms of smart urban innovation. This is achieved by addressing the following research questions:

RQ 1. *How can we categorize the different dimensions often included in the smart city concept, and how are these dimensions coupled to innovation?*

RQ 2. *What are the implications of the different understandings of the smart city concept for cities' abilities to be innovative?*

In this article, the focus is therefore on smart city initiatives as urban innovation(s). Innovation can be both multidisciplinary and multifaceted, including product, service, process, position, strategic, rhetoric, and governance innovation (Hartley 2005; Baregheh, Rowley, & Sambrook 2009). Furthermore, it is important to consider innovation not just as new ideas, but also new practices (Hartley 2005). However, new (smart) urban practices can entail elements from different parts of the innovation spectrum. The theoretical point of departure is therefore based on the operationalization of innovation as an actively intended process of change that leads to discontinuity, with the aim of improving institutional structures and/or practices in a given context. Either through several incremental steps, or one (more) radical step (cf. Moore & Hartley 2008; Baregheh et al. 2009; Sørensen & Torfing 2011; Hartley, Sørensen, & Torfing 2013). The article at hand examines dimensions often present in the innovative smart city, and draws on an in-depth case study of a Norwegian urban development project where the city has embraced an encompassing smart city vision. Furthermore, the case is a rather ordinary small-town European municipality (albeit relatively small in terms of population), and can therefore be considered a representative exemplar of “smart city policies and ideologies” in play (Shelton et al. 2015: 15). The case also depicts a variety of dimensions within the smart city concept,

and is therefore well suited to illustrate the multifaceted character of smart urban innovation. As is elaborated in the methodology section, this case was chosen based on its subjection to a critical juncture (cf. Collier & Collier 2002), which predated the initiation of a new urban development project. This juncture catalyzed a need for change, which again led to an urban development project consisting of different dimensions of smart urban innovation.

Conceptualizing smart city initiatives as urban innovation

The smart city is a multifaceted and wide-ranging concept. The scholarly definitions are many – with varying focus and contents. The understanding of smart cities has commonly been of a technological character, viewing smart cities as cities using new technologies (e.g. Batty et al. 2012). However, a city’s smartness is contingent upon more than mere technology. Importantly, technology is not the defining feature of smart cities per se, but merely an instrument in the pursuit of improvement (Angelidou 2015). As the popularity of the concept has surged in later years, the number of scholarly contributions aimed at clarifying what constitutes the ‘smart’ in smart cities has also increased (Deakin 2014b; Lee et al. 2014; Albino et al. 2015; Meijer & Bolívar 2015; Ahvenniemi et al. 2017). Not only has the notion of the smart city concept expanded, the real smart city has indeed been asked to stand up by scholars globally, as seen in several attempts at addressing “the actually existing smart city” (cf. Shelton et al. 2015). In this section, I therefore explore existing conceptualizations of the smartness of cities, and argue that the multifaceted character is what gives the concept its appeal. I combine these notions of the smart city with innovation theory to provide a typology of smart urban innovation.

What constitutes the smart in smart cities? A brief outline

A quick google search for “smart city” shows 1 220 000 000 entries¹, so there can be little doubt that this is a widely popular topic. However, its origin is not as obvious. In his paper from 2008, Hollands sets out with the aim to create a “critical polemic” of the rhetoric aspect of the smart city label, by asking the real smart city to please stand up. Despite it being challenging to pinpoint how precisely the label ‘smart city’ came into existence, Hollands (2008) outlines a sound notion of what underlying elements might have inspired the emergence of the concept. Through the presentation of various empirical examples, he specifically emphasizes the impact of information and communication technology (ICT), related to multi-application smart-cards,

¹ Per July 5, 2018

infrastructure, telecommunications, and e-governance solutions, respectively. Furthermore, Hollands indicates that there might be other labels (e.g. 'wired', 'digital', 'intelligent', 'creative', 'entrepreneurial', 'sustainable') also denoting similar applications of (technological) innovations and intended change in order to improve conditions in urban areas. However, a lot has happened to and with the smart city concept since the publication of Hollands' article, e.g. do de Jong et al. (2015) address the issue of concept multiplicity within sustainable urbanization. Angelidou (2015: 104) specifically emphasizes that while the smart city as a concept has been explicitly developed only in recent decades, its history dates back to previous "visions about urban futures" - visions of what used to be state-of-the-art technology and production systems. Consequently, one might argue that the smart label was adopted through the use of the 'smart' adjective in ICT solutions (i.e. "smart technology"). However, the content of the concept has evolved since its emergence as an ICT adjective, moving away from the internet-bias of the 1990s, when the smart (city) characterization started to gain momentum (Caragliu et al. 2011).

Meijer & Bolívar (2015) uncover three different foci in the literature on smart urban governance: (i) technology, (ii) human capital, and (iii) collaborative governance. The literature emphasizing technology and/or new Information and Communication Technology (ICT) as the defining feature tend to focus on the possible strengthening of the urban system by the use of (new) technologies (Meijer & Bolívar 2015). However, the literature focusing on human capital in smart cities departs from the notion that (smart) citizens are the main driver for smart urban development, rather than the technology itself (Hollands 2008; Albino et al. 2015). In this context, smart cities comprise metropolitan areas with large shares of adults with higher education, i.e. areas hosting (important) higher education institutions, that experience substantial growth (Shapiro 2006; Winters 2011). In scholarly contributions with a governance focus, the interactions between different stakeholders are highlighted as the defining feature of the smart city (Albino et al. 2015). Collaborative efforts are central in this perspective, and focus tend to be centered on developing productive interactions between networks of urban actors (Kourtit, Nijkamp, & Arribas 2012).

The combination of the three elements of smartness (as outlined above) is also emphasized by Caragliu et al. (2011). The authors state that a city is believed to be smart "when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise

management of natural resources, through participatory governance”. To clarify, this definition seems to not only indicate what a smart city is envisioned to be, the authors also emphasize the *aim* of the smart city, which can be interpreted to mean sustainable development through interactive governance. Interactive governance is described in the network literature as a process where different actors with diverging interests work together to achieve a common goal through collaboration (Torfing et al. 2012: 2). The latter reflect a growing tendency to address increased complexity in urban development through the employment of collaborative efforts and innovation, particularly in order to resolve increased demands of sustainability (Sørensen & Torfing 2011; Hartley et al. 2013; Hofstad & Torfing 2015; Hartmann & Geertman 2016). Furthermore, Bode & Firbank (2009) emphasize that interactive governance (they use the term ‘co-governance’) is often seen as highly suitable to handle complex situations, and that the formation of organizational networks is deemed a potential remedy to increased organizational complexity in the public sector. Consequently, the concurring demand for and increase in employment of collaborative efforts and innovation can be seen in the continuous emergence of smart city initiatives (Angelidou 2015).

Some scholars accentuate the ability to generate economic growth as a key driver behind smart city initiatives, which also poses a conflict of interest, or even a barrier, to the social and environmental sustainability dimension in smart urban development (Monfaredzadeh & Berardi 2015; Shelton et al. 2015). However, generating economic growth in urban areas is nothing new, as Shelton et al. (2015: 16) also point out. The smart city concept poses a multifaceted idea(1) in urban development, where information and communication technologies, human resources and participatory governance comprise an interplay of resources working together to increase both sustainability and quality of life. What the multifaceted character of the smart city concept highlight is the relevance of innovation apparent in smart city initiatives, despite that technology, human capital, and collaborative governance may not comprise elements of new practices if addressed separately. Arguably, the combination of different elements is what sets the smart city apart from other innovative initiatives. Based on the preceding discussion of what constitutes the ‘smart’ in smart cities, I argue that the concept should be understood as a collection of developmental features. Consequently, the smart city functions as a label that connects the dots for a range of already existing activities. Furthermore, the holistic and broad fundamentals of the concept might be what gives the smart city its appeal, much in accordance with other (related) concepts such as ‘open innovation’ and ‘innovation ecosystems’ (Adner 2006; Chesbrough 2006; Huizingh 2011; Oh et al. 2016).

The innovative dimension and the smart city

Scholars explicitly advocate an extensive approach to smart urban innovation, a notion I do share (cf. Nam & Pardo 2011; Neirotti et al. 2014). However, to my knowledge there are few scholarly contributions empirically addressing the scope of different innovative function(s) that the smart city concept is supposed to comprise, e.g. do Kraus et al. (2015) examine conditions that affect innovation from the perspective of entrepreneurs operating within smart city initiatives, but not the category of innovation. Although there have been several empirical studies of smart city initiatives (cf. Lee et al. 2014; Anthopoulos 2017), they use empirical examples from large(r) metropolitan cities. This is pointed out by Shelton et al. (2015), who try to counteract the excessive focus on unequalled metropolitan cities by drawing attention to actually existing smart cities. As mentioned in the introduction, the limited scholarly contributions explicitly addressing innovation in smart city initiatives tend to focus on the impact of the use of technology, rather than the scope of innovations present in the smart city. Nam & Pardo (2011) presents a framework for smart city innovation with three dimensions of innovation elaborated: technology, organization, policy. They also emphasize the context of the innovations as important. While this has merit as a broad conceptualization of smart urban innovation, the authors do they test their conceptualization empirically. As a step in addressing the real smart city, I have developed a typology of smart urban innovations, which is elaborated in this section. The idea is that the typology will constitute an analytical framework for understanding smart city initiatives of various shapes and sizes. To illustrate this I will utilize the typology in the analysis of a case from Norway (The Smart Bodø case) later in the article. The typology of smart urban innovation is visualized in Figure 1 (page 8).

The continuum comprises four dimensions, ranging from a technology-oriented dimension, through dimensions focused on organizational and collaborative innovations, to the more holistic-oriented experimental dimension. Smart city initiatives mainly focused on technological innovations comprise new practices, products and services (Hollands 2008; Caragliu et al. 2011), while smart city initiatives emphasizing organizational innovations primarily happen internally in the public organization, and often has a more project-oriented scope (Lam 2005; Nam & Pardo 2011). Smart city initiatives that are based in collaborative innovations combine efforts and resources that emerge through triple helix or ‘advanced triple helix’ networks (Leydesdorff & Deakin 2011; Deakin 2014a). Smart city initiatives in the experimental dimension has a comprehensive outlook to innovation, and values rhetoric and storytelling aspects, through a more citizen-centric approach, e.g. entrepreneurial citizens

(Kraus et al. 2015; Joss et al. 2017). Furthermore, integrating holistic sustainability as a strategic vision for development is also central (Lee et al. 2014; Monfaredzadeh & Berardi 2015; Anthopoulos 2017). In the following paragraphs, I will elaborate these four dimensions of smart urban innovation.

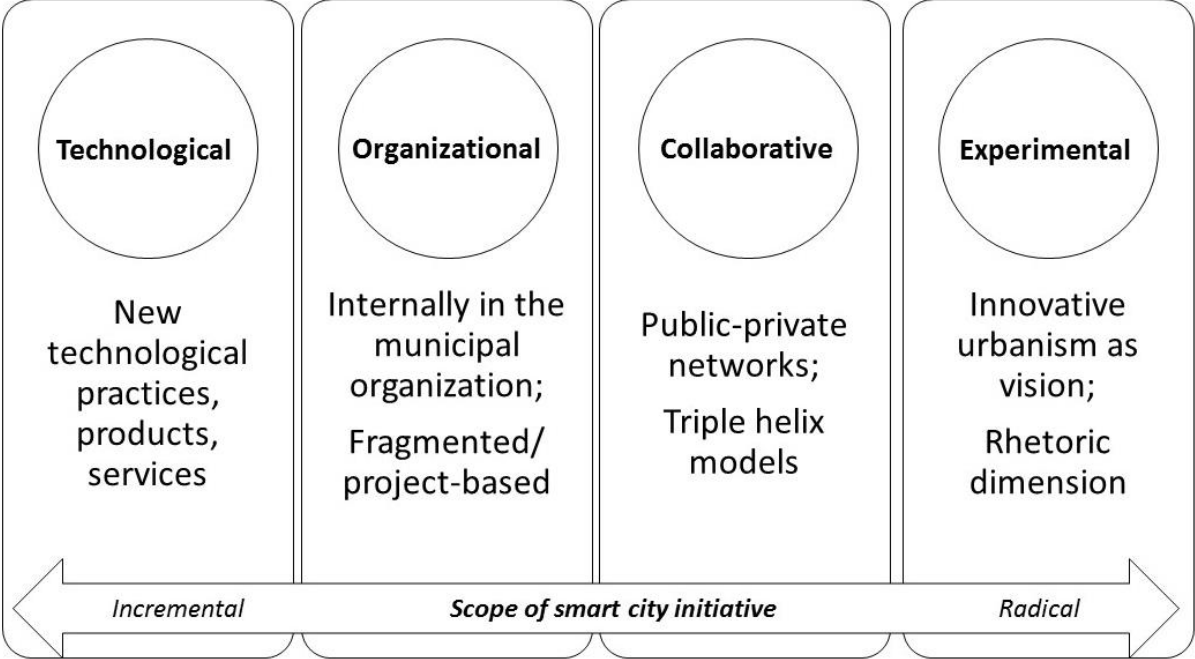


Figure 1 – Smart city initiatives as multifaceted urban innovation

The technological dimension

The extensive focus on technology and technological advancements present in the smart city literature emphasize that new technology plays a substantial role in developing new practices, products, and services. It may be relatively self-explanatory that product innovation entails new products, while service innovation entails new ways of providing services to inhabitants in urban areas (Hartley 2005). However, Hartley (2005: 28) exemplifies these types of innovations as new medical instruments in health care, and new digital service provision for inhabitants, respectively. Technological innovation might also entail new practices derived from new technology, e.g. an app to encourage the use of public transportation in urban areas, or similar initiatives. Such practices could potentially also include (new) ways to increase citizen participation, which conforms to the governance dimension of innovation (Hartley 2005). Practitioners may arguably see these new technologies as a possible solution that will enable them to address conflicting considerations in the context of a highly sectorial and organizationally fragmented area of urban development (Montin 1990; Christensen & Lægheid

2007; Saglie, Hofstad, & Hanssen 2015). However, what the technology-based innovations have in common in a smart city context, is that they often comprise incremental steps for improving urban development, and not a radical approach to making the city smarter (although technological innovation can of course be radical).

The organizational dimension

Dissimilar to technological innovations, organizational innovations in smart cities do not necessarily provide a concrete end result. Rather, in the context of smart cities, organizational innovations may be linked to (positive) changes in daily operations in the municipal body, specifically aimed at increasing efficiency, productivity, and quality (Lam 2005; Salge & Vera 2012). Furthermore, organizational innovations take place internally in the (municipal) organization, and can entail both process innovation, strategic innovation and governance innovation (cf. Hartley's classification of innovation types). However, smart city initiatives based on organizational innovations often entail more project-based practices (Nam & Pardo 2011). Consequently, the scope of smart city initiatives based on the organizational dimension is on the incremental end of the scale, as projects often have a limited timeframe, which might make them few, or even singular in occurrence.

The collaborative dimension

As emphasized earlier, the concurring push-pull in the employment smart collaborative efforts and innovation is can be seen in the continued emergence of smart city initiatives. In the collaborative innovation perspective, it is a prerequisite to have an open and interactive governance process, as is also the case in the open innovation paradigm. As such, it is the highlighting of the entrepreneurial role of different actors and the interaction between them that constitutes the foundation in this dimension (Sørensen & Torfing 2011). In a smart city context, the involvement of multiple actors in more open and pro-active governance structures will arguably benefit the socio-economic and ecological performance of the city, as well as help combat negative external effects and intricate path dependencies (Kourtit et al. 2012). The possible (and desired) increase in actors' participation and engagement in societal development that the collaborative innovation perspective advocates can therefore be viewed as socially motivated. Smart city initiatives based in this dimension tend to be of a more radical scope than the two previous dimensions.

The experimental dimension

The recent focus on citizen-involvement and experimentation in urban development is portrayed in the literature on the experimental city (Evans, Karvonen, & Raven 2016; Bulkeley 2018). Urban living labs are central as a method in facilitating innovation in the smart city, which can be described as a platform for open innovation (Bulkeley et al. 2016). Smart city initiatives based in this dimension value the rhetoric and story-telling aspects of innovation, through an experimental and (more) citizen-centric approach, e.g. entrepreneurial citizens (Kraus et al. 2015; Joss et al. 2017). Moreover, this dimension entails an approach that permeates most aspects of urban development, and thus also the municipal organization, aimed at creating a form of holistic sustainability through the combination of the former three types of smart city initiatives. Smart city initiatives conforming to this dimension tend to value innovative urbanism as a vision for development in the city. Smart city initiatives categorized in the experimental dimension thus naturally have a radical scope.

Methodology

The article at hand examines how we can categorize different dimensions often present in the innovative smart city, and what implications different understandings of the smart city has for cities abilities to be innovative. Besides being a multifaceted concept, smart city initiatives can be complex and context-specific, and are therefore favorably examined through case studies (George & Bennett 2005). This approach enables the exploration of actors, events, and the mapping of associations that exist between them (Gerring 2007). The empirical data presented comprises an in-depth case study of a smart city-labelled urban development project in the municipality Bodø, located in Northern Norway. As stated in the introduction, the municipality is relatively small on a European scale, with a population of approximately 51 000 inhabitants (per 2017). Furthermore, utilizing data from cities of a relatively small size is important to capture the multifaceted nature of smart city initiatives, as they indeed occur in smaller sized cities. The municipality of Bodø was subjected to a critical juncture (cf. Collier & Collier 2002). This juncture led to a context of *carte blanche* for the local government, followed by a need for change, which again led to urban development project holding elements of new institutional practices.

While this critical juncture is not an element in the analysis of the case, it is a part of the selection criteria, and is therefore elaborated in the methodology section. In June 2012, where

the Norwegian parliament made a resolution to close down the national air force base located in Bodø (the base was to be relocated to a different region further south in Norway). As a consequence of the resolution, the military would largely withdraw from the municipality, implying extensive loss of jobs connected to the operation of the air force base, in both public and private sector. This parliamentary resolution brought on a crisis in the municipality of Bodø (What were they to do now? How were they to replace the loss of jobs? etc.), and thus became the catalyst for substantive change to the municipality of Bodø, resulting in a long-term urban development project. The project consists of two parts, although the focus of this article is on the latter:

- 1) *The “New city, new airport” initiative*, specifically concerned with the development of a new urban district on the soon to-be former air force base, and the moving of the current runway of Bodø airport.
- 2) *The “Smart Bodø” initiative*, regarding how urban development is to be conducted in Bodø in the future – both in the existing city and in the former air force base are conjoining the existing city center.

The data consists of semi-structured interviews with a strategic selection of government officials, political leaders, and actors from local industry and commerce. These individuals were chosen based on their involvement as key actors in the urban development project. In total, 9 individuals were interviewed during the time period of 2016-2017; a preliminary round was conducted in the first half of 2016, and the main interview process took place in the spring of 2017. Additionally, follow-up interviews were conducted in the second half of 2017. The interviews were carried out in Norwegian, and then transcribed and coded in Norwegian. The quotes presented in the following section were then translated into English. As a supplement to the interviews, data in the form of official (online) project descriptions and municipal strategy documents were used to provide a clear notion of the timeline and underlying strategies of the development project. Furthermore, these documents were important understanding the scope of the different sub-initiatives included in the smart city project. I have chosen to structure the analysis around the four dimensions of the innovation continuum, with the intent to illustrate the multifaceted character of smart urban innovation.

The case of “Smart Bodø”, Norway – Visions of a smart urban future

In Bodø, it was indeed a case of “crisis as the mother of innovation”. The parliamentary decision to close the national air force base in Bodø triggered a substantive urban development project, including the wish to be smart. At first this wish manifested itself in the vision of

becoming the world's smartest city (Bodø municipality (online)). Yes, this sounds an unattainable goal for a small municipality in the north of Norway. However, it did lead to the municipality of Bodø embracing an encompassing smart city vision. This started out with the municipality's participation in several smart initiatives aimed at developing (new) information and communication technology (ICT) solutions. Among these projects are initiatives focusing on: Zero emission neighborhoods (ZEN), energy efficiency and energy saving through the use of ICT (E-lighthouse/INTERREG projects), urban mobility indicators, and cooperative, connected and automated mobility (also called C-ITS). However, external actors own most of these projects, and the municipality is merely a participating actor. In the initial project portfolio of the Smart Bodø initiative, six out of eight projects were concerned with ICT development. Initially, it therefore seemed to be extensive focus on smart technology (the remaining two projects were concerned with national smart city networks and participatory, citizen-centric activities).

In the Smart Bodø case, a positive attitude towards the technological dimensions in smart urban development was prominent from the start. However, the strategic focus in the municipality has shifted from the incremental to the radical, in that the scope of the smart city initiative has become an encompassing vision for the urban development in this city. On the strategic level, the smart city vision is now incorporated in central developmental strategies for the whole municipality, e.g. envisioning co-creation for smart and green industry and commerce development (Bodø municipality online). While technology is still a crucial element in making Bodø smart(er), it is to a larger degree viewed as an instrument to ensure efficiency and improvement. When talking with government officials about how the municipality intends to implement the smart city initiative in the planning of the new urban area, one strategic leader explained:

“When it comes to smart, a part of what we're going to do, to try to define and narrow the concept somewhat for the community, [...] will concern some important parameters, citizen involvement, technology and digitalization, it will concern especially smart forward-looking solutions in communication and transport, infrastructure, logistics, so in reality climate and environmental concerns.”

The understanding of the smart city in this case appears more comprehensive in the eyes of the strategic leader, as he emphasizes technology and ICT, but also citizen involvement. This is also the case in the municipal strategy documents that focus on compact urban development

and coordinated urban housing-, land-use-, and transport planning to achieve a modern and eco-friendly city. Furthermore, the planning and strategy documents state that the smart city concept is to be the guiding principle in the development of the new urban area where the airport used to be.

The other administrative officials involved in the project support this notion of the smart city as a sustainable and holistic approach to urban development. The head of the planning department mentions the intent to establish a collaborative forum as a working method in the project, through establishing an urban living lab. This urban living lab (ULL) is intended as an instrument, method and a tool to facilitate increased (open) innovation in the city, aimed to achieve sustainability (Hvitsand & Richards 2017). The municipality has explored this method through participating in a workshop with other municipalities, learning about the experiences of other, more established development projects. One strategic leader emphasizes the collaborative element of this initiative:

“We’ve actually decided to use urban living lab as the fundament in the new urban area, although we have to operationalize it in some way, but we will establish a quadruple helix forum and that’s how the development will be driven forward, not just by internal resources, but as a collaboration.”

Through establishing a collaborative forum that combines both internal and external resources, the municipality envisions to have an open innovation approach to urban planning in this urban development project. This intent to establish an ULL was realized in the spring of 2018, when the Bodø City Lab was opened. Employees from several departments of the municipality involved in the urban development project are currently located there, including the project manager of Smart Bodø. The empirical data from this case suggests that the municipality intends the smart city initiative to permeate the whole organization, both strategically and in practice. Despite that the project portfolio initially entailed mostly ICT-related projects, the portfolio still fosters collaboration (both internally and externally in the organization), as they are either research projects involving multiple actors and municipal sectors, in addition to projects derived at network and participatory activities. Furthermore, the establishing of the Bodø City Lab is a concrete start on the way towards realizing the comprehensive vision of Smart Bodø. As the chief municipal executive in Bodø explained when talking about the intent of the Smart Bodø project:

“What’s important is that the smart city initiative doesn’t become just one isolated project in the development department, living its own life. Of course it’s important that such an initiative takes hold, well, in all departments really.”

What the chief municipal executive is describing here is the desire to embed the smart city concept in the whole of the municipal organization. The executive leader of the business development section, who pointed out that the business development strategy emphasizes collaboration to ensure smart sustainability, also expressed the same intent as the chief official. This is further elaborated by a project leader in the municipality, who expresses that smart city initiatives can be seen as a way of bringing essential functions back into the city:

“A smart city is really just an expansion of the urban development concept. That’s why I’m saying that cities are fundamentally smart. I mean, you could have just called it ‘city’, because cities are smart. But then one has changed the city, over time - started to move functions out of it, and pulverized the city as an essence, as a collection of functions you have access to, whether it’s health care, whether it’s employment, whether it’s recreation, culture - all these things the city contains have been moved out, as a consequence of car-based planning. [...] And now we’re on our way back to collecting these functions within the city, it’s a physical step, but to achieve that we have to use smart measures. Whether it’s technology, on one side, to accomplish rational solutions, to make it possible; whether it’s building tall, to have enough room for people; last but not least it’s how you involve people, and perhaps that’s the core in smart urban development, that people are contributing to shape their own city.”

As the project manager emphasizes, the notion of the smart city comprises a reintroduction of essential functions in urban areas, i.e. a way to revitalize the urban essence with a mix of functions. This notion of the smart city initiative in Bodø seems to entail all of the dimensions in the smart city continuum, and is therefore to be considered a comprehensive smart city approach. The scope of the Smart Bodø case seems to base itself at radical end of the scale, in the collaborative and experimental dimensions. The way that the municipal development strategy is constructed, the smart city initiative will be the common denominator through all focus areas. Moreover, key actors intend to use the smart city initiative to involve a broad specter of actors, with the municipal body intending to facilitate the collaboration between them, so that the municipality as a whole can respond to future challenges in the best possible way.

Discussion and conclusions

This paper has examined how we can categorize the different dimensions often included in the smart city concept. By drawing on innovation theory, I have developed a typology of smart city initiatives based on the extent and types of innovations they involve, and illustrated this typology through analyzing the case of “Smart Bodø”. This smart city continuum distinguishes between an incremental and radical scope of smart city initiatives, where the incremental end of the spectrum entails the technological dimension, and the radical end entails the combination of technological, organizational and collaborative innovations in a comprehensive, experimental approach.

The empirical insights from the Smart Bodø case indicate that there is not as much focus on technological innovations in smart city initiatives as one might expect from the theoretical conceptualizations. Findings suggest that the technological dimension of smart cities is applied with the intent that it could lead to improvement of everyday life for the inhabitants of the city. However, this seems a bit ambiguous from the municipality’s perspective, as they are involved in several technology-based initiatives. This inconsistency between rhetoric and practical application of the smart city concept indicates that technology is not only an instrument in improving conditions in urban areas, but also that the use of new technology is publicly acknowledged as it has a strategic value to achieve consensus in political matters. An implication of such approaches could be a deflation of political life in urban areas, a matter that needs to be addressed. Still, technology comprises an important tool for enhancing smart urban innovation, also in a comprehensive approach, as seen in the Bodø case. Thus, technology might even have been mislabeled as the big bad wolf in a smart city context.

Through the empirical data presented, it becomes apparent that collaboration is an important dimension in the Smart Bodø case. Through collaborative efforts in an experimental forum such as Bodø City Lab, the municipality has chosen an open innovation approach to smart urban development. Consequently, smart city initiatives on the radical end of the scale can be viewed as a remedy to handle complex and fragmented organization in public organizations. The collection of developmental features that the smart city label depicts, i.e. the reinstating of mixed functions in the city, seem highly relevant in this context. Although not all smart city initiatives necessarily include all of the four dimensions of the proposed continuum in the same initiative, it is increasingly apparent from the empirical insights that a broad approach is

necessary to capture the multifaceted character of smart urban innovation. The Bodø case shows that this smart city initiative is extensive in character, at least on a rhetoric level. However, the implementation of initiatives such as the Bodø City Lab has recently begun, and it will be interesting to see how it progresses. This urban development project is still in its beginning, and with a very protracted time frame. Therefore, concrete progress is waiting to happen, and more research is needed to assess whether the comprehensive outlook will persist.

Despite the conceptual evasiveness of the smart city concept, the conceptual and empirical insights presented in this paper illustrate that smart city initiatives can be viewed as an arena for multifaceted urban innovation. However, I would like to draw attention to what is often neglected in different understanding of smart cities, namely an explicit distinction between the political aspect, i.e. the performance indicators and measurement (which has not been the focus here), and the theoretical framing, i.e. the (often ideal-typical) guiding principles of what a smart city is supposed to actually be. I therefore argue that the combination of technology, human resources and interactive governance is important in contemporary urban development, although governance is the aspect that most likely will ensure holistic sustainability. If the local government does not attempt to actively govern the development, who will? In other words, it is necessary to invoke governance to promote development. A mere technological advance in itself is therefore insufficient to ensure a city's smartness. Further empirical research of what is actually happening in the real smart city is thus needed.

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