Cities 114 (2021) 103187

Contents lists available at ScienceDirect

Cities

journal homepage: www.elsevier.com/locate/cities

The advantages of and barriers to being smart in a smart city: The perceptions of project managers within a smart city cluster project in Greater Copenhagen

Thomas Bjørner

Aalborg University, Department of Architecture, Design and Media Technology, A. C. Meyers Vænge 15, 2450 Copenhagen, SV, Denmark

ARTICLE INFO

Keywords:
Project managers
Smart city
Case study
Mixed methods
Stakeholders

ABSTRACT

The background for this study is a two-year smart city cluster project, called Ready for Smart Growth, which included various smart city projects in 22 municipalities. This study's novelty lies in the context of its analysis and theoretical contribution, which outline an identification of the complexity, advantages and barriers that smart city project managers perceived in an ongoing smart city cluster project. Further, a definition for a smart city project is suggested. This research is within a case study methodology, and was based on a mixed method approach that employed nine key informant interviews and two questionnaires. The results revealed that the project managers perceived different needs and goals within the context of smart city innovation and realization. The project managers perception of smart city was mainly within a smart economy and smart governance perspective. However, the project managers also criticized the relatively less focus on public participations and dialogue-oriented smart city solutions. The perceived major barriers to real smart city implementations were regulations; silos; and the choice of stakeholders, including companies promising too much. The major advantages include the different perspectives and types of knowledge of various stakeholders.

1. Introduction

The background for this study material was a two-year (2017–2018) smart city cluster project in Greater Copenhagen, Denmark, called Ready for Smart Growth, which included various smart city projects in 22 municipalities. The project's overall aim was to enhance municipalities' competencies in computer-driven urban development and smart city innovations, as well as to create networks and encourage knowledge sharing among the municipalities in the context of accelerated smart city development. Ready for Smart Growth was organized along four themes: municipal strategies, smart streets, intelligent street lights, and smart waste innovations. The project's description posed the following question: "How can municipalities make smart cities into a good business model in which crossover and qualitative benefits are included in the economic considerations, and how this can be documented within the city as a tool for knowledge?" The project's aims included the overall perspective that qualitative benefits, knowledge sharing, and interrelations (crossover effects) can be key drivers for smart cities. This approach is similar to a holistic interpretation of smart cities, highlighting that their development depends on a balance and diversity among human, social, cultural, environmental, economic, and technological factors (Edvinsson, 2006; Giffinger et al., 2007; Hollands, 2014; Mora et al., 2019). The perspective that treats the city as a tool for knowledge (Edvinsson, 2006) also includes the view that the municipalities, universities, companies, and other project stakeholders can, because of their diversity, facilitate synergistic interventions and innovations. As a possible innovation approach, the city as a tool for knowledge can also be described in multifaceted and complex development policies within smart city values, and it is often linked to a societal context that includes short- and long-term challenges for the city.

Within the considerable and rapidly growing body of existing smart cities literature (Lim et al., 2019), there is a lack of studies in which a smart city cluster project is evaluated formatively during the project based on the project managers' perceptions of advantages and barriers using the context of a recent included analysis. Previous studies described barriers and challenges that public governments face during smart city development (Caird, 2018; Ferraris et al., 2020; Hollands, 2014), similar to the Ready for Smart Growth organization and project. However, these barriers have most often been described from either policy-making perspectives (Crivello, 2015; Dekker & Van Kempen, 2004; Kumar et al., 2020; Lytras et al., 2019; Wathne & Haarstad, 2020) or citizens' perspectives (Batty et al., 2012; Bovaird, 2007; Cardullo &

E-mail address: tbj@create.aau.dk.

https://doi.org/10.1016/j.cities.2021.103187
Received 28 February 2020; Received in revised form 13 January 2021; Accepted 15 March 2021
Available online 30 March 2021

Kitchin, 2019; Gabrys, 2014). The project manager perspective within smart cities has also been studied and has included diverse approaches within, for instance, entrepreneurship, innovation, risk priorities, stakeholders, and HR management (Edvinsson, 2006; Ferraris et al., 2019; Ferraris et al., 2020; Ferraris, Santoro, et al., 2018; Joshi et al., 2016; Sandulli et al., 2017; Söderström et al., 2014). However, these studies' foundations often lack very specific (local) and ongoing smart city technology implementations. This study's novelty lies in the context of its analysis, which examined the advantages and barriers that smart city project managers perceived in an ongoing smart city cluster project. The project managers implemented policymakers' visions, ideas, and goals in real life. By examining how these visions were perceived, realized, and acted on in very local implementations, there is potential for new insights and information aimed at effective smart city developments and evaluation. Furthermore, this paper contributes to the theory by outlining some of the complexity that project managers face within ongoing smart city projects, including engagement and motivation. Further, this study will contribute with a suggestion for a definition of a smart city project. The study's research question was as follows: Which advantages and barriers do smart city project managers perceive within the Ready for Smart Growth smart city project?

The paper is structured as follows: Section 2 provides an overview of the previous literature, with a special focus on difficulties related to evaluating smart city projects. Section 3 introduces the context of analysis and theoretical contribution, including an identification of the complexity in an ongoing smart city project from a project manager perspective. Section 4 presents the material and methods, including the methodology, participants, case selection, procedure, and data analysis. Section 5 reveals the results in four subsections. Section 6 contains the discussion and conclusion, and Section 7 concludes the paper and outlines the limitations and future work needed.

2. Previous literature

Converting cities into smart cities has been a substantial focus in recent years. There are many different small-, medium-, and large-scale projects, organizations, perspectives, aims, and strategies related to smart cities. Most urban smart governance today recognizes that it is not just about information and communication technology (ICT) development and implementation within a city (which was the main focus when the term *smart city* was first used in the 1990s), but also includes economic, governmental, social, and environmental (sustainable) aspects. However, cities often claim to be smart without defining what this means or offering evidence to support such claims (Hollands, 2008; Huovila et al., 2019). Many perspectives and definitions of the smart city concept are employed (Albino et al., 2015; Anthopoulos, 2017; Caird, 2018; Hollands, 2008, 2014; Huovila et al., 2019; Lim et al., 2019; Song et al., 2017). For the same reasons, many challenges arise when evaluating smart city projects (Akande et al., 2019; Caird, 2018; Huovila et al., 2019; Pereira et al., 2017). One such problem is that there are no standardized smart city evaluation frameworks for measuring a city's performance (Caird, 2018), although there is extensive ongoing work within the ISO standards (e.g., ISO ISO37100 and ISO37101). Many frameworks, attempts, and models are already used as indicators for smart city evaluations (Akande et al., 2019; Caird, 2018; Huovila et al., 2019; Kourtit et al., 2012; Pereira et al., 2017; Sharifi, 2019). These evaluations focus on assessing cities' capabilities as instrumented, interconnected, and intelligent. This focus implies that there are already given stages or phases in the process, an ICT development, and some cross-evaluation criteria (Caird, 2018). However, this might not be the case, so previous challenges related to the evaluation of smart cities emphasized that there is no universal approach to smart city development (Albino et al., 2015; Caird, 2018, Kumar et al., 2020; Paskaleva et al., 2018). It is a tremendous challenge to build evaluation frameworks for smart city projects because their parameters are not comparable and because they are often ongoing or pilot projects. For example, challenges include representing the complexity of dynamic, evolving, open, and unbounded urban systems; the interrelationships between slow-changing urban forms and faster changing urban flows; and the interacting social, economic, political, technological, and environmental factors (Arnold, 2004; Caird, 2018). Furthermore, smart city projects and organizations differ from country to country. Therefore, it is also difficult to compare smart city projects across countries. There can be considerable differences in demographics, country size, infrastructure, political decision-making, funding, technology levels, prices, regulations, and smart city alternatives.

Instead, this paper follows other authors' suggestions (Albino et al., 2015; Caird, 2018; Coulson et al., 2018; Edge et al., 2020; Ferraris et al., 2019, 2020; Hollands, 2008, 2014; Kitchin, 2015; Kumar et al., 2020) to focus on the specific contexts of specific projects and to go beyond large, standardized key performance indications. However, this paper does not focus on citizens' perceptions (Edge et al., 2020; Caird, 2018; Lytras et al., 2019; Mora et al., 2019; Pereira et al., 2017; Praharaj & Han, 2019). Instead, it focuses on the project managers, which the following section introduces in detail.

3. Context of analysis and theoretical contribution

The following context of analysis and theoretical contribution identifies some of the complexities that project managers face within ongoing smart city projects with included case examples from the Ready for Smart Growth project. Fig. 1 identifies the complexity in an ongoing smart city project from a project manager perspective. The identification implies three factors; one internal at the municipal level (labeled *interactions in the municipality*), as well as two external factors, or staging from above, labeled *societal and city challenges* and *foundation*. It is important to emphasize that the identification is dynamic in terms of place, time, and context.

3.1. Challenges, visions, and smart city projects

Smart city projects often derive from visions of life enrichment for those who live, work, visit, or lead the city (Anthopoulos, 2017; Edge et al., 2020; Galati, 2018). These visions are mainly based on the current contextual societal and city challenges, which can include complex pressures on environments, infrastructures, buildings, networks, and resources (Buck & While, 2017; Lim et al., 2019; Lytras et al., 2019). Policymakers often form these visions within the complex dynamics of the city's development, but the literature has sometimes criticized such visions as anticipatory visions and self-fulfilling prophecies (Sadowski & Bendor, 2019) that could result in the co-production of political orders and technoscientific projects (McNeil et al., 2017) or the corporate smart city (Hollands, 2014). There are many perspectives within the public governments in terms of smart city visions, including both innovation, entrepreneurship, and barriers to achieving these visions (Appio et al., 2019; Caird, 2018; Ferraris et al., 2020; Hollands, 2014). Smart city visions are not always specifically described, but can include green transitions, energy usage and efficiency, intelligent transportation, digital automation, economic impacts and growth, sustainable processes and urbanization, smart waste innovations, public security and resiliency, connected citizens, innovation, and improved quality of life. Realizing these visions is far from simple. Most often, the visions are anchored in projects that can be included in either larger cluster organizations (such as within the Gate21 project) or minor projects. Their lengths and budgets can also be very different. In addition, these projects are often led by project managers and are embedded in many complex considerations and systems. Related responsibilities include budget control, communication, reporting and providing evaluations to policymakers (often in terms of the project realization, budget, and expenditures), objectives, milestones, success criteria, implementations, evaluations, engagement, and motivation (intrinsic and extrinsic) for all included stakeholders.

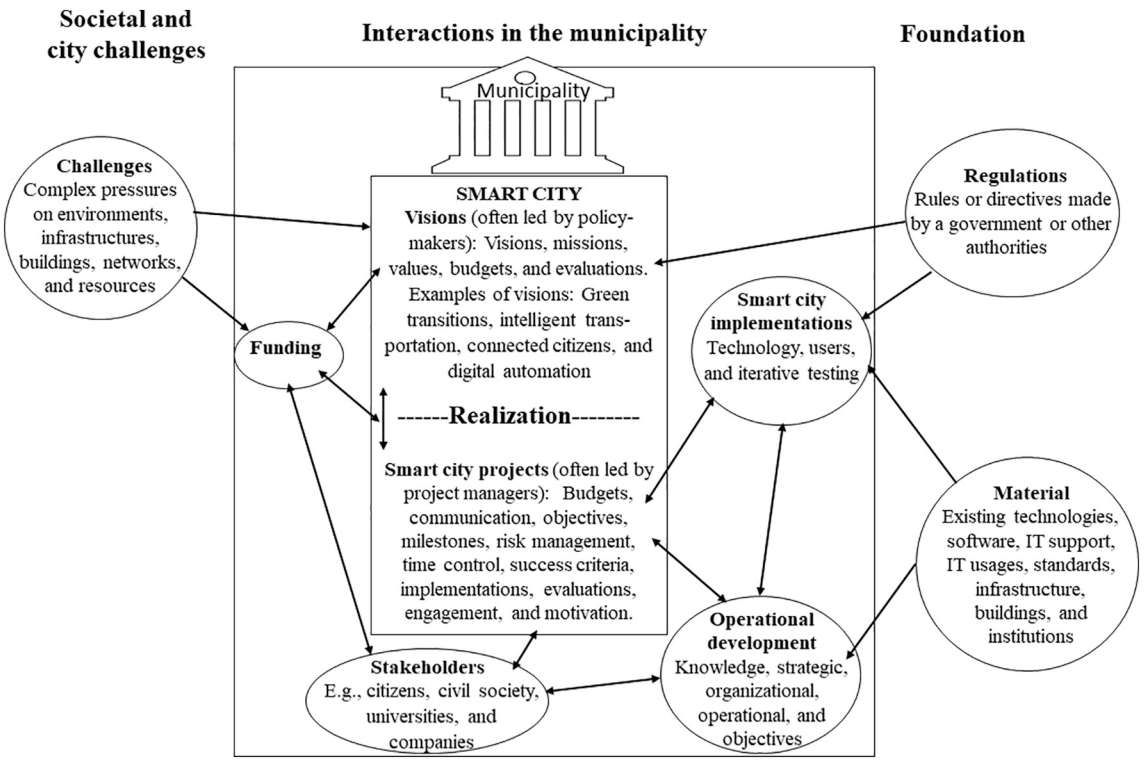

Fig. 1. An identification of the complexity in an ongoing smart city project from a project manager perspective.

The Ready for Smart Growth project was only one project within a cluster of ten other ongoing projects. All the cluster projects were organized within a partnership network called Gate21, which board members mainly are municipal policymakers. The Gate21 project's vision is to make Greater Copenhagen the leading region in the world for green transition and growth. The strategy is based on the use of regional and local demand to develop, demonstrate, and deploy new energy- and resource-efficient innovations in the climate and energy sectors. The capital region and a number of municipalities in Greater Copenhagen have adopted ambitious targets for transitioning to a fossil-fuel-free society. The challenges for Greater Copenhagen lie within the global trend toward urbanization, which places increased pressure on environments, infrastructures, buildings, networks, and resources. Greater Copenhagen is a metropolitan region that spans eastern Denmark and Skåne in southern Sweden and consists of 85 municipalities and 4.3 million inhabitants. Just within the urban Copenhagen area, the expected growth rate for 2025 is 4.65%, leading to a population of 1,455,000 (United Nations, 2018).

3.2. Funding

The Ready for Smart Growth project was funded by public regional funds. However, funding options for smart cities are numerous (Galati, 2018) and can be combined to form a collective, program-wide funding solution. Such funding is often provided in the context of challenges, with earmarked funds allocated (e.g., from the government or private sources) within a thematic context such as environments or buildings. The funding options include private funding, public–private partnerships (PPPs), public funding, country or government funding, and local funding. The funding can be investigated or coordinated by policymakers or, most often, the project managers.

3.3. Stakeholders

As Ferraris et al. (2019) emphasized, project managers are directly involved in and coordinate the smart city projects with internal and external partners and stakeholders, including companies, universities, citizens, civil society, and NGOs. Project managers are in strict contact with internal and external city partners, and they have some decision-making power, but it can be quite challenging to meet the stakeholders' demands and align the realization, projective objectives, and coordination among the often multifaceted stakeholders (Buck & While, 2017; Ferraris et al., 2020), given the potential for competing values and competition for money.

3.4. Operational development

Before actual smart city implementations occur, there comes the important element of operational development. This process includes the conceptualization and frameworks, which reflects the realization of the smart city project (Brem & Wolfram, 2017). Operational development begins early, sometimes even before the smart city projects. Because new smart city projects affect the municipality in terms of time, money, resources, contracts, new technology developments, stakeholder engagement, and potential political success or failure, development must be aligned with single or multiple strategic targets, which are evaluated and agreed on using strategic management (Brem & Wolfram, 2017). Scholars have emphasized the importance of strong management and commitment, especially within development and smart city activities (Batty et al., 2012; Caird, 2018; Edge et al., 2020; Kleinschmidt et al., 2007; Pereira et al., 2017). Within smart city projects, the organization is often team based (also in the Ready for Smart Growth project), but with rather different degrees of provided freedom for creativity and maneuverability.

3.5. Smart city implementations, regulations, and material

Smart city implementations are almost always derived from the project manager's development of various projects. The implementation can include multiple and vary from lab experiments to full-scale operational systems, but they often include an iterative user testing process. In addition, implementations in a smart city must be considered based

on a foundation of regulations (rules or directives made and maintained by any authority), current materials, including existing technologies, software, IT usage, standards, infrastructures, buildings, and institutions. Furthermore, the implementations must be considered within the context of integrating the physical infrastructure, communicative standards, and IT usage. A variety of smart city software systems exist, but as Saborido and Alba (2020) outlined, from a project manager's perspective, little is known about these software systems' barriers and limitations.

The Ready for Smart Growth as within the capital region, are home to a highly digitalized society. In Europe, the Copenhagen region has with the highest share of people interacting with public authorities over the Internet (93%), and participation in social networks peaked at 81% in the region (Eurostat, 2019). This public digital driver is an important element in the Danish smart city context, which can be seen as a facilitator of smart city development due to its strong inclusion of the public and private spheres.

4. Materials and methods

4.1. Methodology, participants, case selection, and ethical issues

This research was within a case study methodology, as it was an empirical evaluation that investigated a contemporary problem within its real-life context (Yin, 2003). Case study research is used with considerable variations across fields, but this study primarily met Yin's (2003) criteria for a descriptive case study, as its overall aim was to describe a smart city phenomenon in it is real-life context, in which both context and case are important (Yin, 2003). In addition, as Flyvbjerg (2006) pointed out, case studies often contain substantial narrative elements, and a good narrative typically tackles the complexities and contradictions of real life. For this reason, qualitative and mixed methods are a good way to address these narratives within case study research (Flyvbjerg, 2006).

In this study, the project managers were employed within 22 municipalities, and were all enrolled within the smart city cluster project Ready for Smart Growth. The project managers had different titles, including project leader, project manager, project planner, (project) coordinator, IT expert, and consultant. Average experience within their current work area was 7.3 years. The three municipalities selected for interviews (labeled M1, M2, and M3) were chosen based on the selection of typical and similar cases (Seawright & Gerring, 2008) within their smart city project participation. The main reason for this selection was to probe the causal mechanisms that confirmed or disconfirmed the given theory as outlined in Fig. 1. All three municipalities were active in all four project themes (see introduction) and had similar populations of approximately 70,000 inhabitants. However, M3 differed from M1 and M2, as it was on the outskirts of the capital region, whereas M1 and M2 were close suburbs to Copenhagen.

All received anonymized ID numbers, and all data were labeled using these IDs and stored in an encrypted database. The study had been ethical approved with special considerations for the interviews. A specific checklist for research-related data processing from the university was followed, and legal access, permission, and consent were obtained.

4.2. Procedure

This study was based on a mixed method approach that employed key informant interviews (n = 9) in three municipalities and two questionnaires (n = 71 and n = 23). The key informant interviews were conducted during the period between the two questionnaires. The interviews were conducted to provide further in-depth insights of specific smart city implementations, as well as to identify strengths, weaknesses, opportunities, and threats the project managers perceived within the smart city context.

The first questionnaire was distributed at the beginning of the project in 2017, and the second was distributed at the end of the project in 2018. The questionnaires were distributed in paper format to all project managers just after their participation in one of the four smart city themes (i.e., municipal strategies, smart streets, intelligent street lights, and smart waste innovations). The paper format and distribution were chosen to avoid potential recall bias and to increase the response rate. The first questionnaire (baseline) was based on 71 respondents (73% response rate), and the second was based 23 respondents (28% response rate). In the first year (2017), 97 project managers signed up as participants in Ready for Smart Growth; 83 project managers signed up in the second year (2018).

Questionnaires 1 and 2 asked the same 17 questions. The first question was an open-ended question: "What is a smart city?" The next five questions used a visual analog scale (VAS) and asked the participants to rate their knowledge, planning, implementation, and the level of knowledge sharing within a smart city context. Questions 7–12 used a staple scale (−2 to +2) and asked questions about smart city technologies, including their perceived usefulness, perceived ease of use, implementation, economic viability, and acceptance.

The theoretical framework behind Questions 7–12 was inspired by the technology acceptance model (TAM; Davis, 1993; Venkatesh et al., 2002; Van Der Laan et al., 1997), which emphasized ICT and how users (in this case project managers) come to accept and use (smart city) technology. The TAM suggests that when users are presented with a new technology, a number of factors influence their decisions regarding how and when they will use it; notably, these include perceived usefulness and perceived ease of use (Davis, 1993), as well as satisfaction, general perceptions, and experience (Van Der Laan et al., 1997; Venkatesh et al., 2002). Questions 13–21 asked about the participants' affiliation, years of job experience, and specific satisfaction with the Ready for Smart Growth smart city project. The last two questions were open-ended and asked about ideas for and the future of potential new smart city projects.

4.3. Data analysis

Traditional coding (Bjørner, 2015) was used to analyze the interview data following four steps: organizing, recognizing, coding, and interpretation. The first step was to organize and prepare the data for analysis, so the interviews from the nine project managers were transcribed verbatim. The next step was recognizing; the researcher read the transcripts several times to establish the concepts and themes. This step provided a general sense of the information and an opportunity to reflect on its overall meaning. The third step was coding, during which the researcher organized and labeled the data using categories (advantages and barriers) and subcategories. Examples of coded subcategories included strategies for smart city implementations, specific implementations, lack of success criteria, and the organization as a barrier. Various topics were clustered to avoid having too many categories. The last step was interpretation, which included an analysis of the categories using questions and considerations based on the research questions regarding perceptions of smart cities. Internal and external debriefing was used to validate the coding and interpretations, and single-analyst reliability (Goodwin & Goodwin, 1984) was used to identify the same data segments for coding and classification into the same categories and subcategories.

Both questionnaires were analyzed using cumulative frequency. To code and analyze the smart city perceptions, the literature suggested using six basic and commonly used dimensions for defining a smart city (Anthopoulos, 2017; Giffinger et al., 2007; Lombardi et al., 2012).

5. Results

The 22 municipalities that participated in the Ready for Smart Growth project were quite different in terms of physical area, population size, economies, and organizations, and their foundations in terms of software and IT support for smart city innovations were quite different

(Fig. 1). The project managers perceived that the municipalities had different visions and, therefore, different needs and goals within the context of smart city innovation and realization. There were also different approaches to being involved in Ready for Smart Growth. The smart city operational development was perceived quite differently across municipalities, and internal organizations and strategies for smart city implementations differed. Some municipalities implemented smart city coordination across various administrative departments, as well as inclusion and serving as a communicative link between the higher political level and the project managers in terms of innovation and realization, whereas in other municipalities, smart city innovations were personnel or department driven.

5.1. Smart city perceptions

The researcher hypothesized that an important element of the variations in approaches among project managers might lie within their different perceptions of the complex and even blurred terminology related to smart cities. However, this is not the case. Among the project managers, there were only minor variations in their perceptions of the smart city concept, and the main perceptions related to smart cities appeared situated within the smart economy or smart governance (Fig. 2).

The project managers perceived the term smart city in this context mainly within the smart economy as descriptions of technology and innovation for strengthening business development, employment, and urban growth (Anthopoulos, 2017), followed by smart governance, which incorporates descriptions of how power-related establishments (governance) use ICT for service delivery, participation, and engagement. Descriptions of smart environments were also mentioned, including how ICT can be implemented for natural resource protection and management (e.g., waste management systems, emission control, recycling, sensors for pollution monitoring). Table 1 below outlines typical statements within three of the six dimensions of a smart city.

The perceptions of smart cities were interconnected, and some project managers mentioned more than one dimension in their answers (see Fig. 2). However, the dimensions of smart people (learning, creativity, and open innovation) and smart mobility (transportation) were almost absent. It is generally agreed that successful smart city implementations require data collection and ICT infrastructure (Albino et al., 2015; Anthopoulos, 2017; Caird, 2018; Lombardi et al., 2012), but as part of a holistic approach that includes all six dimensions (Anthopoulos, 2017; Appio et al., 2019; Lombardi et al., 2012; Shen et al., 2018). Furthermore, is interesting that most project managers perceived smart city implementations as pushing technologies as something that the municipality provides to the citizens. This includes software, platforms, and digital solutions for citizens. Very few project managers mentioned

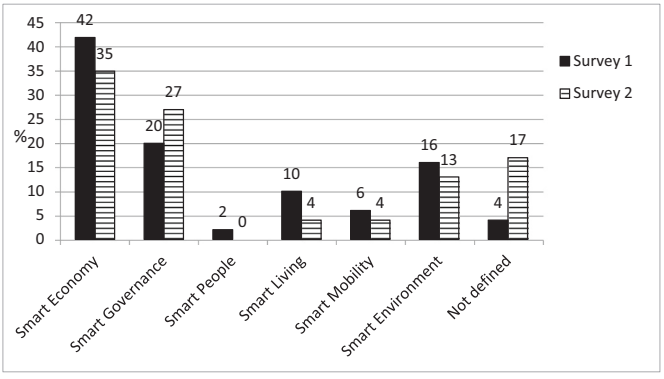

Fig. 2. Project managers' perceptions of the term *smart city*. Answers in % are responses to the question "What is a smart city?" and are categorized using six dimensions of a smart city.

Table 1
Typical statements within the common perceptions of a smart city. Q = questionnaire.

Smart economy	Smart governance	Smart environments
Smart cities are about cheaper and better solutions for the citizens (Q1, ID6).	Smart cities are about digital support for management processes (Q1, ID30).	Smart cities provide green and sustainable solutions based on innovative technology solutions (Q1, ID58).
They provide sensors for optimizing operations (Q1, ID10).	They include solutions that involve new technology and data, which provide a better basis for decisions for management and policymakers. This will improve living conditions for our citizens (Q1, ID69).	In terms of today's climate challenges, smart cities are important as facilitators for a green transition (Q2, ID9).
Smart cities are digital solutions for optimizing citizens' behavior and creating new jobs for the citizens (Q1, ID5).	Technology and data are put in play for a better city for the citizens' own good (Q1, ID19).	A smart city is a city with green and sustainable solutions that create value for both citizens and companies (Q2, ID18).
A smart city implements digital solutions to make life easier for the citizens in the growing city (Q1, ID1).		

a push and pull understanding of technology; for example, one participant replied, "A smart city integrates technology into the city. It uses concerted planning and actions with feedback mechanisms. This also includes public participation" (Q1, ID71). Most project managers' perceptions were also to some extent in line with a more technocentric understanding of a smart city (Hollands, 2008; Khan & Haleem, 2015). However, some project managers included critiques and self-knowledge about the missing push and pull approaches, as well as the lack of public participation in smart city implementations (M = municipality, PM = project manager):

> *Well, there is a lot of focus on data in administrative management and how we can collect various types of data to create value for the citizens and companies in our municipality. However, a big question remains unanswered: what is the value creation for the citizens? For the same reason, I believe that smart cities are fading out because there is no direct value creation for the citizens. The gain is simply missing for the citizens.*
>
> *(M2, PM4)*

Some of the project managers also explicitly mentioned the lack of smart living and public participation in the smart city implementations. They mentioned that the combination of stakeholders was one of the reasons for the focus on the smart economy and on smart governance.

5.2. Stakeholder advantages and barriers

The 22 municipalities that participated in Ready for Smart Growth were very different in terms of their sizes, populations, economies, and organizations, and their foundations in terms of software and IT support for smart city innovations were very different (Fig. 1). The project managers perceived that the municipalities had different visions and thus different needs and goals in smart city innovations and realizations. They also had different approaches for being involved in Ready for Smart Growth. Some municipalities facilitated smart city coordination across various administrative departments and were involved at a higher political level, whereas in other municipalities, smart city solutions were personnel or department driven. When the project managers were asked during the interviews where their smart city knowledge came from, a rather complex mix of stakeholders and organizations with various

characteristics and impacts were identified (Table 2).

The project managers perceived both advantages and barriers in smart city implementations linked to the stakeholders and organizations. All of the project managers mentioned the major advantages of the different perspectives and types of knowledge of various stakeholders in the smart city projects. They also mentioned the advantages of collaborations with companies, civil society, and other municipalities and regions. The larger cities naturally had more stakeholders compared with some of the smaller cities involved, and the larger cities were mainly the ones who had international networks and project collaborations.

According to the project managers, the main barrier regarding the stakeholders involved finding the right stakeholders to develop smart city implementations. Some challenges with materials and technological solutions especially existed for some companies:

> *Sometimes, some of the companies, promise a bit more than they actually can complete within smart city solutions.*
>
> *(M1, PM2 2)*

Furthermore, similarly to what has already been described in the literature (Ferraris et al., 2020), the project managers mentioned the difficulties that different stakeholders faced with sharing clear and aligned objectives, both in terms of the visions (policy level) and in terms of specific implementations. The project managers mentioned that they were not always the ones to establish the teams/stakeholders. Rather these decisions often came from the policy makers, which could make it more difficult to align the project managers with the stakeholders, as well as to have the best teams for solving challenges.

It is also interesting that the project managers perceived the stakeholder impact (low, medium, or high) on smart city knowledge in smart city projects as low in academia and international projects, which could indicate some communication gaps between the municipalities and academia. However, as Ferraris, Belyaeva, and Bresciani (2018) described, universities can play an enhanced role in innovation in smart cities with both their technological and their interdisciplinary knowledge-based approaches. Below, one of the interviewed project managers provides an explanation for the low knowledge impact of universities, which has to do with both work differences between cities and universities, as well as the project organization:

> *Sometimes it seems like the universities works a bit slow and different in terms of how much time we actually have within the smart city project. Actually, I think there are much more potential with the universities within realization of really good smart city implementations and solutions. But there is needed more time, and maybe also another set-up within the project organization.*
>
> *(M1, PM1)*

Table 2
Where does your smart city knowledge come from? Derived from the interviews.

Type of stakeholder	Examples	Characteristics	Perceived stakeholder knowledge impact
Civil society	Housing associations, youth and sport clubs, unions, city communities, NGOs	Informal, and with potential smart city test or use cases. Long term.	Medium
Shared knowledge and projects with other municipalities or regions	Local and regional collaborations	Informal and formal, and often with broad range of different projects or programs across municipalities	Medium
International networks or projects	EU-projects, Scandinavian projects.	Informal and formal, often with focused pilot or short-term projects	Low
Academia or knowledge institutions	Universities, Departments, Science centers.	Informal and formal, often with focused pilot or short-term projects. Nonprofit agenda	Low
Companies	Companies within energy, mobility, waste, health, consulting, etc.	Formal by contracts. Private. For profit	High
State or government	Laws and regulations	Formal. Governmental. Nonprofit agenda. Long term	High

5.3. Regulations and internal organization as the biggest barrier

Almost all of the project managers identified law and regulations (mainly from the Danish Parliament) as major barriers in smart city projects, especially when it came to implementations as well as legal and regulatory issues:

> *We dropped a self-driving project in a tourist area due to regulation issues, which became too big a barrier… The technology is not quite ready yet either, but the potential is there.*
>
> *(M3, PM 9)*

> *We would like to have better registrations of people's flow and mobility in the city in order to provide better smart city solutions. However, due to the general data protection regulation [GDPR] issues we did not find the right tool.*
>
> *(M3, PM 8)*

The interviews also revealed that the project managers are very concerned about being tangled up in regulatory issues. Therefore, they are adopting a wait-and-see attitude toward potential smart city solutions with positive impacts and effects.

> *We [Municipality G] would rather like to be absolutely safe. Of course, we would like to be smart city pioneers but we don't want to burn our fingers. So, we have adopted a wait-and-see attitude regarding smart city solutions, also due to the GDPR issues.*
>
> *(M2, PM 4)*

It is also interesting that many of the project managers mentioned their own city organizations as the biggest barriers to real smart city solutions, or solutions across various administrative departments.

> *It is a huge challenge to get a smart city anchored in our own municipality organization, mainly due to managerial culture and history. We have many years of experience in our own department, but having a smart city be really successful we need think in new ways in our organization. We need to think across departments and operations, and reduce organizational silos.*
>
> *(M2, PM 4)*

Khan and Haleem (2015) observed similar results, with organizational structure and managerial actions being the two most important barriers to a smart organization. As stated in the above quote, the need exists to reduce organizational silos to anchor smart city projects and make them successful. Silos are a common problem, especially in larger smart city organizations, as they hinder information and the organization's effectiveness (Khan & Haleem, 2015). The problem is that crossover data and information can be crucial to relevant and successful smart city implementations. With information silos, an organization is incapable of reciprocal operations with other related or required

information systems. Reducing silos can improve collaborations and information insights, both inside and outside of departments, and thereby align goals and performance in an overall smart city strategy for successful implementations.

5.4. Smart city implementations

The project managers perceived an increased level of smart city implementations during the two-year project period. However, the increased level did not necessarily stem from the Ready for Smart Growth project but rather could have been due to other networks and projects. From survey 1 to survey 2, the level of general knowledge about smart cities increased from an average rating of 4.0 to an average of 6.5 (Fig. 3). The level of knowledge sharing involved in smart city solutions also increased from 3.2 to 4.5. General knowledge and knowledge sharing in the smart city cluster project were expressed very positively in the interviews, with the common statement being that the smart city project in itself did not facilitate new projects but rather supported existing or already planned projects:

> *It is difficult to run a project like this [Ready for Smart Growth] as the participants and municipalities have a very different starting point. This was tackled pretty well, and with proper facilitation of knowledge and, even more importantly, knowledge sharing. However, the Ready for Smart Growth project has not facilitated new smart city projects, but the project has supported what we already were doing.*
>
> *(M1, PM 1)*

The highest level of self-reported implemented and planned smart city projects are in Copenhagen and Frederiksberg. Frederiksberg is an enclave surrounded by Copenhagen Municipality and occupies an area of less than 9 km^2 with a population of 103,192. Frederiksberg self-reported the second-highest level of smart city planning (5.3) and is on the high end of implementations (4.0). Frederiksberg is also one of the municipalities with a smart city coordinator.

Also, some of Copenhagen's suburban municipalities self-reported high levels of both planning and implementation. In some of the suburban municipalities are living labs where companies can test and implement new smart city technologies that support development in small towns and rural districts as part of these municipalities' visions.

The project managers were generally concerned about how smart city projects can fulfill the goals of both rural municipalities and more urban municipalities, especially when it comes to developing good business models and scalable technologies. However, within Greater Copenhagen are many smart city initiatives. Table 3 lists some examples of smart city implementations in Greater Copenhagen.

Give a Hint is a successful smart city implementation. The app incorporates citizens into the solution's affordances, as they can communicate to the municipality if something needs to be fixed. Examples may include a broken bin, missing street signs, potholes, graffiti that should be removed, or a lamp that is no longer lit. Citizens can use their smartphones to take photos and send them via the app, which adds GPS data so that the municipality is notified of the exact location. All hints go directly to the relevant department, most often the technical and environmental department. The most frequent hints from citizens involve damaged signs and potholes, followed by trash/overloaded bins and lamps that are no longer lit. In the interviews, all of the project managers viewed Give a Hint as a good tool for a smart city. However, even though the project managers were positive about the hints received from citizens, some project managers also challenged public participation in the app:

> *I would say that this falls in smart living, and Give a Hint actually works quite well as an error detection helper. However, the app could also be further developed and motivate the citizens to take part in the city, and be more dialogue based, instead of just a push-technology.*
>
> *(M2, PM 5)*

It is also interesting that some of the project managers viewed Give a Hint as a tool for a city to save money, as city workers will not have to go around to check lids, potholes, bins, signs, etc. Most smart city implementations (as listed in Table 3) have their main focus on technology factors. However, not much focus has been placed on human or institutional factors. An exception, however, is the Smart City Challenge, whose main focus is on human factors and public participation. The Smart City Challenge is a 48-h competition where citizens develop ideas for specific visions (e.g. sustainability) with the aim of contributing to knowledge sharing and a better future in the municipality. All project managers viewed the Smart City Challenge as a very good idea but were skeptical about the actual implementations of these ideas. Similarly to some of the elements that Coulson et al. (2018) mentioned, the project managers perceived barriers to implementation due to a lack of relevant information as well as data, timing, funding, accessibility, and regulations.

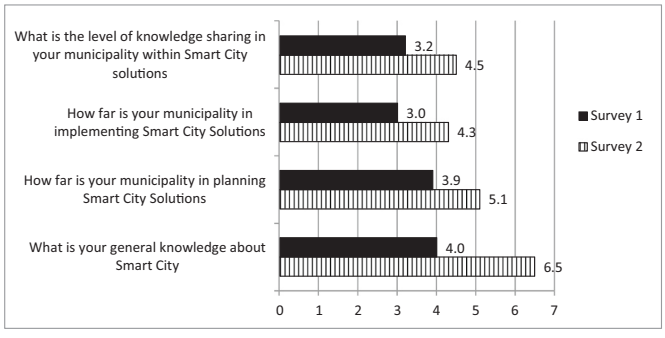

Fig. 3. Aggregated perceptions of knowledge sharing, implementation, planning, and general knowledge about smart cities. Based on VAS scale, 0–10.

Table 3
Examples of smart city implementations in Greater Copenhagen. PPP = public–private partnerships.

Examples of Smart City implementations in Greater Copenhagen	Place
Give a hint: An app or webpage that citizens can use to communicate to the municipality if something needs to be fixed. A citizen can take a photo and send it via the app, which adds Global Positioning System (GPS) data so that the municipality is notified of the exact location. Most municipalities in Denmark provide this service.	All
Smart City Network: A large-scale project on the digitalization of the water and heat supply. A PPP.	Frederiksberg/ Capital
EnergyLab Nordhavn: A full-scale smart city energy lab. Demonstrates how electricity and heating, energy-efficient buildings, and electric transport can be integrated into an intelligent energy system.	Copenhagen/ Capital
Smart waste management: Sensors/radio-frequency identification and Internet of Things (IoT) solutions to identify and analyze when garbage cans are full and when and where waste is produced.	All
Smart Parking: An application programming interface solution (both navigation systems and mobile apps) that makes it easier for drivers to find vacant parking spaces near their destinations.	Copenhagen/ Capital
Street Lab: A test area in Copenhagen for smart city solutions in a real urban space 1:1. Used for show-and-use cases for new technologies in a smart city and IoT. A PPP.	Copenhagen/ Capital
DOLL, Intelligent lighting: A living lab for intelligent lighting and smart city services. A PPP.	Albertslund/ Suburb
Smart Village Svebølle: Test city for many smart city initiatives. A PPP.	Kalundborg/Rural
Smart City Challenge: Students, citizens, and companies meet to generate ideas and solutions on the themes of livability, mobility, sustainability, and health.	Frederiksberg/ Capital

The citizens do of course not have all available information, as well as they do not have the insight in terms of the specific funding and the complex regulations. However, the ideas can be good, and can highlight some hotspots, but for reel implementations, I am a skeptical.

(M2, PM4)

6. Discussion and conclusion

6.1. Different perceptions and a definition of a smart city project

The 22 municipalities that were part of the Gate21 project called Ready for Smart Growth were very different in terms of their sizes, populations, economics, and organizations. Due to these differences, the smart city project managers had varying perceptions in terms of needs, goals, and implementations. The Ready for Smart Growth's vision was mainly derived from policy makers and was within the holistic approach of a smart city, which included knowledge sharing, crossover effects, and finding innovative business models in private-public partnerships. Based on the context of analysis from The Ready for Smart Growth cluster project, the following definition for a smart city project is suggested: A smart city project includes dynamic constructs that are covered in the city, taking knowledge, context, interactions, foundation, time, and space into account. In this definition, great emphasis is placed on the non-static city, as different local factors can exist (even in the same city), which are related to the existing smart city knowledge, the context (societal- and city challenges), the chosen interactions for the city municipality; including the funding, stakeholders, operational development, and implementations, as well the staging above foundation (regulations and materials).

The definition incorporates an ability to increase the smart city knowledge, to develop new capabilities, and to enhance existing capabilities through knowledge combination and exchange (Nonaka & Takeuchi, 1995). Furthermore, in this definition of the smart city project, emphasis is also placed on its reflections within current viewpoints (beliefs) and how the current resources should be positively configured and exploited. The smart city project approach can (and should) be different, as the needs, advantages, and barriers are different by city, region, and country. The suggested definition is also a contribution and supplement to the previous attempts (Anthopoulos, 2017; Bhatt & Jani, 2017; Joshi et al., 2016; Kumar et al., 2020; Sandulli et al., 2017) to identify how to make successful smart city projects, but within this study from the project managers perceptive.

6.2. Advantages, barriers, and absent public participation

The project managers in this study perceived the different perspectives and types of knowledge of various stakeholders as the main advantages within a smart city project. The advantages of knowledge sharing in smart city projects (especially within the implementations) is based on the perceptions of being able to avoid "reinventing the wheel" and thus limiting risk for cities, citizens (taxpayers), and private sector partners. All of the involved project managers also perceived IT solutions and data as major advantages, as they can lead to better management as well as a better quality of life for citizens.

The project managers in this study perceived the following major barriers to real smart city implementations: regulations; silos; and the choice of stakeholders, including companies promising too much. In addition, the project managers were missing more of a focus on the specific local smart city implementations and to deliver real value by reaching all citizens by large scaled smart city solutions.

In contrast to the increased focus on user data in smart city solutions, relatively less focus is placed on project managers' impact, facilitation, and perceptions in smart city projects. In this study, the project managers perceived smart cities mainly in the smart economy and smart governance, but they also viewed smart city implementations as push technologies. Both push and pull technologies with public participation and dialogue-based solutions seem to be almost absent. This absent public participation in a smart city could be derived from a strong administrative management that focuses on the data and technological aspects of the city. Therefore, integrating both push and pull implementations could have more potential in future smart city solutions. The absence of public participation in smart cities has previously been addressed from several perspectives (Batty et al., 2012; Cardullo & Kitchin, 2019; Gabrys, 2014) and falls within the labels of "non-participation" or "the algorithmic city." However, as Batty et al. (2012) concluded, participation is becoming more bottom up than top down, in line with more complex systems.

7. Limitations and future works

As with many studies, the major limitation of this research concerns the subjectivity in the interview response and thus in the gathering of data. This study used a mixed method approach to improve the validity. However, the interviews were the most valuable method for understanding the project managers' perceptions of the advantages and barriers in a highly complex context of a smart city. Another limitation within this study was the number of interviews and cases (9 key informant interviews in 3 municipalities). In spite of being very strict in the case selection criteria, future studies should explore more cases, investigating specific conditions under which these advantages and barriers are more common, as well as suggesting more systematic recommendations for best practices to overcome the barriers. Due to time constraints, and the structure of the interview guide, there is a potential bias in the responses with too much focus on the barriers, rather than the advantages.

More work is needed to reveal examples of good public participation that motivates and engages citizens in the various contexts of temporal and spatial dynamics in the city. Effective public participation must make sense for both the citizens and the municipalities, meaning that not all technology and data solutions in a smart city correspond to public interest. Therefore, the need to be more focused also exists (e.g., different solutions) in various target groups (e.g., different ages and locations). Current and future younger generations might have other approaches to public participation that current project managers have not thought of to incorporate into smart city designs (Bovaird, 2007). Therefore, future work could focus on local context–specific methods and strategies for project managers to incorporate to achieve public participation.

Declaration of competing interest

None. This study is ethical approved (ID 2020-020-00431) by an ethical committee at Aalborg University.

Acknowledgements

This research has been partially funded by Gate21: Ready for Smart Growth (16000285), and Department of Architecture, Design and Media Technology, Aalborg University. Thanks to all the involved project managers. Thanks to the reviewers for useful feedback.

References

Akande, A., Cabral, P., Gomes, P., & Casteleyn, S. (2019). The Lisbon ranking for smart sustainable cities in Europe. *Sustainable Cities and Society, 44*, 475–487. https://doi.org/10.1016/j.scs.2018.10.009.

Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology, 22*(1), 3–21. https://doi.org/10.1080/10630732.2014.942092.

Anthopoulos, L. G. (Ed.). (2017). *Understanding smart cities: A tool for smart government or an industrial trick?*. Springer International Publishing. https://doi.org/10.1007/978-3-319-57015-0.

Appio, F. P., Lima, M., & Paroutis, S. (2019). Understanding Smart Cities: Innovation ecosystems, technological advancements, and societal challenges. *Technological Forecasting and Social Change, 142*, 1–14. https://doi.org/10.1016/j.techfore.2018.12.018.

Arnold, E. (2004). Evaluating research and innovation policy: A systems world needs systems evaluations. *Research Evaluation, 13*(1), 3–17. https://doi.org/10.3152/147154404781776509.

Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., … Portugali, Y. (2012). Smart cities of the future. *The European Physical Journal Special Topics, 214*(1), 481–518. https://doi.org/10.1140/epjst/e2012-01703-3.

Bhatt, J. G., & Jani, O. K. (2017). Smart grid: Energy backbone of smart city and e-democracy. In T. Vinod Kumar (Ed.), *E-Democracy for smart cities. Advances in 21st century human settlements*. Singapore: Springer. https://doi-org.zorac.aub.aau.dk/10.1007/978-981-10-4035-1_11.

Bjørner, T. (2015). Data analysis and findings. In T. Bjørner (Ed.), *Qualitative methods for consumer research: The value of the qualitative approach in theory and practice*. Hans Reitzel: Copenhagen. https://hansreitzel.dk/products/qualitative-methods-for-consumer-research-bog-36789-9788741258539.

Bovaird, T. (2007). Beyond engagement and participation: User and community coproduction of public services. *Public Administration Review, 67*(5), 846–860. https://doi.org/10.1111/j.1540-6210.2007.00773.x.

Brem, A., & Wolfram, P. (2017). Organisation of new product development in Asia and Europe: Results from Western multinationals R&D sites in Germany, India, and China. *Review of Managerial Science, 11*(1), 159–190. https://doi.org/10.1007/s11846-015-0183-7.

Buck, T., & While, A. (2017). Competitive urbanism and the limits to smart city innovation: The UK Future Cities initiative. *Urban Studies, 54*(2), 501–519. https://doi.org/10.1177/0042098015597162.

Caird, S. (2018). City approaches to smart city evaluation and reporting: Case studies in the United Kingdom. *Urban Research & Practice, 11*(2), 159–179. https://doi.org/10.1080/17535069.2017.1317828.

Cardullo, P., & Kitchin, R. (2019). Being a "citizen" in the smart city: Up and down the scaffold of smart citizen participation in Dublin, Ireland. *GeoJournal, 84*(1), 1–13. https://doi.org/10.1007/s10708-018-9845-8.

Coulson, S., Woods, M., Scott, M., Hemment, D., & Balestrini, M. (2018). Stop the noise! Enhancing meaningfulness in participatory sensing with community level indicators. In *Proceedings of the 2018 designing interactive systems conference* (pp. 1183–1192). https://doi.org/10.1145/3196709.3196762.

Crivello, S. (2015). Urban policy mobilities: The case of Turin as a smart city. *European Planning tudies, 23*(5), 909–921. https://doi.org/10.1080/09654313.2014.891568.

Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies, 38*(3), 475–487. https://doi.org/10.1006/imms.1993.1022.

Dekker, K., & Van Kempen, R. (2004). Urban governance within the Big Cities Policy: Ideals and practice in Den Haag, the Netherlands. *Cities, 21*(2), 109–117. https://doi.org/10.1016/j.cities.2004.01.007.

Edge, S., Boluk, K., Groulx, M., & Quick, M. (2020). Exploring diverse lived experiences in the Smart City through creative analytic practice. *Cities, 96*, 102478. https://doi.org/10.1016/j.cities.2019.102478.

Edvinsson, L. (2006). Aspects on the city as a knowledge tool. *Journal of Knowledge Management, 10*(5), 6–13. https://www.emerald.com/insight/content/doi/10.1108/13673270610691134/full/html.

Eurostat. (2019). Eurostat regional yearbook, 2019 edition. https://ec.europa.eu/eurostat/statistics-explained/index.php/Eurostat_regional_yearbook. (Accessed 1 July 2020).

Ferraris, A., Belyaeva, Z., & Bresciani, S. (2018). The role of universities in the Smart City innovation: Multistakeholder integration and engagement perspectives. *Journal of Business Research*. https://doi.org/10.1016/j.jbusres.2018.12.010.

Ferraris, A., Erhardt, N., & Bresciani, S. (2019). Ambidextrous work in smart city project alliances: Unpacking the role of human resource management systems. *The International Journal of Human Resource Management, 30*(4), 680–701. https://doi.org/10.1080/09585192.2017.1291530.

Ferraris, A., Santoro, G., Bresciani, S., & Carayannis, E. G. (2018). HR practices for explorative and exploitative alliances in smart cities. *Management Decision, 56*(6), 1183–1197. https://doi.org/10.1108/md-04-2017-0384.

Ferraris, A., Santoro, G., & Pellicelli, A. C. (2020). "Openness" of public governments in smart cities: Removing the barriers for innovation and entrepreneurship. *International Entrepreneurship and Management Journal*, 1–22. https://doi.org/10.1007/s11365-020-00651-4.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry, 12*(2), 219–245. https://doi.org/10.1177/1077800405284363.

Gabrys, J. (2014). Programming environments: environmentality and citizen sensing in the Smart City. *Environment and Planning D: Society and Space, 32*(1), 30–48. https://doi.org/10.1177/1077800405284363.

Galati, S. R. (2018). Funding a smart city: From concept to actuality. In *Smart Cities* (pp. 17–39). Cham: Springer. https://doi.org/10.1007/978-3-319-59381-4_2.

Giffinger, R. C., Kramar, F. H., Kalasek, R., Pichler-Milanović, N., & Meijers, E. (2007). Smart cities ranking of European medium-sized cities. Final report. http://curis.ku.dk/ws/files/37640170/smart_cities_final_report.pdf. (Accessed 1 July 2020).

Goodwin, L. D., & Goodwin, W. L. (1984). Are validity and reliability "relevant" in qualitative evaluation research? *Evaluation & the Health Professions, 7*(4), 413–426. https://doi.org/10.1177/016327878400700403.

Hollands, R. G. (2008). Will the real smart city please stand up? *City, 12*(3), 303–320. https://doi.org/10.1080/13604810802479126.

Hollands, R. G. (2014). Critical interventions into the corporate smart city. *Cambridge Journal of Regions, Economy and Society, 8*(1), 61–77. https://doi.org/10.1093/cjres/rsu011.

Huovila, A., Bosch, P., & Airaksinen, M. (2019). Comparative analysis of standardized indicators for Smart sustainable cities: What indicators and standards to use and when? *Cities, 89*, 141–153. https://doi.org/10.1016/j.cities.2019.01.029.

Joshi, S., Saxena, S., Godbole, T., & Shreya. (2016). Developing smart cities: An integrated framework. *Procedia Computer Science, 93*, 902–909. https://doi.org/10.1016/j.procs.2016.07.258.

Khan, U., & Haleem, A. (2015). Improving to smart organization. *Journal of Manufacturing Technology Management, 26*(6), 807–829. https://doi.org/10.1108/JMTM-05-2014-0062.

Kitchin, R. (2015). Making sense of smart cities: Addressing present shortcomings. *Cambridge Journal of Regions Economy and Society, 8*(1), 131–136. https://doi.org/10.1093/cjres/rsu027.

Kleinschmidt, E. J., de Brentani, U., & Salomo, S. (2007). Performance of global new product development programs: A resource-based view. *Journal of Product Innovation Management, 24*(5), 419–441. https://doi.org/10.1111/j.1540-5885.2007.00261.x.

Kourtit, K., Nijkamp, P., & Arribas, D. (2012). Smart cities in perspective – A comparative European study by means of self-organizing maps. *Innovation: The European Journal of Social Science Research, 25*(2), 229–246. https://doi.org/10.1080/13511610.2012.660330.

Kumar, H., Singh, M. K., Gupta, M. P., & Madaan, J. (2020). Moving towards smart cities: Solutions that lead to the smart city transformation framework. *Technological Forecasting and Social Change, 153*, 119281. https://doi.org/10.1016/j.techfore.2018.04.024.

Lim, Y., Edelenbos, J., & Gianoli, A. (2019). Identifying the results of smart city development: Findings from systematic literature review. *Cities, 95*, 102397. https://doi.org/10.1016/j.cities.2019.102397.

Lombardi, P., Giordano, S., Farouh, H., & Yousef, W. (2012). Modelling the smart city performance. *Innovation: The European Journal of Social Science Research, 25*(2), 137–149. https://doi.org/10.1080/13511610.2012.660325.

Lytras, M. D., Visvizi, A., & Sarirete, A. (2019). Clustering smart city services: Perceptions, expectations, responses. *Sustainability, 11*(6), 1669. https://doi.org/10.3390/su11061669.

McNeil, M., Arribas-Ayllon, M., Haran, J., Mackenzie, A., & Tutton, R. (2017). Conceptualizing imaginaries of science, technology, and society. In U. Felt, R. Fouché, C. A. Miller, & L. Smith-Doeer (Eds.), *The handbook of science and technology studies* (4th ed., pp. 435–463). Cambridge: The MIT Press.

Mora, L., Deakin, M., Reid, A., & Angelidou, M. (2019). How to overcome the dichotomous nature of Smart City research: Proposed methodology and results of a pilot study. *Journal of Urban Technology, 26*(2), 89–128. https://doi.org/10.1080/10630732.2018.1525265.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.

Paskaleva, K., & Cooper, I. (2018). Open innovation and the evaluation of internet-enabled public services in smart cities. *Technovation, 78*, 4–14. https://doi.org/10.1016/j.technovation.2018.07.003.

Pereira, V. G., Cunha, M. A., Lampoltshammer, T. J., Parycek, P., & Testa, M. G. (2017). Increasing collaboration and participation in smart city governance: A cross-case analysis of smart city initiatives. *Information Technology for Development, 23*(3), 526–553. https://doi.org/10.1080/02681102.2017.1353946.

Praharaj, S., & Han, H. (2019). Cutting through the clutter of smart city definitions: A reading into the smart city perceptions in India. *City, Culture and Society, 18*, 100289. https://doi.org/10.1016/j.ccs.2019.05.005.

Saborido, R., & Alba, E. (2020). Software systems from smart city vendors. *Cities, 101*, 102690. https://doi.org/10.1016/j.cities.2020.102690.

Sadowski, J., & Bendor, R. (2019). Selling smartness: Corporate narratives and the Smart City as a sociotechnical imaginary. *Science, Technology & Human Values, 44*(3), 540–563. https://doi.org/10.1177/0162243918806061.

Sandulli, F. D., Ferraris, A., & Bresciani, S. (2017). How to select the right public partner in smart city projects. *R&D Management, 47*(4), 607–619. https://doi.org/10.1111/radm.12250.

Seawright, J., & Gerring, J. (2008). Case selection techniques in case study research: A menu of qualitative and quantitative options. *Political Research Quarterly, 61*(2), 294–308. https://doi.org/10.1177/1065912907313077.

Sharifi, A. (2019). A critical review of selected smart city assessment tools and indicator sets. *Journal of Cleaner Production, 233*, 1269–1283. https://doi.org/10.1016/j.jclepro.2019.06.172.

Shen, L., Huang, Z., Wong, S. W., Liao, S., & Lou, Y. (2018). A holistic evaluation of smart city performance in the context of China. *Journal of Cleaner Production, 200*, 667–679. https://doi.org/10.1016/j.jclepro.2018.07.281.

Söderström, O., Paasche, T., & Klauser, F. (2014). Smart cities as corporate storytelling. *City, 18*(3), 307–320. https://doi.org/10.1080/13604813.2014.906716.

Song, H., Srinivasan, R., Sookoor, T., & Jeschke, S. (Eds.). (2017). *Smart cities: Foundations, principles, and applications*. Hoboken, USA: Wiley and Sons.

United Nations. (2018). Department of Economics and Social affairs. Population Division [Online]. Available: https://esa.un.org/unpd/wup/. (Accessed 1 July 2020).

Van Der Laan, J. D., Heino, A., & De Waard, D. (1997). A simple procedure for the assessment of acceptance of advanced transport telematics. *Transportation Research Part C: Emerging Technologies, 5*(1), 1–10. https://doi.org/10.1016/s0968-090x(96)00025-3.

Venkatesh, V., Speier, C., & Morris, M. G. (2002). User acceptance enablers in individual decision making about technology: Toward an integrated model. *Decision Sciences, 33*(2), 297–316. https://doi.org/10.1111/j.1540-5915.2002.tb01646.x.

Wathne, M. W., & Haarstad, H. (2020). The smart city as mobile policy: Insights on contemporary urbanism. *Geoforum, 108*, 130–138. https://doi.org/10.1016/j.geoforum.2019.12.003.

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). London: Sage Publications.