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Smart Governance For Sustainable Cities: Findings from a Systematic Literature Review

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ABSTRACT

This paper presents a systematic review of the literature on smart governance, defined as technology-enabled collaboration between citizens and local governments to advance sustainable development. The lack of empirical evidence on the positive outcomes of smart cities/smart governance motivated us to conduct this study. Our findings show that empirical evidence for the alleged sustainability benefits is sparse. In addition, the emerging picture is ambiguous in that it reports both positive and negative effects in respect to the sustainability achievements of smart governance. The study identifies contextual conditions of smart governance as crucial to understanding these mixed outcomes. Our paper points up the need for more empirical work and develops an agenda for researching the relationship between smart governance and sustainability outcomes.

KEYWORDS

smart governance; sustainable development; government-citizen collaboration; citizen e-participation; Information and Communication Technologies (ICTs); urban development

Introduction

In their efforts to address pressing urban challenges, local governments around the world have embraced smart city agendas. They promote digital technologies for optimizing urban management and interactions between state and non-state actors in the pursuit of sustainable development (Aichholzer et al., 2016; Gil-Garcia et al., 2015; Bolívar and Meijer, 2016; Chourabi et al., 2012).

The role of citizens in the transition to a more sustainable socioeconomic system has been widely acknowledged (Alusi et al., 2011; Osella et al., 2016; Royo et al., 2014a, 2014b; Stratigea et al., 2015; Goh, 2015). Public engagement in urban development not only fosters a more democratic, and hence legitimate decision-making process, it also serves as an intelligence-gathering tool. Citizens are the bearers and users of local knowledge and expertise, which—together with the strategic knowledge of organizations—is essential for defining priorities and allocating scarce resources (Voorberg et al., 2015; Charalabidis et al., 2012; Misuraca and Rossel, 2011).

At the same time, gaining the participation of citizens has proven to be an elusive goal, leading cities to explore the potential of new information and communication

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technologies (ICTs) as a means of enhancing public engagement. ICT-enabled participation is considered by many to offer an obvious and viable route to creating a dialogue tool between the local authorities and urban inhabitants for the collective advancement of urban sustainability. We, therefore, view smart governance as a sociotechnical approach, which aligns technological potential with novel forms of collaboration between local government and citizens with the aim of tackling urban issues based on the principles of sustainability (Meijer and Thaens, 2016; Bakici et al., 2013 Paskaleva, 2014; Ertiö, 2015; Roman and Miller, 2013; Caragliu et al., 2011; Hollands, 2015).

Although sustainable development has manifold conceptualizations, our definition relates to that posited in the Brundtland Report: development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). According to this definition, sustainable development is pursued on the basis of the "triple bottom line" (Elkington, 1998), which emphasizes the need for balanced development of ecological, socio-cultural, and economic values (Inayatullah, 2011; Bifulco et al., 2016). Yet, the strong belief that sustainability can be achieved through ICT-enabled co-creation with citizens, notwithstanding skepticism, abounds about the power of technology to enhance citizen engagement (Roman and Miller, 2013; Hollands, 2008; Torres et al., 2006). A range of studies refutes the ability of state ICTs to radically transform citizen-government relationships in public affairs. In addition, both academics and professionals question whether ICT applications can reverse people's apathy towards public affairs and their distrust of political representatives (Yetano and Royo, 2015; Edelmann et al., 2009). The use of ICTs also raises questions about exclusion, as deployment of these tools limits participation to those with access to digital devices (Molinari and Ferro, 2009; Yigitcanlar and Lee, 2014).

The bulk of smart city research focuses on conceptualization—on mapping the meanings, components, and goals of the smart city from the perspectives of particular fields of study, such as public administration, information science, and urban development (Meijer and Thaens, 2016; Bolívar and Meijer, 2016; Krenjova and Raudla, 2017; Bifulco et al., 2015; Hollands, 2015). Although these studies consider interactive governance to be an essential component of smart cities, they fail to examine this in any great depth (Gil-Garcia et al., 2015; Paskaleva, 2009; Lin and Geertman, 2016; Hamza, 2015). This paucity of knowledge prompted the present attempt to contribute to smart city discussions by exploring smart governance at the interface of different study areas.

A systematic analysis of the literature offers a means to map what is known about smart governance and its effects, and thus to provide a more realistic perspective on the value of this approach for cities. To that end, the present study is guided by the following research question: *What relationships exist between ICT-enabled citizen-government collaboration and sustainable urban development and how do contextual circumstances influence these*?

The contribution of this study to the discussion is in the first place conceptual: we aim to identify the various components and dynamics of smart governance to develop a rich understanding of this ICT-supported collaboration mode. Secondly, this paper contributes to the literature by broadening our understanding of the relationship between smart governance and outcomes in terms of its contribution to urban sustainability. While the literature describes many opportunities and threats in this relation, we still know very little about the environmental, societal, and economic outcomes of ICT-supported collaborative governance (Aichholzer et al., 2016; Scott, 2015; Winters, 2011; Lazarious and Roscia,

2012; Hollands, 2015). Finally, this study enhances our understanding of the role of context. Governance dynamics are mediated through multiscalar variables and moderated by contextual features of the local urban setting. Contextual aspects include external place- or domain-specific circumstances, such as physical, political, institutional, societal, economic, and cultural conditions, as potential influences in digitalized governance processes. Although widely recognized, a systematic overview of the influence of contextual factors on smart governance processes is still lacking (Walters, 2011; Meijer, 2016; Gupta et al., 2015; Sampson, 2017; Hong, 2015; Zheng, 2015). This study fills this gap by opening the black box of the context-reliant nature of smart governance.

In sum, the major objective of this study is to generate a factual basis for debate by providing an overview of what is known about the context-dependent contribution of ICT-enabled citizen-government collaboration to urban sustainability. The article is structured as follows: in the next section, we introduce our research methods, followed by the section wherein we examine the main building blocks of smart governance. Then we present what the literature reveals about the (sustainability) outcomes of smart governance, while the section after that highlights the major contextual factors. In the last section, we discuss policy implications and suggest a future research agenda.

Literature Review: Methods and the Corpus

In order to address the research question formulated above, we conducted a systematic literature review. Cooper and Hedges (2009) formulated six stages for a systematic literature review, i.e., problem formulation, literature search, data evaluation, data analysis, interpretation of results, and public presentation. Our problem formulation has already been presented in the introduction, and this paper represents the presentation of our review to the public. The remaining steps can be grouped into two main categories: the literature search, and the data evaluation, analysis, and interpretation. We will elaborate on these two phases below.

For our literature search, we established a set of rules describing the study and report eligibility criteria, and the search strategy:

- *Topic and search terms:* To cover all dimensions of our research topic in an integrated way, we used the following combinations of search terms: e-governance participation, e-governance sustainability, citizen e-participation urban sustainability, smart city participation sustainability, city participation ICT sustainability, governance e-collaboration citizen sustainability, smart city citizen sustainability, e-participation co-creation sustainability and collaborative e-governance. Our aim was to find articles dealing with the topic in its entirety, and addressing, in particular, the relationship between smart governance and sustainability, rather than its distinct elements separately (such as collaboration, governance, innovation, e-government, participation, sustainability, etc.).
- *Study and research design:* We included all types of research designs (case studies, questionnaires, experiments, literature review, comparative research) with a goal of covering the full breadth of the research field to compensate the identified shortcomings in scope and depth in the scientific literature.
- *Year, language, and publications status*: Studies were retrieved which were published in the period 2006–2016, as smart cities and the use of ICTs for participatory/collaborative

governance are recent phenomena (Harrison et al., 2010). Only publications written in English language were considered. In order to assure the quality of our literature review, we only included international, peer-reviewed (conference, proceedings) papers and books, and book chapters from well-known academic publishers.

We started the search process by using established scientific databases, such as Scopus, PiCarta, and Web of Science. In the first round, we used the terminologies "e-governance" AND "participation and e-governance" AND "sustainability" as titles, abstracts, and key words in the query entry. Based on the above detailed search and eligibility criteria and their accessibility, we could identify only 11 relevant publications. To expand the results and to build up a robust body of relevant literature, we then used Google Scholar. While we are aware that the algorithm of Google Scholar is not transparent, we opted for its use as this yielded many more relevant publications. Since the more general search terms (such as "e-governance") on Google Scholar generated a huge number of irrelevant articles, we formulated specific combinations of terminologies, targeting our research scope (as listed above). Each combined search term delivered more than 40,000 hits. The selection took place by identifying appropriate articles from page one by reading their titles, abstracts, and introductions. Beyond the defined search criteria, the records were also assessed according to additional quality indications (journal, edited book by renowned scholars) and impact (number of citations). Each search term was assessed to about page 10 or 12, up to a point where either irrelevant or previously identified papers were exposed. This resulted in an additional 83 articles.

Our search through digital databases produced a total of 94 articles. In addition, we included further studies in the analysis from other sources, namely recommendations from academics and peer reviewers. Systematic literature procedures, such as the PRISMA method, allow the use of documents from sources other than database searching (Liberati et al., 2009). The extensions we used provided additional perspectives, both as regards updating and the inclusion of other fields of study (public administration, urban issues, etc.) important for our theme. This resulted in 20 additional papers.

Table 1 provides a quantitative overview of the examined articles (a total of 114, included in the references list), classified according to the specific research field in which they were published. As this table shows, our paper is a multidisciplinary synthesis of various strands of literature (e.g., public administration, urban studies, planning, computer sciences) related to smart cities and smart governance that aims to pave the way for

Table 1. Number and percentage of articles per research field of the source (i.e., journal, conference, book)

Research Field	Number of Articles	Percentage
Public Administration	17	15
Specialized Fields, combining (Information) Technologies with Human Interactions such as Government, Participation, Governance, etc.)	47	41
Urban Studies	10	9
Spatial and Planning Studies	10	9
Computer Sciences/IT	10	9
Management and Economics	8	7
Topic-Related (i.e., Sustainability, Buildings, Water, Energy, etc.)	12	10
Total:	**114**	**100**

an integrative understanding of these concepts. Almost half of the examined studies originate from specialized areas that deal with the application of (information) technologies in human-related interactions by connecting issues of government, technologies, collaboration, citizen participation, and sustainable development. At the same time, the number of articles that precisely match our topic—namely, the effect of technology-enabled collaboration between citizens and local governments on sustainable development—is small. This confirms that our review is a valuable contribution to understanding how technologies affect and are effected by urban environments.

For our data evaluation, analysis, and interpretation, we worked with a structured spreadsheet. For each main variable (i.e., smart governance, outcomes, and context) we identified sub-variables as a starting point for the analysis since the main variables are often not explicitly mentioned in the papers and because these broad concepts consist of multiple components.

As sub-variables of smart governance, we identified governance actors, organizational characteristic, types of ICT-use, citizen participation, and the (spatial) scale of collaboration. The sub-variables of sustainability outcomes were defined as the desired and adverse social, economic, and ecological outcomes and their impact on various societal and spatial levels. The third group of sub-variables referred to the context and entailed culture and democratic tradition, policy domain, trust, socioeconomic characteristics, demographic characteristics, spatial characteristics, and Internet penetration. Given the explorative nature of the review and the preliminary character of these components, we iteratively further developed these sub-variables throughout the research.

Based on the demarcation of the main and the initiatory sub-variables, we created an Excel factsheet for encoding the articles. Three researchers encoded each of the articles independently from one another. In order to guarantee inter-coder reliability, the three researchers discussed the results and the work methods, and refined the analytical factsheet. The analysis and interpretation of the results were performed qualitatively, since the perspectives on the topics as presented in the various papers varied considerably in scope, nature, and depth. A follow-up assessment of evidence for certain relations was not possible at this stage, due to the low number of empirical evaluations of smart governance. To arrive at an overview picture, we aimed to map this variation and identify the various conceptualizations and mechanisms. We summarized the overview in the spreadsheets to highlight the main patterns in the literature. This resulted in an overview of the literature that formed the basis for a more systematic examination of smart governance.

The Components of Smart Governance

We first explored the literature to enhance our understanding of smart governance by revealing details on its structure. To this end we examined the main components of smart governance that are—in line with our definition—governmental organization, citizen participation (and, consequently, government-citizen collaboration), and the use of technology.

Governmental Organization

The first building block of smart governance is the organization of government. This term entails a whole range of sub-facets such as motivation, vision and strategies, attitudes,

decision-making, process coordination, and roles and responsibilities, as well as the provision of financial, regulative, technological means and human resources, knowledge management and organizational culture, etc (Przeybilovicz et al., 2017). It emerged from our analysis that three organizational characteristics are critical for smart governance: (1) commitment, (2) responsiveness, and (3) operational management.

The first organizational characteristic, commitment, refers to the extent to which local government is motivated to engage in sustainable development through ICT-supported urban collaboration. According to a large number of papers, smart sustainability governance will not ensue without the cooperation of local governments (Islam, 2008; Chiabai et al., 2013; Portney and Berry, 2010; Royo et al., 2014b; Nam and Pardo, 2011; Sørensen and Torfing, 2016; Hendriks, 2014).

The second organizational characteristic regards the responsiveness of government. A longstanding relationship between government and citizens requires governments to become a receptive partner towards inhabitants (Alusi et al., 2011; Ertiö, 2015., Chiabai et al., 2013; Estevez et al., 2013; Engelken-Jorge et al., 2014; Santos et al., 2014). In order to continuously improve the effectiveness of e-participation programs, government leaders should report on the level of e-participation to major stakeholders and solicit feedback. This aspect is important in sustaining fruitful online collaboration since the degree of satisfaction of e-participants with the responsiveness of their government has a direct and positive association with their perceptions of individual development, their perceived influence on decision-making and their trust in government (Kim and Lee, 2012; Zheng, 2015; Royo and Yetano, 2015).

The third organizational characteristic is operational management. This classic organizational feature provides the operational basis to equip technology-supported collaborative governance arrangements with whatever is needed for their running, and covers all facilitative types of measures, actions, and preconditions. Many articles emphasize that this requires an integrated approach combining infrastructural, technological, social, and political systems, as well as cross-sectoral bridging between policy domains and urban priorities (Molinari, 2010; Nam and Pardo, 2011; Janowski, 2015; Paskaleva, 2014; Laspidou, 2014; Karlsson, 2012).

Process management and coordinated leadership as well as a well-crafted reiterative participation process with clear guidelines for the interlaced elements of strategic planning, design and implementation phases, are vital. Likewise, flexible institutional designs based on networking among interdependent public, private, and civil actors will support ICT-supported collaborative forms of co-initiation, co-design, and co-implementation, which may lead to creating novel public services (Yetano and Royo, 2015; Cruickshank et al., 2014; Lee et al., 2014; Sørensen and Torfing, 2016; Cimander, 2016).

A large strand of literature identifies a plethora of other organizational aspects for stimulating smart governance between citizens and their local administrations, such as financial resources and funding; time; the provision of technological training and guidance; the evaluative monitoring of processes and outcomes; supportive and protective (privacy) legislation (Certomà et al., 2015; Capra, 2016; Al Hujran et al., 2013; Lang and Roessl, 2011; Kingston, 2007; Schröder, 2014).

Hence, what is needed is clear. However, the literature tells us that the ambitions often remain within the realm of rhetorical phrasings. Despite the verbal adulation of sustainability and technology-enabled stakeholder participation, this does not often result in the

implementation of significant changes in these areas (Aichholzer et al., 2016; Portney, 2013; Washington, 2014; Krenjova and Raudla, 2017; Wehn et al., 2015; Álvarez-Crespo, 2014; Molinari and Ferro, 2009; Santos and Tonelli, 2014).

Sustainability policies, therefore, often tend more to resemble "greenwashing" than actual commitment with digital technologies primarily being applied for administrative and transactional efficiency instead of, for instance, in support of dialogue (Cruickshank et al., 2014; Roman and Miller, 2013; Janowski, 2015; Royo et al., 2014a; Wolfram, 2012; Loorbach et al., 2016; Gabrys, 2014; Washington, 2014).

Urban governments still regard the public as mere recipients of information, often failing to consider citizens' various perspectives in decision-making or to provide feedback on ICT-supported participation processes (Edelmann et al., 2012; Coleman and Blumler, 2009; Ferro and Molinari, 2009; Verdegem and Verleye, 2009; Charalabidis et al., 2012; Lee and Kim, 2014; Yetano and Royo, 2015; Zheng, 2015).

This is mainly due to the municipalities' lack of understanding, capacity, and expertise. In addition, many articles point to the reluctance of local governments to share power with citizens and to give up their autonomy (Gabrys, 2014; Royo et al., 2014a; Santos and Tonelli, 2014; Paskaleva, 2014; Bifulco et al., 2015; Roman and Miller, 2013; Janowski, 2015).

Citizen Participation

The second building block of smart governance, and one according to the literature that offers huge potential, is citizen participation. Citizens can offer useful and helpful suggestions for government agencies to arrive at better informed policy decisions (Al Hujran et al., 2013; Stratigea et al., 2015; Anttiroiko et al., 2014; Singh Kalsi and Kiran, 2013). Relevant components are (1) the degree to which these forms of citizen participation in urban governance are interactive (Arnstein, 1969), (2) the representativeness of the participating population, and (3) motives for citizens to participate.

Concerning the level of citizen participation, the findings indicate that technology-supported governance initiatives have modest outcomes. The literature mainly referred to non-participative and non-deliberative activities such as political support-seeking, consultation, or one-way information provision (Cruickshank et al., 2014; Molinari, 2010; Edelmann et al., 2009; Molinari and Ferro, 2009; Royo and Yetano, 2015). The review shows that authentic e-participation, leading to policy changes through citizens' authority in decision-making, is nearly absent in practice (Wehn et al., 2015; Capra, 2016; Royo et al., 2014a, 2014b; Tikka and Sassi, 2011; Roman and Miller, 2013). According to some, better governance through digitally facilitated cooperation between citizens and governments is a myth, since very few empirical studies could offer evidence of improvement in this area (Roman and Miller, 2013; Bekkers and Homburg, 2007; Paskaleva, 2014; Chiabai et al., 2013). In that respect, many papers cast doubt on the value of ICT tools in participation by arguing that digitization has not resulted in broader and deeper civic involvement.

The findings are more diverse regarding citizens' capacity and willingness to engage in smart governance. In this regard, questions on the issue of the representativeness of citizen participation in smart governance abound. Numerous papers stated that pre-existing participation patterns, including socioeconomic and technological segregation, have been strengthened as a result of applying new technologies in government–citizen relations (Neirotti et al., 2014; Neubauer et al., 2012; Karlsson, 2012; Nam and Pardo, 2011). The

reason for this is twofold: on the one hand, the technology has enabled the emergence of a group of very active participants who are usually better educated, more affluent, technologically more competent, and who know more about urban policy issues (Lee and Kim, 2014; Karlsson, 2012; Wehn et al., 2015; Stratigea et al., 2015; Hanna, 2010; Neirotti et al., 2014; Portney and Berry, 2010). For instance, the US cities most noted for environmentalism and a sustainability ethic are characterized by a youthful, idealistic, and prosperous citizenry that have strongly influenced municipal sustainability policies (Washington, 2014). On the other hand, the emerging technology also created a group of "unplugged" citizens who do not participate, typically made up of people with low incomes, insufficient schooling, and/or a marginalized status (immigrants, disabled, elderly), or living in isolated/rural locations (Molinari and Ferro, 2009; Yigitcanlar and Lee, 2014; Gabrys, 2014; Yetano and Royo, 2015; Sun and Nakata, 2011; Molinari and Ferro, 2009; Kingston, 2007; Neubauer et al., 2012). Although members of the older generations are usually more engaged and interested in politics and public affairs, they are digitally less skilled, and prefer traditional (face-to-face) participation (Wijnhoven et al., 2015; Yetano and Royo, 2015; Tikka and Sassi, 2011; Åström and Granberg, 2008). Young people have considerable experience in using computers, the Internet, and smart phones, but they predominantly tend to lack the eagerness to engage in policy-making processes or urban development (Ertiö, 2015).

The motivations to engage in smart governance received far less attention in the literature than the other two components. What information there was suggested that intrinsic motivation and intangible rewards were far more decisive factors in the decision to participate in collaborative technology-supported governance than extrinsic motives (e.g., monetary reward). Civil actors were found often to be motivated for reasons of solidarity, altruism, and the felt need for problem-solving in environmental and community issues (Royo and Yetano, 2015; Kim and Lee, 2012; Zait, 2017). However, the examined studies also confirm that despite civic voluntarism by knowledgeable and active inhabitants, citizens' interest and involvement in public affairs exhibit a general decline (Krenjova and Raudla, 2017; Sørensen and Torfing, 2016; Roman and Miller, 2013; Deakin and Allwinkle, 2007; Chiabai et al., 2013; Wehn et al., 2015).

Use of Technology

The final building block of smart governance is the use of technology, in particular ICTs. We mapped how digital technologies are applied in participatory governance processes aiming at sustainable urban development. We identified the types of technologies used and the aims they are applied for, as well as their limitations.

The literature showed a growing diversity of devices, tools, and technologies that are deployed for diverse engagement (Islam, 2008; Royo and Yetano, 2015; Anttiroiko et al., 2014; Estevez et al., 2013; Álvarez-Crespo, 2014; Engelken-Jorge et al., 2014). One intention technologies serve is one-way communication with examples as web portals (including e-mail service) and different kinds of visualizations (Augmented/Virtual Reality), which aim at building support for intended policies. Openly available tools serve to lower the barrier to entry into the policy realm for the average citizen, allowing him/her to make connections and enhancements to often available, but not easy to leverage information from municipality websites (Gano, 2013). By soliciting ideas and gauging

opinions through these channels, municipalities can test the level of public agreement on their proposals beyond the more conventional e-voting and e-petition tools. Other applications commonly employed for information receive-only purposes are the collection of geo-data by sensors and collaborative mapping, monitoring greenhouse gas emissions, or localized diversity in energy use (Wehn et al., 2015; Laspidou, 2014). Mobile phones, growing more than other types of communication, are in particular frequently deployed in these kinds of participatory sensing that enables citizens to collect a wide array of data in situ (Ertiö, 2015; Wehn et al., 2015; Das Aundhe and Narasimhan, 2016; Nam and Pardo, 2011; Krenjova and Raudla, 2017; Singh Kalsi and Kiran, 2013). Mobile phones were seen as becoming increasingly important in developing regions, as they grant a viable alternative to computers and hence access to resources that might be a step towards bridging the digital divide and eradicating poverty (Islam, 2008; Hanna, 2010; Singh Kalsi and Kiran, 2013; Kim and Lee, 2012). The use of mobile phones is also expected to attract more youngsters to participatory processes, as these tools are much more appealing to them (Ertiö, 2015; Zheng, 2015).

Technological applications, such as discussion forums, electronic town hall meetings, wikis, and blogs, are also employed in two-way communication processes, wherein participants can productively interact with each other (Cleland et al., 2012; Royo et al., 2014b; Stratigea et al., 2015; Tikka and Sassi, 2011; Termeer and Bruinsma, 2016). The increased use of Web 2.0 and social media tools favor citizen-created content, which not only enhances the free flow of information but fosters diversity of opinions, socio-political debate, and freedom of expression while creating an environment conducive to crowdsourcing initiatives (Royo and Yetano, 2015; Chiabai et al., 2013; Karlsson, 2012).

The literature also found that data platforms and software tools that allow for the retrieval, storage, modelling, analysis, and visualization of data play an increasingly important role. These applications are often used jointly with the aforementioned information gathering and communication support technologies and entail instruments such as Public Participatory Geographic Information Systems (PPGIS), Planning Support Systems (PSS), and Decision Support Systems (DSS) (Macintosh, 2004; Kokkinakos et al., 2012; Geertman et al., 2015).

Although these technological applications play an increasingly important part in governance processes, they also have limitations in use, mainly due to a lack of technological infrastructure and/or ICT knowledge on the part of both public officers and citizens (Lee et al., 2014; Karlsson, 2012; Islam, 2008). According to the literature, the level of technology intensity is inversely related to the intensity of civic participation: projects with less dependence on technologies and data deliver more involvement of participants and vice versa, This is because ICT-facilitated collaborative projects with a strong technological and data-driven nature hinders citizens' understanding of complex issues and policies (Capra, 2016; Deakin and Allwinkle, 2007; Yigitcanlar and Lee, 2014; Charalabidis et al., 2012; Evans and Campos, 2013).

In this aspect it is not surprising that the reviewed articles also indicate that, despite the ongoing increase of online involvement, much citizen–government cooperation still happens through face-to-face interactions, since this is what citizens prefer (Capra, 2016; Abu-Shanab and Al-Quraan, 2015; Yetano and Royo, 2015). Citizens choose rationally between different participation methods. Whether they opt for offline or online engagement depends on which is more convenient, efficient, and cheaper. The

functionality of e-participation applications affects a user's choice: websites that are difficult for citizens to navigate or from which it is difficult to extract information, discourage participation (Coleman et al., 2008; Zheng, 2015; Hong, 2015). Compared to citizens' offline public activities, digital participation showed lower engagement levels and higher drop-out rates. Online cooperation projects are easily abandoned due to the referred causes, including low entry, transaction, and opportunity cost. The wide net of online activities of many people breeds shallow attention, time shortage, and transitory involvement (Lee and Kim, 2014; Yetano and Royo, 2015; Zheng, 2015; Bifulco et al., 2016).

Critiques revealed in the literature highlight other limitations, for example how apps-based participatory sensing transforms citizens into operative units for data-collection (Roman and Miller, 2013; Gabrys, 2014; Yigitcanlar, 2015). Also, various studies claim that the technologies available, rather than the users' needs and expectations, guide the design of online service infrastructures (Gabrys, 2014; Roman and Miller, 2013; Chiabai et al., 2013; Laspidou, 2014; Royo and Yetano, 2015). Governments assume that the sheer presence of online channels will automatically lead to more participation ("*if you build it they will come*") (Molinari and Ferro, 2009: 6).

What Are the Outcomes of Smart Governance?

The aspired substantive outcome of smart governance is sustainable urban development integrating social, economic, and environmental values. These aspects are discussed in this section to provide an answer to the second guiding question: what are the outcomes of smart governance?

A first observation is that the effects of smart governance on sustainable urban development have remained strongly understudied. This is confirmed by the strand of the investigated corpus arguing that the way smart governance contributes to a more sustainable society is largely unknown (Paskaleva, 2014; Voorberg et al., 2015; Osella et al. , 2015; Aichholzer et al., 2016; Meijer, 2016). Although both academics and practitioners commonly associate the potential of smart governance with creating greener, healthier, more equitable, economically and culturally thriving communities (Portney, 2013; Meijer and Bolívar, 2016; Bifulco et al., 2016), verification of this was difficult to find in the examined literature. Despite the profusion of promises and expectations, the extent to which these were actually realized remained largely unexplored. Some papers initially stated an intention to examine in depth the actual contribution of smart governance and the use of ICT tools in collaboration in terms of public values and sustainable development. However, they tended not to venture beyond the discussion of either public service transactions and related administration efficiency or the presentation of collaboration and project objectives (Osella et al., 2016; Singh Kalsi and Kiran, 2013; Bifulco et al., 2016).

A second observation is that the studies were mixed regarding the effects on sustainable urban development. The few papers (listed and discussed in the following two paragraphs) that addressed the effects of ICT-supported cooperation on sustainable development in its integrative concept including economy, social issues, and environment offered varying perspectives. We found skeptics/pessimists, and optimists. The optimists—who were, granted, limited in number—did report observing sustainability benefits from ICT-enabled cooperation projects (Estevez et al., 2013; Hanna, 2010; Scott, 2015). Estevez

et al. (2013) analyzed EGovernance for Sustainable Development (EGOV4SD) initiatives, and showed that these contributed to a range of sustainable development goals. The authors mentioned that the most common sustainability problems, effectively addressed in these projects, were empowerment (social), business opportunities (economic), man-made activity (environment), and capacity building (institutional).

The skeptics and pessimists held that smart governance has not yet yielded long-term sustainability outcomes (Royo et al., 2014a, 2014b; Yigitcanlar and Lee, 2014; Deakin and Allwinkle, 2007; Singh Kalsi and Kiran, 2013; Washington, 2014; Royo and Yetano, 2015). They mostly rejected the idea that digital co-creation could have value from the perspectives of political and social impact, scalability, and sustainability (Paskaleva, 2014; Voorberg et al., 2015; Prieto-Martín et al., 2012). They pointed to the growing techno-economic divide between tech haves and tech have nots as a negative effect, as well as to a range of unfavorable ecological outcomes. The South-Korean smart eco-cities of Songdo and Incheon, for example, were established on precious wetlands, destroying the habitat of some of the rarest species on the planet (Yigitcanlar and Lee, 2014).

A third observation is that studies frequently focus on sole elements of sustainability such as only the social or only the environmental outcomes of ICT-supported state-citizen collaboration. In view of the environmental outcomes researchers found that smart governance could produce decreasing emissions of carbon dioxide on both the individual (household) and the collective level. They emphasize that only a multitude of multidisciplinary actions, activating citizens on different scales, can trigger behavior changes and fossil energy reductions for environmental protection (Cimander, 2016; Cimander et al., 2016). However, adverse effects have also been found such as those partially produced in a European smart governance project targeting the reduction of CO_2 emissions. While significant savings were achieved in respect of heating energy and electricity, in some cases increased emissions occurred in the fields of nutrition and consumer goods. The mobility domains of private and public transportation and flights also exhibited heterogeneous tendencies (Cimander, 2016).The social aspect of sustainability, which was covered by studies, partly refers to citizen participation that has been detailed in the previous section "The Components of Smart Governance." Citizen participation here may also be termed democratic governance when considering the specific goals targeted by citizen participation: enhanced transparency, democracy, improved legitimacy, and efficiency of public service delivery (Wolfram, 2012; Ertiö, 2015; Zavadskas et al., 2010; Roman and Miller, 2013; Curwell et al., 2005; Engelken-Jorge et al., 2014; de Araujo and Taher, 2014). However, whether these participation goals have been achieved are not examined in the articles selected. Rather, the various characteristics of citizen participation (e.g., the types, roles, and number of participants, the level and intensity of involvement, citizens' satisfaction with the project) are considered by the majority of the articles as the main outcomes of ICT-supported collaborative governance (Chiabai et al., 2013; Capra, 2016; Wehn et al., 2015). This solitary focus in the bulk of the articles suggests that civic engagement was assessed for its own merit and much less for its contribution to urban sustainable development through democratic governance (Meijer and Thaens, 2016; Aichholzer et al., 2016; Osella et al., 2016).

Another social aspect of sustainability, which was addressed in the articles, refers to participants' learning capacity about which the literature is more hopeful. Much is made of the beneficial features of online citizen participation in terms of learning. Citizens' experiences in the policy-making process are thought to be able to serve as a "school of democracy," since it

may help participants become more informed citizens. In addition, information technologies can positively affect citizen participation by enabling participants to become more knowledgeable about governmental and public affairs and sustainability challenges and also become more skilled in communication. These interactions make citizens more prepared and interested in engaging in collective policy-making and urban development (Hong, 2015; Termeer and Bruinsma, 2016; Hanna, 2010; Nam and Pardo, 2011; Paskaleva, 2014; Yetano and Royo, 2015; Anttiroiko et al., 2014; Neirotti et al., 2014; Laspidou, 2014).

The examined articles provide examples. For instance, learning and sharing experiences between living labs—user-centered, experimental areas in a realistic territorial context—have triggered additional expressions of interest from potential user organizations and a significant growth in demand for related e-services (Cleland et al., 2012; Schuurman et al., 2012). Similarly, hackathons—time-limited, venue-based events, where ICT professionals, civil servants, interested citizens, and the private sector develop tech-based solutions for societal challenges—engendered the bridging of physical, cognitive, and social boundaries between stakeholders from wide-ranging domains (e.g., agrarians, politicians, civil partners, etc.). App feedbacks have advanced the identification of shared values and joint problem-solving, resulting in pilots by government agencies as well as by public and private stakeholders (Termeer and Bruinsma, 2016; Washington, 2014; Wang and Feeney, 2016; Das Aundhe and Narasimhan, 2016). Furthermore, the collective use of ICT instruments in spatial planning processes resulted in learning as the most crucial added value (Pelzer et al., 2016).

Learning in these cases positively influenced the governance process and the achievement of the objectives by different mechanisms. Learning—by becoming more conscious, informed, and aware—fostered the removal of mutual prejudices, the increase of partners' reciprocal understanding and trust, and a deeper knowledge of the issues at stake. Stakeholders' enhanced interest in the specific project and policy domain not only enabled the initiation of collaboration, but also allowed this to be sustained. Intellectual capital has been found to be a critical success factor in ICT-led government projects through multiparty collaboration. It refers to collective knowledge, largely in tacit form, embedded in governance actors' shared experiences during problem solving (Krenjova and Raudla, 2017; Das Aundhe and Narasimhan, 2016; Wehn et al., 2015; Sørensen and Torfing, 2016).

These encouraging effects notwithstanding, a recurrent theme in many articles was the insufficient learning capacity of local government and the negative effects this has on participation and urban co-production (Coleman and Blumler, 2009; Molinari and Ferro, 2009; Verdegem and Verleye, 2009; Charalabidis et al., 2012). To increase the outcome-effectiveness of their policies and of smart co-creation, city governments must themselves become learning organizations before formulating and implementing smart governance (Anttiroiko et al., 2014; Certomà et al., 2015; Capra, 2016; Termeer and Bruinsma, 2016; Hanna, 2010, Karlsson, 2012). However, in practice, less priority is given to drawing up a knowledge agenda of governance arrangements that could help advance process-management (Paskaleva, 2014; Stratigea et al., 2015; Meijer and Thaens, 2016).

Contextual Factors Influencing Smart Governance

Finally, we explored the literature to learn about (expected) major contextual factors and how these influence ICT-supported, citizen-government governance aiming at sustainable

urban development. The analysis resulted in a context-sensitive operational framework and a list of expectations that can be tested in further empirical research.

Policy Domain

The core themes tackled and the characteristics of the problems within a policy domain are considered to be decisive for technology-enabled, citizen-government governance for sustainable urban improvement (Stratigea et al., 2015; Wolfram, 2012; Estevez et al., 2013; de Araujo and Taher, 2014; Royo et al., 2014a; Chiabai et al., 2013; Wehn et al., 2015). The salience, urgency, the socio-political intensity or sensitivity of topics may influence (enhance) the commitment of both governments and citizens to smart governance. For instance, the generally acknowledged importance of environmental protection, climate change, or the safeguarding of cultural heritage has heightened smart policy agendas and joint online or offline activities across the world (Krenjova and Raudla, 2017; Royo et al., 2014a; Chiabai et al., 2013; Portney and Berry, 2010; Vanolo, 2013). These strategic, collaborative agendas are frequently incited by external political pressure on governments to collectively find solutions.

Also, certain policy domains were seen to be more conducive than others to collectively taking sustainability measures and reaching the objectives through the support of digital technologies. This was illustrated by online participation projects such as the smart governance project aimed at reducing CO_2 emissions: while significant reductions were achieved in respect to heating energy and electricity, emissions failed to decrease or were even augmented in the fields of nutrition, consumer goods, and mobility (Cimander, 2016; Cimander et al., 2016).

Finally, some articles stressed that the complexity level of policy issues is critical for citizen-government relationships (Royo et al., 2014b; Certomà et al., 2015; Ertiö, 2015; Capra, 2016; Cleland et al., 2012). Complicated issues may be expected to have a negative effect on both online and offline citizen engagement, as tasks that are too specific and demand too much expertise can hamper citizens in the development of an informed opinion and discourage continued involvement. Simplicity also stimulates governments to facilitate ICT-supported collaboration, as it does not drastically increase workload (Krenjova and Raudla, 2017; Gabrys, 2014; Yetano and Royo, 2015).

Trust

Although trust can be an individual characteristic, the literature reveals that the general condition of trust within society is a vital factor in digital cooperation between public and civil actors (Ertiö, 2015; Molinari, 2010; Lee and Kim, 2014; Capra, 2016; Abu-Shanab and Al-Quraan, 2015; Certomà et al., 2015; Wehn et al., 2015; Meijer, 2016). Trust relates to the image people have of their government regarding existing policies, what they can expect from governments, and their own perceived influence in technology-facilitated decision-making.

Many scholars refer to the positive influence of trust, as it increases the probability that citizens will invest their resources, time, and knowledge in ICT-based participatory alliances (Royo et al., 2014b; Cruickshank et al., 2014). These scholars consider trust as a reflection of citizens' willingness to comply, cooperate, adopt, and support government

policies and innovative programs. By contrast, others state the exact reverse: that trusting citizens are less likely to engage in ICT-enabled, government-citizen participation, as trust decreases citizens' motivations to monitor government. It may well be that, although a lack of trust in politics motivates citizens to start collective actions, maintaining such initiatives necessitates the presence of trust. A third group of researchers argue that citizens' trust or distrust in mainstream representatives do not make them alienated from politics and their life communities. In that respect, political disappointment or satisfaction shows no effect on people's willingness to engage in smart governance practices (Wijnhoven et al., 2015; Edelmann et al., 2012; Torres et al., 2006).

These paradoxical findings display that technology-facilitated citizen participation can be triggered by either trust or distrust in governmental policy solutions though the endurance of citizen engagement necessitates trust in the procedural fairness of government (Lee and Kim, 2014; Sun and Nakata, 2011; Gano, 2013; Kim and Lee, 2012; Sørensen and Torfing, 2016).

Political and Institutional Environment

It further emerged from the literature that both the formal and informal facets of the wider political and institutional environment play a major role in smart governance. A rather obvious factor here is the strength of democracy. A strong democracy can be expected to result in more ICT-accommodated citizen engagement and to stimulate the top-down digitalization of citizen participation (Santos and Tonelli, 2014; Coleman and Blumler, 2009).

Many articles pointed to the existing political system as a conditioning factor in the outcome of smart governance arrangements (Gano, 2013; Santos and Tonelli, 2014; Coleman and Blumler, 2009; Paskaleva, 2014; Sieber, 2006; Roman and Miller, 2013). Berry and Portney (2013) underline that sustainability policies mostly prevail in cities that are politically liberal (progressive), while Tikka and Sassi (2011) trace the relations between political liberties, electoral rights, and (online) political participation.

Several authors referred to the innovative atmosphere of a place as an influence on digitally-supported open government and cooperative governance (Voorberg et al., 2015; Correljé et al., 2015; Hearn et al., 2005; Alusi et al., 2011). Lee et al. (2014) mention the typical San Francisco culture of creative participation for software applications development and discovering new service areas. Another example is the municipality of Tartu, the adoption-initiator of online participatory budgeting in Estonia. The innovative and creative characteristics of Tartu, along with its reputation as "the city of good thoughts" and "the intellectual capital," drove other municipalities to follow and to implement their own public innovation programs (Krenjova and Raudla, 2017: 17).

The literature also suggested that the political legacy of a country may influence ICT-empowered citizen involvement. Various studies (Santos and Tonelli, 2014; Santos et al., 2014; Cornwall, 2002) demonstrated how colonial exploitation and oppression, long-term slavery, military repression, and a patrimonial, centralized government long discouraged grassroots movements.

Inherited institutional frameworks also influence the evolution of smart governance between citizens and governments. (Lang and Roessl, 2011; Janowksi, 2015; Islam, 2008; Molinari, 2010; Azad et al., 2010; Ricciardi and Lombardi, 2010). Administrative

culture, in particular, rooted as this is in political traditions and societal value orientation, would seem to be an important factor. More formal, hierarchical cultures and highly centralized public administration may therefore be expected to result in less either face-to-face or technology-driven citizen engagement (Portney and Berry, 2010; Torres et al., 2006; Roman and Miller, 2013; Santos and Tonelli, 2014; Schuurman et al., 2012; Hong, 2015).

The literature also contained references to informal institutional dimensions that might shape the evolution of e-government, as well as the propensity for electronic co-production between civil and governmental stakeholders and the forms this could take (Al Hujran et al., 2013; Meijer, 2016; Janowski, 2015; Correljé et al., 2015; Tikka and Sassi, 2011; Álvarez-Crespo, 2014; de Araujo and Taher, 2014). These factors cover issues of customs, traditions, religion, and routines within a given society or community, although their effects are not clear.

Internet Reach and Use

The literature was unanimous on the fact that the Internet and the pervasiveness of digital infrastructures are transforming traditional governance and stimulate online public-citizen collaboration to reach more urban sustainability. A higher intensity and developmental level of online participation was shown to be strongly linked to countries with widespread Internet penetration, broadband availability, and high technological development.

Researchers have also found evidence of a correlation between the availability of ICTs, open-source technologies and the proliferation of technology-based participatory programs, including civil efforts to reverse existing geometries of power (Royo et al., 2014b; Certomà et al., 2015; Torres et al., 2006; Al Hujran et al., 2013; Azad et al., 2010; Edelmann et al., 2009; Schröder, 2014; Hanna, 2010).

Many authors (Islam, 2008; Royo et al., 2014a, 2014b; Certomà et al., 2015; Santos et al., 2014; Stratigea et al., 2015) stress that Internet dissemination and widespread ICT use have changed citizens' expectations regarding governmental actions. By gaining online access to a large number of resources, the public has become used to taking part in online or offline decision-making. It is a cumulative technological effect—a process in which attitudes are gradually being adjusted to the available means (Åström and Granberg, 2008). As the level of Internet infiltration increases, municipalities are feeling an even greater push from citizens and from societal and business organizations to provide (environmental) information, implement sustainability measures, and to include multiple stakeholders in policy processes and online services (Azad et al., 2010; Cleland et al., 2012; Al Hujran et al., 2013; Gabrys, 2014; Yigitcanlar and Lee, 2014; Paskaleva, 2014; Meijer, 2016; Twinomurinzi et al., 2012; Álvarez-Crespo, 2014).

In developing countries and in disadvantaged areas in developed regions, the absence of or limited access to the Internet is a significant obstacle in achieving civic empowerment, public-civil collaboration and sustainability (Islam, 2008; Abu-Shanab and Al-Quraan, 2015; Al Hujran et al., 2013). Moreover, the digital socio-cultural and economic gap impedes the migration of public services and citizen-government cooperation to the World Wide Web (Neirotti et al., 2014; Molinari and Ferro, 2009). The lack of accessibility to various ICT applications hampers collaborative, technology-based urban planning as well (Stratigea et al., 2015).

Socio-Spatial Characteristics

The (human-) geographical features of a city can influence electronic public services and ICT-supported governance practices. For instance, the topography may render specific locations vulnerable to natural disasters (flooding, earthquakes). Such threats may invoke societal pressure and highlight the vital need for collective public-civil actions by making use of new technological applications (Wehn et al., 2015; Royo et al., 2014a; Abu-Shanab and Al-Quraan, 2015; Lang and Roessl, 2011; Meijer, 2016; Tikka and Sassi, 2011; Neirotti et al., 2014).

It was unclear from the articles we examined whether and to what extent the size of an urban area affects the evolution of smart governance. Although big cities are not always more innovative, they have more staff and management resources, facilitating the development of novel instruments, service delivery options, and online interactions with citizens (Torres et al., 2006). The efficiencies associated with larger geographical size, together with greater numbers of constituents can thus provide local authorities with the motivation to employ technologies (Saglie and Vabo, 2009; Cruickshank et al., 2014; Krenjova and Raudla, 2017). On the other hand, citizens in smaller or rural communities have been found to have higher frequencies of ICT-enabled participation, regardless of their relatively poor Internet-connectivity (Cruickshank et al., 2014; Cimander, 2016). Neirotti et al. (2014) also argue that smart city initiatives are not correlated with the size of a city in terms of population, but rather with the population density.

Finally, social cohesion is expected to be positively related to digitally-enabled citizen engagement. Citizens' local embeddedness and place- and community-identity are significant for mobilizing resources to organize collaborative (online) activities in the public domain. In line with this, several studies demonstrated that in order to establish successful urban development, smart governance planning processes should fit the distinct community context (Castelnovo et al., 2015; Álvarez-Crespo, 2014; Zait, 2017). Table 2 summarizes the expectations we found for the influence of context on smart governance.

Finally, Figure 1 recaps our findings concerning the elements of and the relationships between the main variables—smart governance, its (sustainability) outcomes, and the contextual influences.

Conclusions

The highly optimistic accounts of sustainability outcomes of technology-enabled government–citizen interactions, that, however, were generally not based on empirical evidence, triggered us to conduct this literature review. Filling these knowledge gaps was the main goal of our analysis as we sought an answer to our central research question: *What relationships exist between ICT-enabled citizen-government collaboration and sustainable urban development and how do contextual circumstances influence these?*

The first conclusion of our review is that smart governance, in the sense of ICT-enabled government-citizen collaboration to advance urban sustainability, is still rare. Despite the increasing variety of collaboration-based digital instruments, the literature reveals the dominance of a one-way information supply in citizen–government interactions. Although governments promote online and offline citizen engagement and civic empowerment, in practice they do not encourage deliberation or any broad-based public–civil interactions. Therefore, ICT-supported government–citizen cooperation for collectively shaping

Table 2. Expected influence of the context on smart governance

Context Factor	Expectation
Policy Domain	
Sense of urgency	The urgency of the topic within a policy domain results in greater governmental and citizen commitment towards smart governance
Complexity of issues	Complexity of issues has a negative result on ICT-supported citizen engagement and public–civil collaboration
Trust	
Trust within society	Both a high and low level of citizens' trust in governmental policy solutions may kick-start citizen engagement supported by means of technologies. Trust in the procedural fairness of government is needed in the continuation phase of smart collaboration.
Political and Institutional Environment	
Strength of democracy	A stronger democracy results in more ICT-enabled citizen engagement and public-civil collaboration
Political legacy	A recent authoritarian past is negatively related to citizen engagement and public–civil collaboration supported by digital technologies.
Administrative culture	More formal and hierarchical administration styles result in less ICT-enabled citizen engagement. Nationally centralized public administration and government leads to a lower level of technology-enabled collaboration between citizens/ communities and local governments.
An innovative and progressive political and business milieu	A political and economic environment with an innovative and progressive atmosphere nourishes both top-down and bottom-up innovation, citizen participation that contributes to smart governance.
Internet Reach and Use	
Internet penetration	A higher intensity and developmental level of ICT-facilitated participation is strongly linked to countries with widespread Internet penetration and technological proficiency.
Socio-Spatial Characteristics	
Vulnerability to disasters	Vulnerability to disasters and natural forces results—through pressing societal needs—in high levels of governmental and citizens' commitment to smart governance.
Social cohesion	Social cohesion within a locality positively correlates with citizen engagement in smart city arrangements.

public matters seldom occurs. The reason for this lies in the lack of capacity and willingness to genuinely engage in smart governance for urban sustainability, both on the part of government and that of citizens. Old structures, patterns, and routines still dominate. Evidently, the mere availability of technological infrastructure is no guarantee that any radical attitudinal change will occur in public administration and the civil sphere regarding the development of co-creative collaboration to create more sustainable cities.

The second conclusion is that the evidence that smart governance contributes to sustainability is sparse and mixed. Notwithstanding all expectations in this direction, the literature fails to elucidate whether smart governance activities lead to more livable cities, i.e., cities with less social deprivation, more ecological diversity, and enhanced economic prosperity. The limited number of articles dealing with these aspects deliver mixed results. There are some indications for positive sustainability effects, although a significant number of adverse consequences also emerged. Smart governance often increases the gap between the haves and have nots rather than generating more equal societal structures. It may also boost public consumption or jeopardize ecological values, rather than contribute to a city with a balanced program of development along economic, social, and environmental dimensions.

The third conclusion is that there is more evidence for the process effects of smart governance. This is because the majority of the examined articles focuses on solitary,

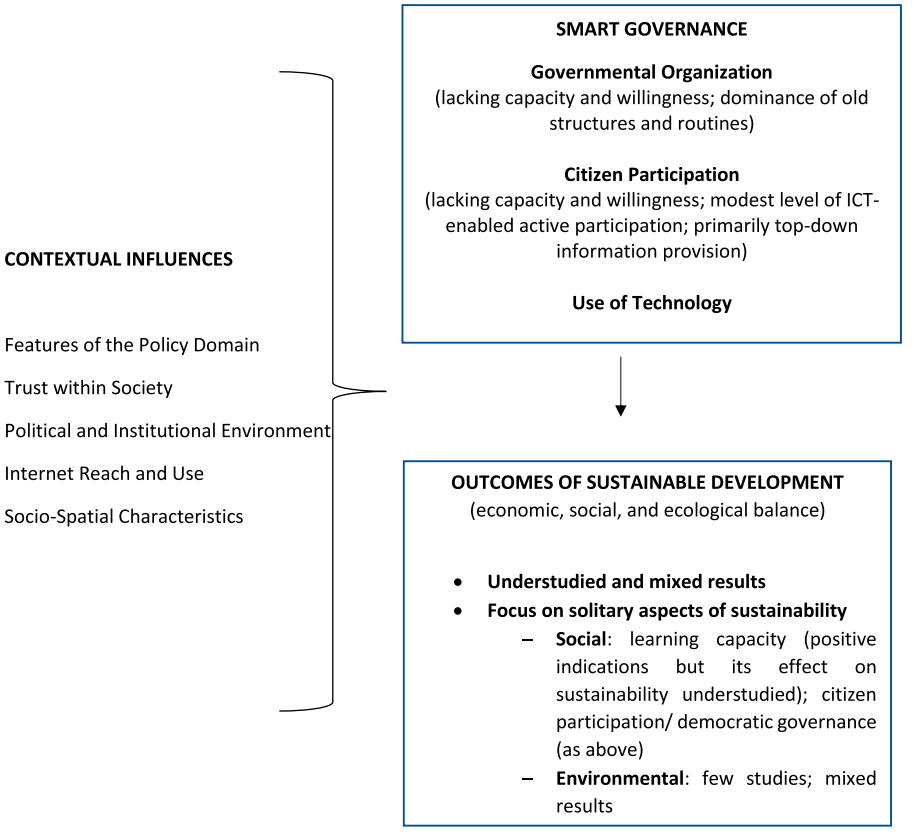

Figure 1. Summary of the research findings with the key variables

particularly the social, aspects instead of assessing sustainability in its integrative—economic, social, and environmental—outcomes. Hence, scholarly attention centers on activities such as civil engagement and learning as primary outcomes of smart governance. Citizen participation and learning can indeed be (achieved) goals as social aspects of sustainable development. However, many studies seem to treat ICT-facilitated citizen participation as a merit in itself—engagement for the sake of engagement without questioning its benefits for the society. The review also revealed that, while the broad range of online collaborative experiments were often seen to contribute to social learning, surprisingly little attention was paid to their contribution to sustainable urban development.

The fourth conclusion is that context matters. We identified specific contextual factors such as the policy domain, political-institutional (e.g., democracy, innovation, administration styles), societal (e.g., Internet reach and use in the society, trust), and socio-spatial (e.g., topography of the city, local-specific social cohesion) dimensions. These contextual factors influence the distinct components of smart governance (the role of governments and citizens as well as ICT use) and define how local governments and citizens collaborate through new electronic resources, which, in turn, determine the potential of advancing urban sustainability. Based on this literature review, we may expect specific governance approaches only to work in similar contexts. Our list of context-related expectations will support future empirical research on this domain.

These outcomes sketch the contours of some essential scope conditions for successful smart governance activities. This success can be understood in terms of the initiation and endurance of broad-based collaboration by means of technologies, which contributes to urban sustainability. For this, the major scope conditions lie at the interface between the human factor and the specific contextual circumstances. While the human factor implies both governmental and civil competences such as commitment, willingness, and capacities the context conducive to effective smart governance refers to the circumstances summarized above.

Our review demonstrates that there is certainly no reason for having blind faith in smart governance. We need a deeper understanding of the forces acting as a hindrance or encouraging local governments and citizens to engage in digitally-supported collaboration in order to accelerate sustainability transition in cities. In addition, more in-depth case studies in various regions and cities are required to develop and test contextualized smart governance models that facilitate theory building about their effectiveness in public administration. We particularly need to gather more empirical facts about the relationship between smart governance and sustainable development. Future research should depart from a contextual understanding of smart governance, as different spatial settings have different urban priorities and circumstances that produce different dynamics of ICT-supported collaborative governance. We hope this research delivers some evidence that is needed for appropriate smart governance to reach the intended population and address the problems of urban unsustainability.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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