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Governing the smart city: a review of the literature on smart urban governance

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Abstract

Academic attention to smart cities and their governance is growing rapidly, but the fragmentation in approaches makes for a confusing debate. This article brings some structure to the debate by analyzing a corpus of 51 publications and mapping their variation. The analysis shows that publications differ in their emphasis on (1) smart technology, smart people or smart collaboration as the defining features of smart cities, (2) a transformative or incremental perspective on changes in urban governance, (3) better outcomes or a more open process as the legitimacy claim for smart city governance. We argue for a comprehensive perspective: smart city governance is about crafting new forms of human collaboration through the use of ICTs to obtain better outcomes and more open governance processes. Research into smart city governance could benefit from previous studies into success and failure factors for e-government and build upon sophisticated theories of socio-technical change. This article highlights that smart city governance is not a technological issue: we should study smart city governance as a complex process of institutional change and acknowledge the political nature of appealing visions of socio-technical governance.

Points for practitioners

The study provides practitioners with an in-depth understanding of current debates about smart city governance. The article highlights that governing a smart city is about crafting new forms of human collaboration through the use of information and communication technologies. City managers should realize that technology by itself will not make a city smarter: building a smart city requires a political understanding of technology, a process approach to manage the emerging smart city and a focus on both economic gains and other public values.

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Smart cities as an emerging domain of study

More than 50 percent of the world population lives in cities (UN, 2011) and city governments face a wide range of challenges: they need to produce wealth and innovation but also health and sustainability. Cities are to be green and safe but also culturally vibrant (Landry, 2006). On top of this, cities need to be able to integrate growing populations from different (ethnic, religious, socioeconomic) backgrounds. Recently, Barber (2013) has argued that city government is crucial to solving global problems and states that 'mayors rule the world'. The current administrative emphasis on cities as governance centers has been paralleled by academic attention. Urban governance has developed into a mature academic field (Pierre, 1999, 2011) but, more recently, this discipline is being connected to disciplines that focus on technology and innovation. E-government and innovation studies are being connected to urban governance to develop approaches that can make cities smarter (Nam and Pardo, 2011).

While Richard Florida's (2002) work about creative cities emphasizes the global competition between cities, Charles Landry (2006) highlights that local politicians and city managers should not strive to be the best city *in* the world but *for* the world. Making cities smarter is something that nobody can be opposed to if it results in more effective solutions to a broad range of societal problems. Smart technologies, smart collaboration, a highly educated population and effective institutions are argued to be needed to face the challenges of modern cities. This discourse about smart cities is rapidly spreading around the world. The idea that cities are the nucleus of economic development is widespread and, for governing the city, this means that city politicians and administrators should not aim to solve all the problems in the city but rather they should strengthen the capacity of urban systems to tackle a wide variety of problems and produce a wide range of public values (Landry, 2006).

An example of the current emphasis in urban governance on making the city smarter is Amsterdam Smart City (amsterdamsmartcity.com). This is 'a unique partnership between businesses, authorities, research institutions and the people of Amsterdam' with the objective of developing the Amsterdam Metropolitan Area into a smart city with a focus on the themes living, working, mobility, public facilities and open data. The city presents itself as an 'urban living lab' that allows businesses to both test and demonstrate innovative products and services. This partnership creates an infrastructure for knowledge exchange and learning between all these actors and results in concrete projects focusing on sustainable energy, innovative health solutions, better transport and more (digital) citizen participation.

This example highlights that cities are becoming smart not only in terms of the way they can automate routine functions serving individual persons, buildings, and

traffic systems but in ways that enable them to monitor, understand, analyze and plan the city to improve the efficiency, equity and quality of life for its citizens in real time (Batty et al., 2012). This has led to a growing body of research on this subject in international journals and books. This literature is rich but also fragmented: although several attempts have been made to formulate a definition of the smart city, this term is a fuzzy concept that is not used consistently within the literature (Tranos and Gertner, 2012).

The fragmentation is reproduced in the concept of smart city governance. There is wide agreement that government policies have a critical role to play in fostering smart cities (Yigitcanlar et al., 2008) and this fits well within the public management perspective that highlights that solving societal problems is not merely a question of developing good policies but much more a managerial question of organizing strong collaboration between government and other stakeholders (Torfing et al., 2012). Researchers from the field of e-government studies are starting to become interested in governance of the city level and scholars interested in urban governance are becoming interested in technology, but a fruitful connection between these disciplines requires that concepts are clarified and repositioned in theoretical perspectives.

The question of designing – developing, facilitating, nurturing – synergies between social structure and new technology has been at the heart of e-government studies in recent decades (Danziger et al., 1982; Fountain, 2001; Gil-Garcia, 2012). These studies have been investigating how new technologies could be used to strengthen the quality and effectiveness of government. What we are seeing now is that the issue of *socio-techno synergy* is being scaled up from the level of the organization – or the chain of organizations – to the level of the urban system. Existing concepts and theories can be used as a basis for studying the higher level of scale but they also need to be revised to make them suitable for studying urban interactions. At the same time, these theories may help to develop analytically rich but also critical perspectives on the seemingly appealing idea of a smart city.

This article presents a conceptual overview of the various approaches to the governance of smart cities to analyze the different conceptual and disciplinary roots of the growing body of literature. Our analysis is based on an extensive and systematic literature review. We aim to create some clarity in a conceptual swamp by singling out the different perspectives on governing the smart city and highlighting different foci in smart city governance research. In addition, we will identify shortcomings or omissions in current approaches and we will develop a research agenda.

Literature review: method and resulting corpus

The literature review consisted of three phases. Being aware of the multidisciplinary nature of the topic of the smart city, the first phase sought to retrieve a broad set of papers. To achieve this aim, an advance search query was performed on the ISI Web of Knowledge, ScienceDirect, Scopus EBSCO Host (Business Source,

Library, Information Science & Technology Abstracts, SocINDEX with Full Text and ebook Collection) and ABI/INFORM (ProQuest) databases. In each one of the databases, the words 'smart city' were entered in all fields in order to retrieve articles and other papers, such as proceedings papers, books, book chapters or doctoral theses.[1] Therefore, the word 'smart city' was entered to be searched in the options 'all text', 'theme', 'title', 'keywords' and 'abstract' in each of the databases selected. In addition, the search was performed without limiting the field of knowledge of the journals in which the paper could be published. The search queries entered in ISI Web of Knowledge, ScienceDirect, Scopus EBSCO Host and ABI/INFORM (ProQuest) databases led us to obtain, respectively, a total of 171, 226, 128 and 212 papers about smart cities.

The second phase consisted of a selection of relevant articles on the basis of abstracts. All the articles from the broad literature search were analyzed for their relevance for debates on smart city governance. The abstract and the introduction section were read, and an overview of the structure of the article was checked. Those articles of a specific technical nature without examining any of the domains analyzed in the article were eliminated from the sample. In addition, double counting of articles was avoided by counting only the articles that were different across the databases. These processes resulted in a sample of 80 articles.

The third phase consisted of a thorough reading of the papers selected in the second phase to select only the papers that were relevant to our research question. To perform this third phase, we conducted a qualitative content analysis for each one of the domains identified in this paper. Literature reviews were removed from the sample since they don't make a new contribution to the domains. As a result, we obtained a final database composed of 51 papers published in international journals, books, proceedings or research studies (see 'References used for literature review' below).

This resulted in a corpus of 51 papers dealing with a variety of different aspects of smart city governance. Attention to this subject is quite recent: the oldest paper was from 1999 and most papers were either from 2011 (nine papers) or 2012 (18 papers). Most publications were articles published in journals (35) but we also found books (five), chapters in books (four) and other forms such as unpublished research reports (four), conference proceedings (two), and an unpublished dissertation (one). These papers were published in a wide variety of journals and conference proceedings with only two journals with more than two articles on issues related to smart city governance: *Journal of Theoretical and Applied Electronic Commerce Research* (four articles) and *Journal of Urban Technology* (three articles).

We analyzed these papers qualitatively to identify how the papers conceptualize smart cities, smart governance, the drivers of smart cities and the outcomes. The primary goal of the analysis was to map the diversity in approaches and to explore to what extent certain issues attract more or less attention. To this end, we developed categories for these different dimensions inductively and applied these categories to the set of publications. A full text analysis was conducted to identify definitions, different roles of government and different legitimacy claims.

We read the full papers to position the argument and then focused on explicit definitions of smart city governance, explicit discussions of the role of government and explicit references to the aims of smart city governance. The labels were applied by a research assistant and extensively checked by the two other researchers in the team and at various times discussed to strengthen the complex qualitative analysis. The focus on explicit definitions, roles and aims resulted in a fairly high number of 'missing values'. The resulting dataset of papers was analyzed for variation and similarities per domain to map the conceptual fragmentation of approaches to smart city governance.

Defining smart cities: smart technology, smart people or smart collaboration?

In the literature that we analyzed on smart cities, we found three different types of ideal-typical definitions: smart cities as cities using smart technologies (technological focus), smart cities as cities with smart people (human resource focus) and smart cities as cities with smart collaboration (governance focus). Some papers clearly build upon one of these ideal-types while others build composite definitions. We analyzed the papers to identify whether they define smart cities within one of these ideal-types or make a combination of these perspectives. The findings of our analysis of the literature are presented in Table 1.

Table 1 shows that many papers do not present a definition of a smart city. Within the group of papers that present a definition, there is an equal number of papers with a technological focus and with a combination of two or three elements and fewer papers with an exclusive focus on human resource or governance. We analyzed these papers qualitatively to get a better understanding of the way a smart city is defined from these different perspectives.

Table 1. Definitions of 'smart city'

Smart city as . . .	Focus	Number of papers	References
Smart technology in the city	Technology	12	4, 5, 8, 14, 26, 27, 29, 31, 39, 46, 47, 48
Smart people in the city	Human resources	4	32, 34, 43, 50
Smart collaboration in the city	Governance	6	10, 15, 28, 38, 41, 51
Combinations of smart technology, smart people and smart collaboration in the city		12	1, 2, 9, 12, 13, 21, 23, 25, 30, 37, 40, 42
No definition		17	3, 6, 7, 11, 16, 17, 18, 19, 20, 22, 24, 33, 35, 36, 44, 45, 49

In the group of publications with a *technological focus*, authors emphasize the possibilities that new technologies offer to strengthen the urban system. These publications were identified by their (implicit) references to technology as the defining characteristic of a smart city. Technologies range from sophisticated energy technologies (smart grids) to transport systems and traffic regulation systems. A recurring aspect in the definition of a smart city is the use of ICTs (Lee et al., 2013; Odendaal, 2003; Walravens, 2012). Washburn et al. (2010: 2) define a smart city as 'the use of smart computing technologies to make the critical infrastructure components and services of a city – which include city administration, education, healthcare, public safety, real estate, transportation, and utilities – more intelligent, interconnected, and efficient'. Aurigi (2005) argues that, even though there are many different perspectives on smart cities, the idea that ICT is central to the operation of the future city is at the core of all perspectives. Many of these authors highlight social issues such as the importance of business-led urban development, the social inclusion agenda, the role of creative industries in urban growth, the importance of social capital in urban development and urban sustainability. The key feature of this approach is that technology forms the starting point for rethinking all these other issues (Lee et al., 2013; Walravens, 2012).

The publications with a *human resource focus* do not ignore technology but focus on smart people as being central to the operation of smart cities. These publications were identified by their focus on human capital and/or human resources as the key feature of a smart city. Smart cities are conceptualized as metropolitan areas with a large share of the adult population with a college degree (Shapiro, 2006). These smart cities are often small and mid-size urban areas containing flagship state universities and experiencing a substantial growth in recent years (Winters, 2011). The concept of smart city in this strand is mainly built on the characteristics of smart inhabitants, in terms of their educational grade (smart people) and this level of education is seen as a main driver of urban growth (Lombardi et al., 2012; Shapiro, 2006). Opinions on the reasons for having a highly educated population differ: Shapiro (2006) indicates that an educated population moves to cities with a high quality of life while Winters (2011) argues that students simply stay in the city after they have finished their education.

The publications with a *governance focus* highlight the interactions between various stakeholders in the city in their definition as the defining feature of a smart city. Smart cities are seen from a user-centered perspective with more emphasis on citizens and other stakeholders than the other city concepts (Calderoni et al., 2012). This perspective highlights the importance of connecting knowledge centers to the action perspectives of various actors in the city to create 'innovation hubs' (Kourtit et al., 2012). The idea of collaboration is more central to this approach and authors focus on developing productive interactions between networks of urban actors (Kourtit et al., 2012; Yigitcanlar et al., 2008).

Combinations of these three elements – smart technology, smart people and smart collaboration – are made in quite a number of papers. Hollands (2008) emphasizes that smart cities require not only sophisticated information

technologies but also the input of various groups of people (see also Sauer, 2012; Schuurman et al., 2012). Giffinger et al. (2007) present an elaborate discussion of the concept of a smart city and even identify six characteristics. Their conceptualization, however, mixes what smart cities are (smart people, smart governance) and what they aim to achieve (smart economy, smart mobility, smart environment and smart living). A prominent and sophisticated definition has been developed by Caragliu et al. (2011: 70): 'We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance.'

This analysis highlights that there are three different ideal-typical notions of smart cities in the literature. A comprehensive definition, such as the one presented by Caragliu et al. (2011), needs to incorporate all these strands and, in addition, we think that a city cannot be qualified as either smart or 'stupid' but could be analyzed in terms of its structural and cultural characteristics in these three domains. To be explicit about the three components of smart city governance and to highlight that smartness is a gradual concept, we would like to present the following definition of the smartness of a city: the smartness of a city refers to its ability to attract human capital and to mobilize this human capital in collaborations between the various (organized and individual) actors through the use of information and communication technologies.

Role of government: governance of smart cities or smart governance?

On the basis of our extensive literature review, we identified four ideal-typical conceptualizations of smart city governance: (1) government of a smart city, (2) smart decision-making, (3) smart administration and (4) smart urban collaboration. These conceptualizations reflect different theoretical perspectives on the role of government in a modern society (Osborne, 2006; Torfing et al., 2012) and differ in their ideas about the need for transformation of government to make cities smarter. More conservative conceptualizations suggest that existing institutional arrangements can bring us smart cities while more radical conceptualizations suggest that government itself needs to be transformed to create a smart city. The papers were categorized by reviewing the perspective on the role of government presented in the introduction and the conceptualization of government in the theoretical framework. Examples of indicators for the different roles are presented below. The numbers of papers for the four perspectives are presented in Table 2.

This table shows that most publications do not present an explicit perspective on smart city governance but there are at least three publications to outline each perspective. The perspective with the highest level of transformation – smart urban collaboration – is presented in most publications and this illustrates the dominance of transformational ideas in the literature on smart city governance. It is important to note that the question whether a higher level of transformation

Table 2. Perspectives on smart city governance

Perspective on smart governance	Level of transformation	Focus	Number of publications	References
Government of a smart city	Low	Good administration, good policy	4	2, 29, 36, 50
Smart decision-making	Medium-low	Innovate decision-making processes	2	45, 47
Smart government administration	Medium-high	Innovate organization and administration	5	8, 11, 24, 31, 51
Smart urban collaboration	High	Innovate governance networks	9	6, 10, 15, 23, 25, 28, 32, 42, 44
No explicit perspective			31	1, 3, 4, 5, 7, 9, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 26, 27, 30, 33, 34, 35, 37, 38, 39, 40, 41, 43, 46, 48, 49

makes for a smarter city is actually an empirical one and not a conceptual issue. Good administration and good policies may result in strong interactions at the urban level whereas a focus on smart collaboration may result in more attention to issues of collaboration than actually making things work. The question which type of governance is most effective and most legitimate (under certain conditions and in a certain context) is a question that needs to be answered through empirical research.

The first type of conceptualization of smart governance suggests no need for transformation of governmental structures and processes. In this conceptualization, smart governance is just the *governance of a smart city*: smart governance is about making the right policy choices and implementing these in an effective and efficient manner. Batty et al. (2012: 505) highlight that smart governance is only an attribute that is associated to governmental management of a city whenever the city is promoting itself as smart. Alkandari et al. (2012) indicate that government must approve the development of the smart city and it can prioritize some areas, and Winters (2011) argues that urban governments must only promote centers of higher education in order to develop smart cities. Finally, Nam (2012: 193) stresses that smart governance is about the promotion of smart city initiatives.

The second type of conceptualization of smart governance emphasizes the need for *smart decision-making processes* and the implementation of these decisions. We qualify this conceptualization at a low level of transformation since it is not about restructuring the organization or government institutions but it does emphasize the

need to restructure decision-making. UNESCAP (2007) emphasizes that smart governance is 'the process of decision-making and the process by which decisions are implemented (or not implemented)'. Walravens (2012: 125) adds that decision-making can become innovative by using network technologies. Schuurman et al. (2012: 51) define smart governance as the process of collecting all sorts of data and information concerning public management by sensor or sensor networks. New technologies are used to strengthen the rationality of government by using more complete – and more readily available and accessible – information for governmental decision-making processes and the implementation of these decisions.

The third level of conceptualization is that smart governance is about creating a *smart administration*. Gil-Garcia (2012: 274) indicates that a 'smart state' is a new form of electronic governance that use sophisticated information technologies to interconnect and integrate information, processes, institutions, and physical infrastructure to better serve citizens and communities. This type of smart governance is at a higher level of transformation since it requires the restructuring of the internal organization of government: administrations need to be innovative to deal with the requirements of differentiated policies. Caragliu and Del Bo (2012) state that 'space-specific characteristics could influence the smart cities development and, therefore, there is a need for geographically differentiated policy actions'. Batty et al. (2012: 497) highlight that 'smart governance is a much stronger intelligence function for coordinating the many different components that comprise the smart city. It is a structure that brings together traditional functions of government and business.'

The fourth and most transformative level of conceptualization stresses that smart governance is about *smart urban collaboration* between the various actors in the city. We qualify this conceptualization at the highest level of transformation since it is not only about the transformation of the internal organization but also of the external organization. Bătăgan (2011: 85) indicates that 'smart governance means collaborating across departments and with communities, helping to promote economic growth and at the most important level making operations and services truly citizen-centric'. Similarly, Tapscott and Agnew (1999: 37) highlight that smart governance is the widespread adoption of a more community-based model of governance with greater connectivity being facilitated by new technologies. Kourtit et al. (2012) argue that 'smart governance is the pro-active and open-minded governance structures, with all actors involved, in order to maximize the socio-economic and ecological performance of cities, and to cope with negative externalities and historically grown path dependencies'.

The overview shows that there is a dominant belief that transformation of governance is desirable and needed to make cities smart. One may question whether this is always needed, and a small group of publications indeed highlight that making a city smarter is about finding better ways to do the basic tasks of government. For our understanding of smart city governance it is important to realize that smart city governance can be scored on a scale ranking from institutional *conservation* (traditional governance of a smart city) to institutional *transformation* (smart urban governance).

Table 3. Aims of smart cities

Legitimacy claim	In more detail	Number of publications	References
Better *outcome* of urban governance	Wealth, health, sustainability	9	7, 16, 19, 28, 29, 30, 31, 39, 43
Better *process* of urban governance	Citizen participation, open forms of collaboration	10	8, 10, 15, 18, 32, 38, 40, 42, 46, 47
No explicit aims		32	1, 2, 3, 4, 5, 6, 9, 11, 12, 13, 14, 17, 20, 21, 22, 23, 24, 25, 26, 27, 33, 34, 35, 36, 37, 41, 44, 45, 48, 49, 50, 51

Legitimacy claims of smart cities: outcomes or process?

Our analysis showed that some authors focus on strengthening the legitimacy of urban governance through the production of better outcome of policies in terms of wealth, health, and sustainability while others focus on the strengthening of citizen participation and open forms of collaboration. The first perspective focuses on the *content* of government actions as a source of government legitimacy, whereas the second perspective highlights the *process* of governance (cf. Scharpf, 1999). The categorization of papers was based on a full text analysis with a specific focus on the introduction, theoretical framework and conclusions of the paper. Examples of indicators for the different categories are presented below. The number of publications per perspective is presented in Table 3. The table highlights that aims are often not mentioned but, when they are mentioned, they are equally divided between outcome and process.

The most general description of the legitimacy claims of smart city governance in terms of *outcomes* is found in the work of Lee et al. (2013). They highlight that governments should design technology roadmaps for supporting research and development of future technologies and public sector services that could improve the quality of life for citizens to enhance government legitimacy. More specific indications of how this quality of life could be strengthened are mentioned by England (2009). He stresses that governments should design a plan for government subsidies to promote smart cities in the domain of infrastructure (water supplies, electricity systems, transportation systems, urban infrastructure), education, health, and innovation. The focus on both material output (wealth) and post-material outputs (health and sustainability) are highlighted by Kourtit et al. (2012). Caragliu et al. (2009: 48) add that the aim is also to achieve the social inclusion of urban residents in public services. Many authors mention general

legitimacy claims of smart city governance but Kourtit et al. (2012) emphasize that the smart city should fit within historically grown path dependencies. Although, to an extent, all cities face similar problems, social inclusion may be an important aim for smart cities with a divided population, whereas health may be considered to be more important. In addition, the aims of the cities depend on what the urban population considers to be important. In some cities, art and culture may be considered to be a core aim of smart city projects whereas better transportation may be high on the priority list in other cities. The key point here is that, although some authors highlight the contextual nature of urban systems (Caragliu and Del Bo, 2012; Giffinger et al., 2007; Kourtit et al., 2012), the idea of a 'one best city' is still quite dominant in the (technological) discourse about smart cities.

Issues of power and democracy play a key role in the publications that focus on obtaining legitimacy of urban governance through smart city as a *process*. This perspective highlights the active engagement of citizens and stakeholders in urban governance. This type of engagement, however, is hardly political in nature. Several authors highlight that the city is to become smarter when it can tap into the intelligence of all urban actors to generate a smart, learning system. Dvir and Pasher (2004) stress that governments should provide its citizens with the enabling conditions which foster knowledge creation, knowledge exchange and innovation. The idea of creating a better learning environment is also present in the strong connection between open data and governance of smart cities. Open data are widely propagated as a means to strengthen the collective intelligence of cities by enabling companies, innovators, NGOs and citizens to extract value from these data. The interesting thing is that smartness is not equal to open access for everybody. Walravens (2012) indicates that 'governments should promote open data systems but the responsible government body should carefully consider the terms under which this data is opened up and to which actors'. Similarly, Batty et al. (2012) indicate that government regulations must protect data and model development, appropriate interfaces, security of who is able or not to access the material online, questions of confidentiality, IPR (Intellectual Property Rights), privacy and so on under a smart city framework. The politics of access are clearly identifiable in these statements but they are presented as issues of managing urban intelligence.

This discussion shows that the idea of a smart city can contribute to the legitimacy of urban governance through strengthening the outcomes (most importantly: not only wealth but also sustainability) but also through more democratic forms of government (most importantly: not only representation but also direct citizen participation). These double legitimacy claims fit well within the post-material position as identified by Inglehart (1971) in the heyday of hippies. Weggeman (2003: 51) analyzed this theory and highlights that the post-material position consists of two dimensions: (1) economic growth versus environmental protection and (2) structured order versus participation. Interestingly, these post-material values are combined with a technocratic perspective on good governance which results in the idea of a smart city that produces a wide range of public values through innovative collaboration.

Towards a sophisticated perspective on smart city governance

We conclude that the current debate about smart city governance is rather confusing since many different perspectives on smart cities and smart governance are presented. This confusion can be productive when the diversity in approaches can be understood on the basis of organizing principles.

We have shown that a *first domain of confusion* concerns the technical or social nature of smart cities. Our literature review shows that many publications have a technical focus while others focus on the level of education or city inhabitants. Others combine these perspectives in a socio-technical perspective on smart cities (most notably: Caragliu et al., 2011; Giffinger et al., 2007; Nam and Pardo, 2011). We have argued that the socio-technical perspective is the richest perspective but it can build upon more technical and more social analyses (Fountain, 2001; Orlikowski, 1992) to present a rich theoretical and empirical understanding of the socio-technical dynamics of a smart city. We identified the need for more sophisticated socio-technical analyses of smart cities to enhance our theoretical understanding of the (contextual and specific) interactions between social/governmental structures and new technologies.

The *second domain of confusion* concerns the need for transformation of existing governmental structures to make cities smarter. The literature review shows that some publications conceptualize smart governance as nothing more than the governance of a smart city while others see it as innovative ways of decision-making, innovative administration or even innovative forms of collaboration. We argue that the focus on innovative collaboration is appealing but may not be suitable for studying smart governance practices. In an actual analysis of smart governance, we need to analyze the level of transformation and then relate this to the level of success of the smart city. One cannot assume beforehand that a higher level of transformation is by definition more effective in smartening a city. In this regard, future research should investigate models of governance for smart cities in order to shed some light on different levels of transformation of governmental structures in a smart city's framework. A stronger connection to the literature in public administration on transformations from (old) public administration to (new) public governance needs to be made (Osborne, 2006). Through the analysis of these models in practice, future research could strengthen the connection between debates about smart city governance and collaborative governance (Torfing et al., 2012).

The *third domain of confusion* concerns the legitimacy claims of smart city governance. Although some academic publications highlight economic gains, most studies of smart cities highlight either post-material outcomes (sustainability) or a post-material process (enhanced citizen participation) as sources of government legitimacy (see Inglehart, 1971). Interestingly, neither sustainability nor citizen participation are analyzed as issues of political struggle and debate but rather as desirables for a 'good society'. The politics of smart cities have so far barely been analyzed since a smart city is assumed to be an issue of 'puzzling' rather than 'powering'.

This overview of academic work on the smart city shows that many of the blind spots and biases in information systems and e-government studies are being reproduced in the new, developing domain of smart cities studies. We present the following recommendations for research into smart city governance:

- *Conceptualize smart city governance as an emergent socio-techno practice*. In the current literature there is an emphasis on either technology or social structure and a limited understanding of the interactions between them and the emergent nature of socio-techno practices. Thirty years of research into technology in government shows that these complex interactions between technology and social structure need to be analyzed to develop a theoretical understanding of techno-governance (Fountain, 2001; Orlikowski, 1992).
- *Focus on both the transformation and conservation of urban governance institutions*. Many publications focus on the transformation of governance without exploring the conservation of organizations and institutional forms. Classic work on technology in government highlights that it mostly results in the reinforcement of power relations and value distributions (Danziger et al., 1982). Empirical research needs to investigate whether reinforcement takes place in smart city practices.
- *Assess the contribution of smart city governance to both economic growth and other public values*. Sound evaluation studies of the impact of smart city governance on the realization of both economic growth and other public values are lacking. There is an urgent need for studies that evaluate the realization of these goals through either in-depth case analyses or through quantitative comparative work.
- *Analyze the politics of smart city governance*. Most publications frame smart city governance as a technical or managerial issue. The underlying assumption is that a smart city makes life better for everyone and there is a lack of attention to the politics of technical choices. The classic work by Winner (1986) is still important here: artifacts do have politics. Specific choices about (technological) infrastructures have consequences for power distribution in the city and thus need to be studied accordingly.

Scaling up the search for socio-techno synergy from the level of organizations to the level of urban systems may certainly have merits but research into these issues should avoid a simplification of the new marriage between technology and social structure. Research into smart city governance should learn from the success factors identified for e-government (Pardo and Gil-Garcia, 2005), build upon existing theories of socio-techno change (Bijker et al., 1987; Fountain, 2001; Orlikowski, 1992), it should study smart city development as a complex process of institutional change (Snellen and Van de Donk, 1997) and it should acknowledge the political nature of appealing visions of socio-techno governance (De Wilde, 2000).

Note

1. We have deliberately chosen not to use other terms such as 'intelligent city', 'virtual city', 'innovative city', 'knowledge city' or 'creative city' since these terms have some overlap but also focus on other discourses such as attracting urban professionals and creating an urban cyberspace. We aimed to explore the different meanings of smart city governance specifically and therefore limited our search to that term.

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