Smart City Governance: A Local Emergent Perspective

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Abstract This chapter presents a local emergent perspective on smart city governance. Smart city governance is about using new technologies to develop innovative governance arrangements. Cities all around the world are struggling to find smart solutions to wicked problems and they hope to learn from successful techno-governance practices in other cities. Learning about successes of smart city governance is important but lessons need to be contextualized: approaches that work in one city may fail in another one. This chapter presents the local cooperative knowledge potential and the nature of the problem domain as key contextual factors and develops a model for studying and assessing smart city governance in context.

Keywords Smart cities · Contextual approach · Multidimensional evaluation framework

1 Introduction

Cities are increasingly seen as not only the engines of innovation and economic growth but also the level at which solutions to wicked problems need to be produced (Inayatullah 2011; Nijkamp and Kourtit 2013). City governments need to produce adequate and innovative approaches for such diverse issues as sustainable growth, social inclusion, and crime control and prevention (Florida 2002; Landry 2006; Barber 2013). In this context, the current wave of attention for "smart cities" is hardly surprising: the expectations of urban systems are exceedingly high and therefore new and innovative forms of governance are needed to meet these challenges (Caragliu and Del Bo 2012). The key question for urban government is: how can we make cities so smart that they can generate economic growth and also produce sustainability, inclusiveness, and safety?

Technological innovations can help city governments to meet these challenges of urban governance and to improve urban environments (Yigitcanlar et al. 2008; Walravens 2012; Hoon Lee et al. 2013; Washburn et al. 2010). New technological

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developments increase the intelligence of urban systems by supporting innovative solutions to traffic control, energy production, crime monitoring, etc.: city governments can develop solutions to wicked problems by making good use of the available technologies. Smart city governance is defined as using new technologies to improve urban governance through better use of information and better communications. At the moment, we are witnessing two distinctive waves of technological innovation that connect to different forms of smart city governance (see also Nijkamp and Kourtit 2013, p. 308): technologies for concentrated intelligence and technologies for distributed intelligence.

The rapid development of technologies can strengthen the concentrated intelligence of the government by providing better, more comprehensive, and up-to-date information about relevant developments (Kuk and Janssen 2011). Traffic monitoring systems, for example, with cameras and sensors can provide city governments with precise information about traffic streams and congestions, and these governments can use this information for traffic management (Hoh et al. 2008). In addition, technologies for communication in policy networks and communities can bring together a wide variety of urban actors to generate more distributed urban intelligence (Lathrop and Ruma 2010; Linders 2012; Nijkamp and Kourtit 2013). Open data and social media facilitate new forms of collaborative governance by, for example, combining information about crime patterns from various sources and coordinating preventative efforts of citizens, housing corporations, and the police. These two technological waves are combined in various ways to produce hybrid smart city governance in the form of a rich array of technological options for smart city governance. These hybrid uses of technologies are often presented as promising venues for strengthening city governance (Caragliu and Del Bo 2012), but little is known about the effectiveness of these new forms of governance.

These new technologies are impressive and "sexy," but that does not necessarily mean they are effective. Assessing the effectiveness of smart city governance is complicated since there is no simple indicator for success in the public sector such as profitability in the private sector. While evaluation of technologies tends to assess success in terms of diffusion and adoption of innovation (Rogers 1995), urban governance and planning studies highlight the contribution to the quality of the urban environment, both in terms of the outcomes and the process of realizing these outcomes. Smart city governance may not use the most advanced new technologies and still be qualified as successful for providing better outcomes (in terms of economic growth, more sustainability, more safety, etc.) and also for providing a better process (in terms of the speed of decision-making process, a reduction in the number of conflicts, etc.). The overall objective of smart city governance is not to make use of new technologies but to contribute to the objective and subjective quality of the urban environment through new technologies. This means that the contribution of smart city governance to the urban environment needs to be assessed through a combination of community, network, and participant criteria.

This chapter develops a local emergent perspective on smart city governance. The scientific basis for the guidelines consists of theories of technology in governance and theories of urban planning and governance. This chapter puts an

emphasis on (1) the contextual nature of smart city governance, (2) the important role of the degree to which local actors are willing and able to cooperate in smart city governance, and (3) the feedback loops that strengthen or undermine smart city efforts. The review of the literature results in a list of specific expectations concerning smart city governance and an agenda for further research.

2 Contextual Model for Smart City Governance

Studying the effects of smart city governance is complicated since the relations between governance arrangements, use of technologies, and effects on the quality of urban life are contextual. An approach that yields fantastic results in one city may fail in another. The situational nature of these relations creates a dilemma: highlighting the unique nature of each situation results in an in-depth understanding of interrelations between various factors but does not produce any general knowledge that would be useful for other situations. To deal with this dilemma, this chapter identifies two key situational variables that help to understand specific contexts while, at the same time, generating more general knowledge about the effectiveness of smart city governance.

The first contextual variable that is included in this contextual perspective on smart city governance is the local cooperative knowledge potential. The literature highlights that the success of smart city governance depends on the match of new technologies to the knowledge and attitude of the relevant actors: a solution that works in one city may not work in another one for a lack of citizens and other stakeholders that are capable and willing to cooperate with the city government. The local cooperative knowledge potential refers to the availability of relevant knowledge among citizens and stakeholders, and the willingness to contribute this knowledge to collective problem-solving. Citizens and shopkeepers may, for example, be prepared to use their smartphones to provide the police with up-to-date information about the local safety situation in one neighborhood, whereas in another neighborhood, they may see the police as an institution that cannot be trusted and should not be collaborated with (Meijer and Thaens 2013).

The second contextual variable is the nature of the problem domain. Situational characteristics, such as democratic institutions and culture, the physical environment, the economic production, etc., matter for the effectiveness of smart city governance since these characteristics are either conducive or limiting to different modes of smart city governance. These situational characteristics interact with a series of political, administrative, and technological choices regarding the use of new technologies for urban governance. This means that an in-depth analysis of the smart solutions in their (political, institutional, societal, economic, and cultural) context is needed to assess the value of certain successful smart city governance approaches for other cities.

Including these two contextual variables, we present the following model for studying smart city governance. We will briefly explain the key features of this

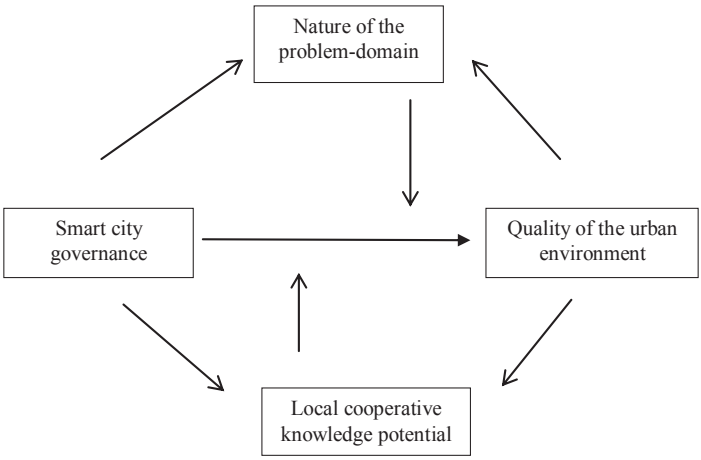

Fig. 1 Contextual model for smart city governance

model and in the remainder of this chapter, we will discuss the various relations more in depth (Fig. 1).

This model highlights the following relations:

- Smart city governance—in different forms—can contribute to the quality of the urban environment by making better use of available resources and producing smarter solutions to problems;
- The effect of different forms of smart city governance on the urban environment depends on the availability of local cooperative knowledge potential and on the question of whether the problem-domain is conducive or limiting to the chosen approach;
- Smart city governance can improve the urban environment not only directly but also indirectly by influencing the nature of the problem-domain and strengthening the local cooperative knowledge potential;
- Improvements in the urban environment can have a feedback effect on the problem-domain and the local cooperative knowledge potential since successes are likely to strengthen the local cooperative knowledge potential and render the problem-domain more conducive.

The model presents an idea of the relations between modes of smart city governance, nature of the problem-domain, local cooperative knowledge potential, and quality of the urban environment. The model identifies various feedback loops and therefore the outcome is nonlinear. The literature highlights mostly positive outcomes, but the moderations and feedback loops can also result in a negative spiral with perverse effects. To position these variables and relations, we will conceptualize them on the basis of the literature from technology studies, governance, and urban planning and we will form expectations regarding the relations between them.

3 Smart City Governance: Concentrated, Distributed, and Hybrid

Urban scholars such as Nijkamp and Kourtit (2013, p. 299) emphasize that "[t]he city is a social fabric based on interaction, participation, and collective responsibility." Our perspective on smart city governance will study the interactions between the variety of actors. The building blocks for a theoretical perspective on smart city governance are theories on technology in (public) organizations (Zuboff 1988; Orlikowski 1992; Fountain 2001; Meijer 2009; Gil-Garcia 2012) and theories on urban governance (Stone 1993; Pierre 1999, 2011; Nijkamp and Kourtit 2013). These theories are used to identify three modes of smart city governance: concentrated, distributed, and hybrid intelligence.

The idea of smart city governance as *concentrated intelligence* stresses that new technologies—big data, data warehousing, monitoring tools—enable central steering actors to strengthen their intelligence, provide more integrated services, develop better policies, and steer other actors in the city more effectively (Leydesdorff and Deakin 2011; Kuk and Janssen 2011). The promise of concentrated intelligence builds upon the foundational work of the Carnegie-Mellon school in organization studies that highlighted that the quality of decision-making in an organization depends on information management (e.g., Galbraith 1973). More recently, Mayer-Schönberger and Cukier (2013) have stressed that the "datafication" and big data will provide invaluable insights that city managers would otherwise not have. These managers can use new technologies such as big data and ubiquitous sensors—referred to as the "Internet of Everything"—to make informed decisions about crime control, traffic management, energy production, etc. Concentrated intelligence may be limited to government but can also take the form of a collaboration between government and a limited number of private partners (i.e., a public–private partnership) or even only a private party when, for example, a company is commissioned to provide urban transport (cf. Driessen et al. 2012).

The idea of *distributed intelligence* highlights that new technologies—social media, Internet, open data—enable the various actors in the city to collaborate more effectively and produce better solutions for the city (Yigitcanlar et al. 2008; Hoon Lee et al. 2013). Theories on collaborative, networked, and coproductive governance highlight that the quality of policies can be strengthened by managing good relations between all stakeholders and tapping into their intelligence. Collaborative learning is at the heart of this approach and (virtual) communities can strengthen the intelligence of the city (Agranoff and McGuire 2003; Koppenjan and Klijn 2004; Torfing et al. 2012). This mode of smart city governance can vary from forms in which city government is still (heavily) involved to self-governance arrangements where private sector, civil society groups, and "social entrepreneurs" are engaged in public problem-solving without any government involvement (Light 2008; Driessen et al. 2012).

The two modes of smart city governance are ideal types and should be seen as extremes on a scale of smart city governance. Intermediate forms are modes of

hybrid smart city governance. Hybrids may lean towards one of the extremes or form a balanced combination of concentrated and distributed forms of governance. One should note that these configurations are not caused by these technologies but result from (political) choices to focus on certain technological features to attain certain ends: they are emerging modes of governance (Fountain 2001). The mode of smart city governance reflects political choices since they represent different views on the relation between government and society (Koppenjan and Klijn 2004; Pierre 2011). The concentrated intelligence perspective builds upon the idea of delegation of power to the government and accountability through formal mechanisms to the people's representatives or, alternatively, on the idea that government should involve large companies in public–private partnerships. Citizens can choose their democratic representatives but they are subjects of government that can be scrutinized with cameras and other information technology. The distributed intelligence perspective takes direct citizen engagement as its starting point and stresses that citizens—like other stakeholders—are coproducers (Alford 2009). Accountability takes place through more informal and more direct mechanisms in networks of stakeholders (Michels and Meijer 2008). The two modes reflect political choices but, still, they can be assessed in terms of their contributions to the quality of the urban environment.

The modes of smart city governance need to be connected to human capital, (open) innovation, and common pool resources to produce public value (Schaffers et al. 2011). Political and administrative choices and dynamics determine what kind of smart city governance is chosen and developed. The promise of hybrid intelligence holds that cities can find ways to combine concentrated and distributed intelligence but, alternatively, concentrated and distributed intelligence may conflict. City governments can choose to use concentrated and distributed smart city governance in separate domains, they can also choose to use concentrated and distributed smart city governance in the same domain but in different ways, or they can integrate both types of smart city governance in one approach. Little to nothing is known about the effectiveness of these different forms of smart city governance in varying contexts.

4 Quality of the Urban Environment: Community, Network, and Participant Assessments

The public management literature has been struggling to find ways of evaluating collaborative governance. Some authors stress that the performance of collaborative governance should be evaluated in terms of impacts on the economy, mobility, environment, people, and living conditions (Lazariou and Roscia 2012; Winters 2011). Others disagree and emphasize that the basic characteristic of collaborative governance is that participating actors have different objectives. Citizens may regard a project for neighborhood improvement, primarily as a way to improve their natural environment while housing corporations focus on the attractiveness of their

property for tenants while the police may highlight the decline of crime in the area. This diversity in objectives means, according to these authors, that the success of collaborative governance can only be assessed in terms of stakeholder satisfaction (Koppenjan and Klijn 2004, p. 124).

The emerging consensus is that a combination of evaluation criteria is needed for a comprehensive assessment (Radaelli and De Francesco 2010; Koppenjan and Klijn 2004; Provan and Milward 2001; Sørensen and Torfing 2009). A sophisticated approach to the evaluation of collaborative governance has been developed by Provan and Milward (2001) that brings together the two other approaches and adds an intermediate level. They highlight that assessing collaborative governance means measuring the effectiveness at the level of the participants (i.e., stakeholder satisfaction), the level of the network, and the level of the community (i.e., the overall impacts on economy, mobility, environment, etc.). This approach highlights that collaborative governance needs to be evaluated both from the perspective of those involved and from the perspective of external stakeholder groups that are confronted with the outcomes of collaborative governance in terms of contributions to the urban environment.

It is important to broaden the assessment to include not only intended effects but also establish side or even perverse effects in terms of, for example, infringements on privacy. The field of surveillance studies highlights that new technologies may turn cities into panopticons where everybody, presumably under the idea that this contributes to urban safety, is always being watched (Lyon 2001). Alternatively, use of new technologies may result in alienation of actors and even new hostilities between certain actors, for example, in relation to traffic management where certain traffic patterns may have an overall positive effect but still a negative effect but specific actors.

Provan and Milward's (2001) approach can be used as a basis for developing a multidimensional approach to assessing the effectiveness of smart city governance. We have used this basis to structure a variety of criteria mentioned either in the literature on smart cities or on collaborative governance. This results in a multidimensional framework for assessing smart city governance (see Table 1).

Applying this framework requires a combination of analyzing data at an urban level about the economic situation, mobility, environment, etc. and collecting perceptual data from network participants through surveys or more qualitative research methods. The results provide rich insights in the objective and subjective effectiveness of smart city governance in different urban contexts.

5 Local Cooperative Knowledge Potential: High or Low

When will smart city governance actually contribute to the quality of the urban environment? Distributed smart city governance taps into local problem-relevant potential, whereas concentrated smart city governance largely ignores or even denies local potential. The presence and availability of local problem-relevant potential re-

Table 1 Multidimensional assessment of smart city governance

Community criteria	Network criteria	Participant criteria
Based on Lazariou and Roscia (2012), Hoon Lee et al. (2013), and Nijkamp and Kourtit (2013)	Based on Provan and Milward (2001)	Based on Koppenjan and Klijn (2004), Sørensen and Torfing (2009), and Meijer et al. (2013)
Economy	*Network constitution*	*Satisfaction with process*
Productivity Gross city product	Strength of relational contacts between actors Diversity of actors involved	Perceived timeliness Perceived openness
Mobility	*Network performance*	*Satisfaction with outcome*
Local accessibility ICT Infrastructure	Range of services provided Integration and coordination of services Absence of service duplication	Perceived desired effects Perceived unintended effects
Environment	*Network cost*	*Learning*
Attractiveness of natural conditions Pollution	Cost of network buildings Cost of network maintenance	Learning about the issue Learning about the actors Learning about institutional context
People	*Unintended or perverse effects*	*Unintended or perverse effects*
Level of education Social and ethnic plurality Participation in public life	Network conflicts Exclusion from dominant networks	Negative image of other actors Unwillingness to collaborate with others
Living		
Cultural facilities Individual safety Education facilities		
Government services		
Speed Accessibility Comprehensiveness		
Unintended or perverse effects		
Privacy Unequal division of benefits		

sults from characteristics of local actors (such as degree of organization, knowledge about the problem, opportunities to collect information, capabilities to contribute to the solution, willingness to engage) and the nature of the policy domain (in terms of capacities and knowledge needed to contribute to a solution). The level of problem-relevant local potential originates from a variety of (political, institutional, societal, economic, and cultural) factors such as legal position of citizens, level of trust in government, level of education, social cohesion, information skills, etc. This means that context does not only differ between cities but also between neighborhoods in cities and, in addition, there are differences between policy areas.

The theoretical expectation is that concentrated intelligence is more effective in a situation of low local problem-relevant potential. An example could be the production of high-tech innovations, such as pharmaceuticals, new materials, and

health-care technologies, for urban economic growth. The level of local problem-relevant potential on this issue is generally low since it requires a high level of expertise and formal training and concentrated smart city governance in the form of a so-called triple helix, a collaboration between government, business, and universities, may be expected to be a more effective form of smart city governance than including a broad variety of citizens, NGOs, local groups, etc. (Etzkowitz and Leydesdorff 1997).

Distributed intelligence can theoretically be expected to be more effective in a situation of high local problem-relevant potential. An example could be the maintenance of green facilities. The knowledge of citizens in certain neighborhoods of gardening can be expected to be fairly high and their willingness to allocate time on urban gardening is often also considerable (Schulz et al. 2013). In such a situation, distributed smart city governance using open data and social media can tap into the potential of these actors to produce effective forms of urban green maintenance. Local problem-relevant potential does not always have to align with government objectives: for example, high problem-relevant potential concerning speed controls may be used to undermine the effectiveness of government traffic safety policies.

In theory, combinations of concentrated and distributed intelligence need to fit the level, nature, and form of problem-relevant potential to be effective. An example could be the situation of fighting organized crime in a neighborhood. Local potential in the form of information about illegal prostitution and drug sales can be tapped into through distributed smart city governance, but needs to be supplemented with concentrated intelligence on crime histories of certain persons and criminal networks. The literature highlights that there is a feedback loop between the successes of interactive governance and local problem-relevant potential (Sørensen and Torfing 2009): If citizens see that their efforts result in better solutions to societal problems, they may learn about these issues and be more prepared to contribute to the solution.

These conditions can—in varying degrees—be influenced through various (smart) policy interventions. There is an important difference between the two modes of smart city governance here: whereas distributed smart city governance aims to strengthen the local problem-relevant potential, concentrated smart city governance ignores or even undermines the local potential. An example of these effects on the local cooperative potential could be the different approaches to fighting crime: use of cameras and data surveillance strengthens the police but disempowers citizens while social media networks between community police officers and citizens help to engage citizens in the production of local security.

6 Nature of the Problem-Domain: Conducive or Limiting

The effectiveness of smart city governance for improving the urban environment does not depend only on the local cooperative knowledge potential but also on a variety of external political, institutional, societal, economic, cultural, and physical

conditions (cf. Torfing et al. 2012). Altogether, these conditions constitute the nature of the problem-domain in terms of support for or limitations to certain approaches to improving the urban environment. These conditions can either be conducive or limiting to the effect of different modes of smart city governance on the urban environment. Some examples may illustrate the argument:

- Legal frameworks may support open government data practices that can stimulate collective learning around problem-areas, but existing laws may also limit the possibilities (Mayer-Schönberger and Cukier 2013).
- Informal rules for collaboration between a variety of urban actors may help to build learning networks, but they may also result in the exclusion of certain others that could potentially contribute to new solutions (Koppenjan and Klijn 2004).
- The physical conditions of a city in terms of climate and the presence of rivers and hills may be conducive to certain approaches to traffic management or sustainability, but they also limit the effectiveness of these approaches.

These various issues all highlight that the nature of the problem-area can be conducive—or limiting—to the effect of either concentrated or distributed smart city governance on the urban environment. This means that cities cannot simply copy approaches from other cities: they need to explore to what extent and how successes in other cities can be translated to their own city. Differences in legal frameworks, informal rules, and physical conditions matter. This requires an in-depth understanding of the relevance of the various aspects of the problem-domain to compare practices and to learn from successful forms of smart city governance.

While certain aspects of the problem-domain are a given—e.g., the climate—or only change in the long term—e.g., urban culture—other aspects can be influenced by smart city governance. Certain forms of legislations and informal rules can be influenced by smart city governance to render them more conducive to the relation between smart city governance and the quality of the urban environment. Changes in legislation concerning open data, for example, can contribute to the success of distributed smart city governance (Mayer-Schönberger and Cukier 2013).

7 Conclusions and Expectations

This chapter has presented a contextual model of smart city governance and highlights that effects of certain techno-governance arrangements depend on situational factors such as the local cooperative knowledge potential and the nature of the problem-domain. The discussion of the key variables can now be used to formulate more specific expectations concerning smart city governance:

1. Concentrated smart city governance fits a situation where the local cooperative knowledge potential is low. This type of governance can result in improvements of the urban environment at the community level.

2. Distributed smart city governance fits situations where the local potential is high. This type of governance can be expected to contribute to the quality of the urban environment as evaluated from the community, network, and participant level.
3. More distributed smart city governance will strengthen the local cooperative knowledge potential more than concentrated smart city governance. Concentrated smart city governance may even conflict with the local cooperative knowledge potential.
4. The local problem-relevant potential will be strengthened if distributed smart city governance results in improvements of the urban environment as evaluated from the network and participant level.
5. The nature of the problem-area matters. This means that successful forms of smart city governance in one city cannot be copied directly to another city. The role of contextual factors needs to be analyzed and successes need to be translated rather than copied.
6. The problem-area may become more conducive to certain forms of smart city governance if these produce successes at the community level. Successes may help to transform legal frameworks and informal rules for collaboration.

These expectations can form the starting point for local, emergent research and they need to be explored and developed further on the basis of empirical studies.

The contribution of this chapter to the literature on smart city governance is that the effectiveness of techno-governance arrangements depends on situational factors. This does not mean we cannot do comparative research nor does it mean that cities cannot learn from successful practices in other countries. We do, however, need to be careful in our focus on "best practices" of smart city governance. The local emergent perspective highlights that situational factors need to be included in comparative analyses and "best practices" cannot simply be copied from one city to another. There is no one-size-fits-all approach to smart city governance: city governments need to develop techno-governance arrangements that work in their specific urban context.

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