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Social Smart City: Introducing digital and social strategies for participatory governance in smart cities

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Abstract. Cities increasingly face challenges regarding participatory governance in order to become a "smart city". The world's best cities to live in are not the ones with the most advanced technological layers but cities that create an atmosphere where citizens, companies and government together build a vital and sustainable city. This study compares various definitions of smart cities and integrates current insights from the field of e-participation. Five best-practice examples from over the world illustrate the various ways participation can be developed from various leadership perspectives. A new conceptual framework, the Social Smart City framework, is derived from both e-participation theory and these best-practice examples. The framework comprises of a set of digital strategies for participatory governance in smart cities.

Keywords: Smart City, Electronic Participation, Governance, Participatory Governance

1 Introduction

What is the city but the people? Today, nearly 4bn people live in cities and it is expected that this number will increase by 2.5bn in the year 2050 according to The Economist [1]. People increasingly prefer to live and work in urban environments. Cities face enormous challenges in terms of attractiveness, social cohesion, safety, city marketing and so on [2]. One of the related challenges is citizen participation [4, 5]. Life in cities tends to become more and more individualistic and citizens often lack interest in taking part in city debate or local politics [6]. As a result, the social cohesion is affected and cities cannot make use of the full potential of the capabilities of their citizens. The rise of online tools could contribute to address these challenges [7–9]. Particularly, the rise of

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web2.0 and social media provides cities with enhanced digital opportunities to reshape the relationship with their inhabitants [10].

In the near future, co-creation in the city by governments, companies and cities will be of increased importance [20]. In many cases, the local government will become part of a network of stakeholders instead of the leading authority [2, 3]. Partnerships and cooperation strategies among main stakeholders are required in order to reach full potential of research and innovation [10]. Therefore, more research regarding effective strategies for the participatory governance of cities, including smarter ways to use the potential of citizens and companies, is necessary. However, to our knowledge, there is currently a lack of knowledge regarding these effective smart city participation strategies.

Therefore the main question of this article is; By using what digital strategies can cities effectively involve citizens and companies in the policy and development process of the city in order to become a smarter city?

The main aim of this article is to develop a "Social Smart City Framework", to create a more comprehensive theoretical understanding of the participatory governance aspect with regard to smart cities. The starting point of the analysis is the assumption that the best cities of the world to live in are not the ones with the most advanced technological layers but cities that create an atmosphere where citizens, companies and government build a vital and sustainable city in close collaboration.

The remainder of this article is structured as follows. In section 2, we will introduce a theoretical background including definitions of smart cities and a literature review. Second we will propose the theoretical framework that can be useful to derive various participation strategies in relation to digital participation ambitions. Section 3 contains a discussion of several best-practices. Finally, we will present both a conclusion and discussion section.

2 Theoretical Background

There is currently a large body of literature addressing the concept of smart city. Yet little consensus exists among researchers about the exact definition, scope and meaning of a smart city [7, 8]. In this section we will pay attention to definitions and key concepts from literature. We will elaborate upon the key related concepts of participation ladders, digital divide and network participation.

2.1 Definitions

Early definitions of smart cities were largely technology-driven [8]. For example, Hall et al. defines smart city as: "a city that monitors and integrates conditions of all of its critical infrastructures" [11]. The big system integrator companies such as IBM, Siemens and Cisco were eager to jump quickly on the bandwagon of smart cities to present their ICT solutions. IBM played an important role in the first years of smart cities and contributed significantly to the thinking behind smart cities [12, 13]. IBM defines smart city as an: "instrumented, interconnected

and intelligent city” [14]. It goes without saying that ICT companies like IBM and Siemens focus largely on delivering the ICT infrastructures enabling cities to be smart. However, when we only address a smart city from the technological perspective there is a risk that the city is not becoming smart at all. Just introducing technology is not enough to become a smart city.

There are also authors that take a more integrated view on smart cities. For example, Caragliu, Del Bo and Nijkamp [4] provide us with a comprehensive definition of smart cities: ”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.” On top of ICT technology as an enabler for city development it is emphasized that smart cities should contribute to better quality of life and stronger economies. Additionally, various authors stress that participatory governance is also an essential part of smart cities [4, 15].

As Neirotti et al. made clear, a smart city can only be really smart when the city is capable of addressing real-life challenges and when it is able to bear the fruit of the social capital of the people involved in that city [16]. In recent years we have seen a development in definitions of smart cities towards more integral ones including the social factor of people, quality of life and economic benefits [17]. ITU-T, a telecom think tank from the United Nations with experts from over the world, investigated a list of more than 100 definitions in 2014 and introduced the term of Smart Sustainable City. As a result of analysis, they provide us with the following definition:”a smart sustainable city (SSC) is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects” [18]. The involvement of citizens and other non-governmental actors is essential. Smart citizens play a crucial role in smart cities by their participation in smart governance [20].

2.2 Key concepts related to smart cities and participatory governance

As Caragliu, Del Bo and Nijkamp [4] made clear in their definition, participatory governance is one of the essential aspects of smart cities. The electronic support of participatory governance has received a considerable amount of attention in the field of electronic participation. In its body of literature there has been emphasis on frameworks and models to understand the various levels of citizen participation in relationship to governmental tasks. First, we will discuss existing theories about so called Participation Ladders as firstly introduced by Sherry Arnstein [19, 20]. Various theories were developed from the foundations of Arnstein to measure and compare electronic forms of citizen participation. A selection of them will be discussed below. Additionally, we will pay attention to the concepts of digital divide and network-based participation.

e-Participation Ladders

In general, electronic participation ladders are theoretical models or frameworks to define and categorize various levels of citizen participation by electronic means. Many authors address the issue of defining and measuring e-participation. From our literature selection, 11 different e-participation ladders were identified but no consensus exists within them [21–31]. As the overview in Table 1 makes clear, the e-participation ladders include levels of participation from low to high.

Table 1. e-Participation ladder theories

Stages/Theory	IAP2/Tambouris[24, 30]	Macintosh[24, 29, 31]	OECD[24, 29, 31, 28]
	1. e-Informing	1. e-Enabling	1. Information
	2. e-Consulting	2. e-Engaging	2. Consultation
	3. e-Involving	3. e-Empowering	3. Active participation
	4. e-Collaborating		
	5. e-Empowerment		

Because of the inconsistent and various ways of defining and measuring participation (as Table 1 shows) in the literature, it is difficult to measure and compare levels of e-participation. A problem with existing e-Participation models is that central concepts are not clearly defined and measurement scales are, consequently, not clear and often confuse different measures [24]. In general the evaluation of e-participation is not well developed [32]. Macintosh [24] created a comprehensive participation ladder with three stages of online participation, which is useful to understand levels of participatory governance in smart cities. Macintosh's model seems most suitable for describing participation levels in a smart city environment. The borders between the steps on the ladder are relatively clear in comparison to other models and it is capable of distinguishing the levels for various stages of participation within electronic tools. Firstly, there is e-Enabling. This stage is mainly about providing access to existing data and information for citizens and companies. The second stage is e-Engaging. During this stage, people can interact with the organization and start a dialogue. People being consulted for certain projects, decisions or activities for instance with forums and polls. The third stage is e-Empowering. This stage is about working together with citizens and companies; Empowering them with responsibilities, tasks and options to allow them to collaborate with the local government.

While these e-participation ladders help to understand the extent to which citizens can take part in government decision making and its ownership, the current ladders predominantly focus on a two-way relationship between citizen and government. However, as we saw in the discussion of the definitions of smart cities, smart city challenges are not only a case of governments and citizens. Companies, nonprofit organizations and other city stakeholders such as schools and

institutions in the city also are part of the network of influencers [3, 10]. Therefore, we argue that the current e-participation ladders have shortcomings for effectively describing various forms of participatory governance in smart cities. The European Union has introduced the concept of Gov 3.0 where the city government is one of the partners in the city and this breaks the paradigm of the government that should always lead and control the future of a city in solitude [33]. As a result, we should consider whether the current e-participation ladders have to be updated to meet these new reality in smart cities.

Digital Divide

Another concept in literature that is strongly related to participatory governance by using digital tools, is the concept of digital divide. Online participation is not representing all groups from society equally. Certain groups of people take more interest in working together with the government while others are more difficult to reach such as young people [34]. According to various authors, those active on the web and willing to participate in government tasks are well-educated males with relatively high incomes and high age [35–37]. Another aspect of the divide is the knowledge and accessibility necessary to participate. There is some evidence available to show that the digital divide is reducing, leveraging potential engagement of citizens with an increased participation of women and younger people [38] but the divide is still something to take into account when deploying digital tools for participation.

Network-based participation

Governments and citizens are not completely isolated from other organizations and institutions in local society. Castells' terminology of the network society is increasingly relevant in contemporary cities: as an historical trend, dominant functions and processes in the Information Age are increasingly organized around networks[39]. Feedback of multiple stakeholders is essential in a network approach [3]. This marks an important shift in contemporary societies including life in cities. Increasingly, people take part in various communities and networks. Just like what we discussed in the previous section, this makes that participatory governance should not be reduced to the government and citizen relationship [2]. A more complete way of addressing the participation of networks of partners in cities is the Quadruple Helix: The Triple Helix innovation model focuses on university-industry-government relations. The Quadruple Helix embeds the Triple Helix by adding as a fourth helix the media-based and culture-based public and civil society[40].

3 Preliminary study of best practices

To illustrate various digital strategy examples we have conducted preliminary study. The main objective was to identify best-practice examples from the world,

where different forms of participatory governance were applied with remarkable outcomes.

As part of a project in collaboration with a municipality, partner universities and selected business partners we started identifying leading examples of smart city projects from a participation perspective. This exploratory part of the project was conducted in the period November 2015 until January 2016. We retrieved 20 examples from literature after an extensive, multi-disciplinary literature review. We have also used the snowball method to find additional resources. The following selection criteria were used to select five best-practice examples:

- Description of the example in literature where it received the verdict of best practice, good example, leading example or similar recommendation.
- The city is well-known worldwide and one of the top 5 largest cities of the country.
- There was a significant impact of the project as demonstrated by recognizable effects on the city life.

We did not strive for completeness here but we focused on five examples that highlight various strategies behind participatory smart city projects. While we could have chosen for another selection, we believe that these five projects work best as illustration here. The five best practice examples of Beijing, Seoul, Berlin, Reyjavik, and Krakow will now be presented below.

3.1 Beijing: Participatory Airbox

The PiMi Airbox is a small sensor box developed by the Chinese Tsinghua University of Beijing [41]. The box is an instrument that measures the quality of the air in the surroundings in which it is placed. An advantage of individual measuring instruments like the PiMi Airbox is that they achieve a high level of accuracy.

The PiMi airbox was provided to citizens of Beijing on a voluntary basis. In the first day of availability already five hundred households volunteered. For the volunteers the PiMi-boxes provide information about the indoor air quality in the interior of their houses. The data as collected by the boxes generate an accurate map of air quality by the process of crowdsourcing. The map is a powerful and low-cost tool for the local government to access air quality data and adjust policies.

The project is developed by a university and enables new data that could enable people to take part in active policy making and social movements. It could therefore be placed in the category of e-Enabling.

3.2 Seoul: Sharing City

In 2012, the South Korean capital Seoul declared itself a "sharing city". The Seoul Metropolitan Government (SMG) developed the Seoul Metropolitan Government Act for Promoting Sharing and translated this in a comprehensive

project called Share Hub. The Share Hub project aims to stimulate as much sharing activities as possible.

According to the 2014 annual report this initiative already resulted in the designation and support of 57 sharing organizations and aims to promote 300 businesses in the years to 2018 [42].

Due to the comprehensive character of the project, it reaches a wide variety of people and stakeholders who are stimulated to start new sharing initiatives. For example, sharing initiatives in sharing cars, knowledge, clothing, parking lots, public buildings, and business ideas were created in the past few years. The government intends to further stimulate sharing initiatives and also invests in education about sharing, to create an adaption of the concept of sharing from childhood on.

The Share Hub project itself is operated in a cooperation of the SMG and Creative Commons Korea. Due to the cooperation and the wide variety of initiatives generated by the project, the project can be characterized as a network-driven initiative. The project empowers citizens to create new initiatives and co-create and co-work in more efficient and sustainable environment. It therefore can be characterized as an e-empowering initiative.

3.3 Berlin: Open Data Portal

In 2013, the City of Berlin introduced a new web portal (Berlin Open Data) on which open data sets of the city of Berlin are gathered and freely shared. Most of these data sets were released under some form of the Creative Commons license. This warrants that interested parties including citizens and companies can freely access these open data sets and work on them. The data sets are gathered from nine governmental organizations in Berlin [43].

As of March 2016, 934 data sets, divided in 22 categories, are published on the dataportal. This resulted in 32 new applications, initiated by non-governmental parties (daten.berlin.de). The organizations that developed applications using the data from the dataportal vary from individual citizens, universities, businesses and startups and contains parties of all four helixes in the Quadruple Helix approach.

The initial initiative to create the data portal came from the local government of Berlin. The availability of the portal resulted in initiatives from a wider range of actors. Those initiatives sometimes generate other new initiatives or strengthen each other mutually as an open data ecosystem [43]. This initiative has all the characteristics of a networked form of development. The platform enables several new initiatives and parties to create new tools and could therefore be categorized as e-enabling.

3.4 Reykjavik: Better Reykjavik agenda setting

In 2010, the platform *Betri Reykjavik* (Better Reykjavik) was launched. *Better Reykjavik* is a website where the citizens of the Icelandic capital can propose

policy ideas and proposals to the local government. Since the opening of the website, it generated the participation of over 70,000 people. This is a large share of the total inhabitants of the approximately 120,000 headed city.

Ideas that are posted to the website can be reviewed by inhabitants of the city and can be voted in favor or against. The municipality of Reykjavik uses this platform to feed the policy agenda and political agenda, therefore providing a citizen generated policy agenda.

Remarkably, since the founding of the website, 256 new ideas of citizens were officially accepted and executed by the city council (betrireykjavik.is).

The project was started by the local government itself, but it currently largely drives on initiatives from local citizens.. The city council uses the content on the website to engage the inhabitants of the city to generate ideas to create a better Reykjavik. This initiative could therefore be categorized as e-Engaging.

3.5 Krakow: Participatory budgeting

In 2013, the Polish city of Krakow introduced a pilot project to create an open and participatory way of budgeting. By doing this, the city gathered information about civic priorities, set by their inhabitants whilst at the same time giving citizens more power in allocating the city budgets.

This project gave the inhabitants of various districts in the city the possibility to decide how parts of the local budget should be spent. By choosing the district as the governmental scale of the project, the project created possibilities for local administrators to gain insight in the desires and needs of inhabitants. Furthermore, the local administration came in close touch with their citizens.

This participatory form of governance resulted in more efficient and effective public spending and a growing understanding of the needs and priorities of Krakows civic society [33].

The pilot project was an initiative of the municipality of Krakow and empowered citizens to set parts of the local budget. It could therefore best be characterized as a form of e-Empowering.

4 Introducing digital and social strategies for participatory governance in smart cities

We noticed that a comprehensive conceptual framework to study and compare participatory governance strategies in smart cities was lacking. Therefore we propose a new framework here in Fig1. The Social Smart City framework is derived from both the theoretical findings and the example cities as described in this article. The framework can be used to have a more systematic way of studying current practices in cities. Furthermore the framework can be used to describe and compare the participatory governance progress of various cities towards becoming a smart city. We draw upon the e-participation ladder of Macintosh [24] to distinct various levels of participation. This is the horizontal axis in Fig1. On the vertical axis we display the aspect of leadership and control

by government, citizens or networks. Each field in the matrix comprises of a different example of a digital participation strategy. The bottom right corner of the matrix is considered to be the highest ambition for cities who aim to be smart in terms of participatory governance. However, as the matrix makes clear also the top left corner still needs a considerable amount of attention for governments to open up their information resources (e.g. open data sets) for the public and meet transparency goals. The data can be opened in order to meet open government transparency policies[44, 46] Open government as a phenomenon is one of the approaches to inform the people and enable citizens and companies to participate [3]. Moreover, opening up government data potentially increases participation, interaction and social inclusion[45]. Fig1 also shows various possible digital strategies for each combination of leadership and level of participation.

stage leadership	e-enabling	e-engaging	e-empowering
government initiatives	web information sharing strategy	digital consultation strategy	crowdsourcing strategy
citizen initiatives	digital e-literacy and digital access strategy	e-petitioning strategy	change movement support strategy
network initiatives	open data strategy	open knowledge consultation strategy	open innovation strategy (co-create)

Fig. 1. Social Smart City framework

5 Conclusion

The Social Smart City framework provides us with a refined way to look at digital strategies for participatory governance in cities that aim to become smart cities. This framework provides us with an overview of various digital strategies for participatory governance in smart cities. However, the overview has to be further developed and refined in future studies. In addition to the known participation ladders, the framework gives a broader perspective on participatory governance than a two-way relationship between citizen and government. The framework shows various examples of digital strategies within smart cities. Although the framework provides us with a refined way to look at digital strategies for smart cities, it should be used with care as a tool to assess smart city progress. A city

probably has to support several e-empowering initiatives to become smart in that respect. Also, the framework should be further applied and validated in studies to refine its contents. Additional strategies could be added that are not yet present within our overview. Potentially, the framework could be extended to become a benchmarking tool for participatory initiatives various smart cities. Validation in future empirical comparative studies could help to assess the completeness and validity of the framework.

6 Discussion

This study has several limitations that should be addressed in future studies. First, it is necessary to underpin the various possible strategies in our framework with empirical data. For example, the proposed framework could be employed in comparative case studies. Secondly, there could have been other best practices of participatory governance in smart cities that were not yet identified. Other examples could enhance the explanatory function of our framework. In the near future we will continue studying the various innovative ways of participatory governance in smart cities. We have designed the framework from the perspective of governmental users. As a result the network initiatives in the framework show examples of strategies that governments could employ. We have deliberately designed the framework in such a way.

In the end, even with solid digital strategies from local governments, the future of cities is largely an outcome of a set of decisions of multiple stakeholders in an open network. We follow the words of Castells since there will be open structures, able to expand without limits, integrating new nodes as long as they are able to communicate within the network, namely as long as they share the same communication codes [39]. The complexity of the ownership, leadership and decision making processes in our future cities will be tremendously high. People increasingly make short-term commitments in changing communities of interest and changing goals that meet their expectations (e.g. Latour, Reassembling the social [6]). The time has come to explore new effective participatory strategies using digital tools in order to really become a smart city that benefits from its human capital.

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