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Smart Cities Governance: The Need for a Holistic Approach to Assessing Urban Participatory Policy Making

Walter Castelnovo[1], Gianluca Misuraca[2], and Alberto Savoldelli[3]

Abstract

Most of the definitions of a "smart city" make a direct or indirect reference to improving performance as one of the main objectives of initiatives to make cities "smarter". Several evaluation approaches and models have been put forward in literature and practice to measure smart cities. However, they are often normative or limited to certain aspects of cities' "smartness", and a more comprehensive and holistic approach seems to be lacking. Thus, building on a review of the literature and practice in the field, this paper aims to discuss the importance of adopting a holistic approach to the assessment of smart city governance and policy decision making. It also proposes a performance assessment framework that overcomes the limitations of existing approaches and contributes to filling the current gap in the knowledge base in this domain. One of the innovative elements of the proposed framework is its holistic approach to policy evaluation. It is designed to address a smart city's specificities and can benefit from the active participation of citizens in assessing the public value of policy decisions and their sustainability over time. We focus our attention on the performance measurement of codesign and coproduction by stakeholders and social innovation processes related to public value generation. More specifically, we are interested in the assessment of both the citizen centricity of smart city decision making and the processes by which public decisions are implemented, monitored, and evaluated as regards their capability to develop truly "blended" value services—that is, simultaneously socially inclusive, environmentally friendly, and economically sustainable.

Keywords

smart cities, governance, policy making, social impacts, evaluation, performance management

[1] University of Insubria, Varese, Italy
[2] European Commission, Joint Research Centre, Institute for Prospective Technological Studies (JRC-IPTS), Seville, Spain
[3] Independent Researcher, Milan, Italy

Corresponding Author:
Walter Castelnovo, University of Insubria, Dipartimento di Scienze Teoriche ed Applicate, Via Oriani, 6, Como, 22100, Italy.
Email: walter.castelnovo@uninsubria.it

Introduction

"Digital experiments" in the urban setting started over 30 years ago, even before the Internet was established. Currently, the expansion of information and communication technologies (ICTs) is characterized by technological convergence, normalization, mobile pervasiveness, and also the emerging mantras of ambient intelligence/Internet of things. This is complemented by other, supposedly "disruptive", technologies and approaches such as cloud and ubiquitous computing, or open and big data (to mention just a few of the current trends). However, effective societal take up of digital means is not yet supported by any clear metrics on whether they can actually improve living conditions in the world's cities.

Despite the fact that ICTs are transforming lifestyles, citizens' expectations, and indeed their frustrations, grow. In fact, over 50% of the world's population lives in urban contexts, and half of these people still live in "slums". At the same time, significant numbers of poor, disadvantaged, and excluded people live in rich urban areas. Despite this, there is no clear framework, especially from a research and policy perspective, for assessing the real level and content of what we call "smartness" when related to cities, or whether ICTs are actually contributing to improving the living conditions of citizens in urban settings. (Misuraca & Rossel, 2012).

There have been many false claims that smart cities are ICT-enabled cities. However, in the rush to digitize everything, it has often been forgotten to consider the ICT-enabled city governance, which we define as the use of ICTs to comprehensively simplify and improve the internal administrative operations of government; facilitate public service interaction between government, citizens, and other stakeholders; enable citizen participation, and ensure inclusiveness and equal opportunity for all (Misuraca, 2010).

Nonetheless, cities are indeed advancing, albeit at very unequal speeds. They are adopting similar options and approaches, for example, in their search for alignment and benchmarking which would allow them to be categorized as "smart", no matter what that means. However, to the best of our knowledge, a holistic approach to assessing the effective smartness of city policies is not yet available. Thus, the objective of this article is to discuss the need for an approach of this kind and to propose a holistic framework that can provide guidance on how to assess the various governance dimensions of a "smart city".

The paper has four sections. The second section discusses the problem of policy evaluation in the context of smart cities and the need for a holistic approach to policy decision making and smart city governance. The third section provides an overview of the scientific and gray literature on smart city assessment, based on a sample of the best-known approaches. It highlights their limitations, which point to the need for a more holistic approach. The fourth section introduces our framework for the assessment of the policy decision-making process for smart city governance. Finally, the fifth section draws conclusions on the advantages and limitations of the proposed approach and outlines future research directions.

From Performance Measurement of E-Government to the Measurement of the Performance of Smart City Governance

Cities and urban areas are ideal places in which to reconcile some of the contradictions of all globalized societies, even though they are rooted in distinct cultures and territories. In fact, the local level is often where the tensions between a system of multiple interactions and frequently conflicting views regarding the three pillars of sustainable development (economic, social, and environmental) can be managed (Jacquier, 2008).

However, up until now research in the field of ICTs and governance at local level has mainly focused on the emerging trends of e-Government, namely:

1. the growing recognition that a crucial test of ICT-enabled solutions is the impact they have on the quality of the relationship between government and its constituency;
2. the value and power of ICT-enabled networks in closely connecting people, government agencies, and private or community sector organizations in new patterns and combinations, either by digitizing previously existing services or by offering new ones.

These trends must be considered as complementary to the traditional objective of public policies and urban planning, that is, that of optimizing urban services and improving the quality of life of citizens. In this sense, a smart city should be a context where more ICTs lead to a better city (Misuraca, Ferro, & Caroleo, 2010).

In this respect, if we want to understand how the Information Society will be shaped in the city of the future—a prerequisite for the development of adequate policies—first we have to look at the processes of informatization driven by actors, their visions, and strategies in dealing with ICTs. Then we must look at (1) the more "blended-value" (Bugg-Levine & Emerson, 2011) impact of this informatization of urban services and (2) how the changes taking place are linked to ways of coping with contemporary society's major challenges.

But how do we actually measure and evaluate whether a city is smart? What dimensions should be considered when defining the smartness of a city?

In this regard, several research and policy/practice-oriented approaches have been put forward in the last decade with interesting results and practical implications for both research and policy (see third section for further detail). However, in assessing the smartness of cities, it is always a risk that any initiative that defines itself as being in some way smart could allow any city to be included in the "smart cities club". To avoid this risk, and go beyond the "beauty contest" or "let's all be part of the club" approaches, we must assess the dimensions that together may serve as a platform for defining a city as smart in more depth (Misuraca & Rossel, 2012).

We therefore focus on a more pragmatic method that explores how ICT-enabled innovations are generating changes in city government systems, the implications of these changes for governance processes, and their impacts on the local economy and society. Thus, we can pave the way for a future-oriented analysis. Decisions taken today will affect the future of our cities and this future will be our legacy to the next generations. Following recent trends in social impact measurement (Epstein & Yuthas, 2014), we suggest a holistic and evolutionary impact measurement framework to better assess the challenges mentioned above. Multistakeholder participation (including citizens) will be at the center of this impact evaluation process of city governance, and performance results will be used to drive resource allocation and to revise strategies to ensure continuous improvement in public value generation.

Background on Smart Cities and Smart Cities Governance Performances Measurement

Many definitions of smart cities have been suggested in the large and growing literature on smart cities, as witnessed by the different literature surveys that have been published in the past few years (e.g., Albino, Berardi, & Dangelico, 2015; Deakin, 2014; International Telecommunication Union [ITU], 2014; Meijer & Rodríguez Bolívar, 2013; Mosannenzadeh & Vettoriato, 2014; Nam & Pardo, 2011a; Sinkiene, Grumadaite, & Liugailaite-Radzvickiene, 2014). In this section, instead of proposing a further survey, we will refer to ones already published in order to identify the "building blocks" for the holistic approach to smart city governance that we will introduce in fourth section.

Our review of the smart city literature encompasses some of the most relevant papers recently published in the field. A large variety of definitions and approaches to smart cities are included and

they provide clear evidence, as many scholars have argued, of how the concept of smart city is fuzzy with many faces. Smart cities should be defined in relation to different perspectives or aspects (Meijer & Rodríguez Bolívar, 2013). Although the view of a city as a complex system of systems (Dirks, Keeling, & Dencik, 2009) is widely shared in literature, many researchers separate the smart city concept into many features and dimensions, using the complexity of managing the concept in a holistic way as justification for this decision (Albino et al., 2015). To date, most of the frameworks that have been suggested in the literature are based on the identification and description of the components of the smart city (i.e., the dimensions that are assumed to influence the city's smartness), whereas only a few of them also consider the complex interactions between those dimensions. The ITU survey provides very clear evidence of which dimensions of a smart city are most considered in the literature (ITU, 2014). The survey analyzed 98 definitions of smart cities in the relevant literature (both scientific and gray) and found 49 key concepts/key words that occur 573 times in the definitions and that could be grouped in clusters corresponding to the dimensions that have been most often considered as defining a city smartness, as summarized in Table 1.

Mosannenzadeh and Vettoriato (2014) suggest that any conceptual framework for smart cities should be able to account not only for *what* smart city initiatives are about, that is, the city subsystems/domains that can be made "smarter" through the implementation of smart city initiatives, but also for *why* and *how* to make a city smarter. The smart city components/dimensions identified in the ITU survey can be considered as a description of *what* smart city initiatives are about. The references reported in Table 1 clearly show that most (if not all) of the frameworks that have been suggested in literature acknowledge that (smart) cities are multidimensional systems. Even the frameworks more focused on a particular component/dimension do not fail to acknowledge the importance of the other dimensions as well (Meijer & Rodríguez Bolívar, 2013). From this point of view, it could be said that there is a substantial convergence among researchers as to what the main targets for smart city initiatives are.

Among researchers there is also a quite widely shared view about why cities should be made smarter and/or smart cities should be created. In the literature, it is quite common to find that the main objectives of smart city initiatives are sustainable development, economic growth, and better quality of life for citizens (Albino et al., 2015; ITU, 2014; Meijer & Rodríguez Bolívar, 2013; Mosannenzadeh & Vettoriato, 2014; Sinkiene et al., 2014). However, as Albino, Berardi, and Dangelico (2015) observe, quality of life plays a special role in the smart city literature. All the smart city initiatives in the end aim to raise quality of life for citizens and other urban stakeholders, whatever city dimension they target directly (Ballas, 2013; Batty et al., 2012; Shapiro, 2006). Quality of life, together with the related and to some extent overlapping concepts of well-being and happiness (both recurring concepts within the smart city literature), represents dimensions of public value (Benington & Moore, 2011; Hills & Sullivan, 2006), which Moore (2013) defines as the net benefit of a public service expressed not only in terms of monetary value but also in terms of how government actions affect important civic and democratic principles such as equity, liberty, responsiveness, transparency, participation, and citizenship. Focusing on raising quality of life as the fundamental goal of smart city initiatives opens the way to a public value management (PVM) approach to smart cities. An approach of this kind has been advocated by Cosgrave, Tryfonas, and Crick (2014) who suggest viewing the fundamental ideas behind the smart city concept in the light of the PVM paradigm. A PVM-based approach to smart cities does not focus solely on the creation of economic value and on the delivery of services but also allows us to understand value beyond the optimization of systems by considering smart city initiatives as inseparable from the political paradigm and the institutional structures within which they are undertaken (Chourabi et al., 2012; Nam & Pardo, 2011a, 2011b). In the end, this leads to a view of smart cities as organic ecosystems in which citizens and other relevant stakeholders are collaboratively involved in the cocreation of sustainable innovations that improve life in the city and boost the local economy (Baccarne, Mechant, & Schuurman, 2014).

Table 1. Smart City Components/Dimensions.

Smart City Components/Dimensions	Examples
ICT, communication, intelligence, information	Hoon Lee, Phaal, and Lee (2013); Washburn et al. (2010); Giffinger et al. (2007); Dirks, Keeling, and Dencik (2009); ITU (2014); Caragliu, Del Bo, and Nijkamp (2009)
Governance, management, and administration	Meijer and Rodríguez Bolívar (2013); Chourabi et al. (2012); Lombardi, Giordano, Farouh, and Wael (2011); Caragliu et al. (2009); Nam and Pardo (2011a, 2011b); Batty et al. (2012); Scholl and Scholl (2014)
Quality of life and lifestyle	Lombardi et al. (2011); Giffinger et al. (2007); Caragliu et al. (2009); Batty et al. (2012); Ballas (2013); Neirotti, De Marco, Cagliano, Mangano, and Scorrano (2014); Shapiro (2006)
Infrastructure and Services	Washburn et al. (2010); Batty et al. (2012); Nam and Pardo (2011a, 2011b); Dirks et al. (2009); Lombardi et al. (2011)
People, citizens, and society	Lombardi et al. (2011); Giffinger et al. (2007); Chourabi et al. (2012); Shapiro (2006); Hoon Lee et al. (2013)
Environment and sustainability	Giffinger et al. (2007); Lombardi et al. (2011); Nam and Pardo (2011a, 2011b); Roseland (1997); Kourtit, Macharis, and Nijkamp (2014); Bătăgan (2011)
Economy and financials	Caragliu et al. (2009); Ballas (2013); Bătăgan (2011); Lazaroiu and Roscia (2012)
Mobility	Neirotti et al. (2014); Lombardi et al. (2011); Giffinger et al. (2007); Caragliu et al. (2009); Dirks et al. (2009); Washburn et al. (2010)

Meijer and Rodríguez Bolívar (2013) distinguish three strands in the smart city literature that represent three different ways of conceiving how city smartness can be improved: the technical strand, the human resources strand, and the governance strand.

In the technical strand, the role of smart technologies (smart ICTs) is emphasized as the fundamental infrastructure for smart cities that allows the integration of all the city components/dimensions. Hall (2000) is among the first to advocate an integrated approach to smart cities by claiming that a smart city monitors and integrates the conditions of all of its critical infrastructures to better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens. Dirks, Keeling, and Dencik (2009) argue that ICTs can be used to achieve the instrumentation and the interconnection of the city's core systems, thus suggesting that smart cities can be considered as an organic integration of IT-based systems. The use of smart technologies can make the critical infrastructure components and services of a city more intelligent, interconnected, and efficient (Washburn et al., 2010).

Komninos (2011) believes that ICTs not only enable the creation of a cyber, digital, wired, informational or knowledge-based city but also enable changes in the way people live and work, fostering innovation, learning, and knowledge. Along similar lines, Hoon Lee, Phaal, and Lee (2013) assume technology to be the starting point for the definition of innovation strategies that affect the development of the urban system and allow a city to supply better services. As Batty et al. (2012) observe, the widespread diffusion of ICTs in smart cities can improve the way every city subsystem operates, with the goal of enhancing citizens' quality of life.

By stressing the fundamental role played by ICT in making cities smarter, the approaches that conceptualize smart cities as primarily a technical issue incur the risk of technological determinism. They underestimate the factors involved at the societal, organizational, individual, and cultural levels (Gil-Garcia, Vivanco, & Luna-Reyes, 2014). These nontechnological factors, which are addressed in Nam & Pardo (2011a, 2011b), and Chourabi et al. (2012) exemplify the governance strand within the smart city literature according to Meijer and Rodríguez Bolívar (2013). Nam and

Pardo (2011a) argue that in order to assess the performance of a modern city, a more comprehensive vision is needed. Measuring a city's smartness by considering separately how it improves the performance in each of its subsystems makes it very difficult (if not impossible) to recognize effects that are only detectable at a whole-system level (Misuraca & Rossel, 2012). Assuming a sociotechnical approach, Nam and Pardo (2011a, 2011b) claim that in order to assess a smart city, whether and how smart technologies have succeeded in changing the city and its performance should be considered. Whether and how traditional institutional and human factors in urban dynamics have affected the smart city initiatives leveraged by ICTs should also be looked at. Chourabi et al. (2012) define an integrated framework in which the typical smart city domains (natural environment, economy, [built] infrastructures, governance, people, and communities) are integrated with technology, management/organization, and policy. These domains should not be considered as further city subsystems but as factors that can make interventions to improve the performance of the city smarter.

According to Meijer and Rodríguez Bolívar (2013), researchers in the human resource strand focus on people as being central to the operation of smart cities. For Chourabi et al. (2012), addressing the topic of people and communities as part of smart cities is critical, although traditionally this topic has been neglected. The social infrastructure, such as intellectual and social capital, is an indispensable part of smart cities (Albino et al., 2015) since it contributes to creating a climate suitable for an emerging creative class that is a fundamental asset for smart cities. Indeed, creativity and social innovation are considered key drivers for smart cities, and thus people, education, learning, and knowledge have central importance in this process (Nam & Pardo, 2011b; TEPSIE, 2015). From this point of view, making people smarter can be considered as one of the objectives of smart city initiatives. Smart people are a fundamental asset for smart cities as they provide a relevant resource on which initiatives can rely to make cities smarter. In fact, besides contributing to a city's competitiveness, which is an engine for economic growth, smart, educated, and informed people can become active users and engage with smart city initiatives. They can make these initiatives a success or a failure, by both adopting and using the (smart) services made available to them and by participating in the governance and the management of the city (Chourabi et al., 2012).

Participatory governance and citizen involvement (under different stakeholder roles) are key concepts in many smart city frameworks (Albino et al., 2015; Caragliu, Del Bo, & Nijkamp, 2009; Chourabi et al., 2012; Giffinger et al., 2007; Lombardi et al., 2011; Meijer & Rodríguez Bolívar, 2015; Misuraca, Reid, & Deakin, 2011; Nam & Pardo, 2011b). According to Belissent (2010), governance is the core of smart city initiatives. Even researchers who do not give governance such a central role at least include it as one of the dimensions that should be targeted by smart city initiatives. Governance is fundamental to bringing smart city initiatives to citizens. It keeps the process of decision-making transparent (Albino et al., 2015) and enables better citizen participation in implementing, monitoring, and evaluating these initiatives (Misuraca et al., 2011). Washburn et al. (2010) observe that many of the obstacles to delivering the smart city vision result from a lack of governance that ensures multistakeholders' collaboration throughout a project, not just at the design and implementation stage but also postimplementation.

In the smart city literature, governance is often seen as referring to citizen participation (Caragliu et al., 2009; Giffinger et al., 2007; Lombardi et al., 2011) and to collaboration among stakeholders (Baccarne et al., 2014; Bătăgan, 2011; Chourabi et al., 2012; Nam & Pardo, 2011a, 2011b; Scholl & Scholl, 2014). This could mean that government structures and operations need to be transformed to some extent (more or less radically) to create a smart city (Meijer & Rodríguez Bolívar, 2013). Although participation and collaboration are often used synonymously in the smart city context, Bartenberger and Grubmüller-Régent (2014) suggest using the more restrictive concept of collaborative governance in order to keep smart city governance distinct from the broader concept of participatory democracy. Ansell and Gash (2008, p. 544) define collaborative governance as "a governing arrangement where one or more public agencies directly engage nonstate stakeholders

in a collective decision-making process that is formal, consensus oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets". Collaborative governance entails a transformation of governance but only as regards how governance is exerted, that is, through collective decision-making processes that include both public and private actors and that, in the case of smart cities, are enabled by ICTs (Misuraca et al., 2011). In the context of smart city governance, this includes the definition and implementation of the policies that aim to make cities smarter, and which require sharing visions and strategies with the relevant stakeholders (Nam & Pardo, 2011b). It also includes the management of the implementation of smart city initiatives targeted at making the various city dimensions/components smarter (Chourabi et al., 2012). Finally, it includes the management of:

- city infrastructures, including ICT infrastructures and systems which are enabling factors for the development of smart cities and that need to be governed;
- the resources necessary for the development of smart cities, including the financial resources that are decisive for the prosperity and sustainability of smart cities over time (Kourtit, Macharis, & Nijkamp, 2014);
- human assets (Lombardi et al., 2011), and other immaterial capital (social and relational capital, intellectual capital and innovation, and knowledge and information) that are decisive for smart, sustainable and inclusive growth (Batangan, 2011).

These concepts are also deeply rooted in the more recent holistic approach to "impact investing" (Bugg-Levine & Emerson, 2011; Rodin & Brandenburg, 2014). This approach underlines how a performing organization—which a smart city should be—has to deal with the "blended-value" management process. This process should reconcile the optimal management of resources (including ICTs), the achievement of economic sustainability, and the pursuit of social equity for its members.

All these governance dimensions are integrated into the holistic framework for the assessment of smart city governance that we introduce in the next section. The framework includes public value creation, vision and strategy formulation, asset management, financial and economic sustainability, social inclusiveness, and multistakeholders participation. These are the building blocks for the assessment of initiatives that aim to make cities smarter by targeting one or more of the smart city components/dimensions reported in Table 1.

A Holistic Framework to Assess Smart City Governance and Policy Decision Making

A public value–based approach to smart city assessment allows us to address the multifaceted, interrelated, and dynamic structure of smart city governance. It also allows us to capture the evolutionary nature of the smart city ecosystem (Baccarne et al., 2014), where performance results could be used to drive resource allocation and to revise strategies to ensure continuous improvements in public value generation (Epstein & Yuthas, 2014). It also permits us to focus on the central role of citizens in the decision-making process, giving them an active role in the design, adoption, and evaluation of the city's policies and services (Savoldelli, Codagnone, & Misuraca, 2014). The adoption of a service is influenced by citizens' perceptions of both its value and the level of transparency in the related decision-making process (Feeney & Welch, 2012; Van Ryzin, 2009). Positive perceptions of a service's capability to deliver public value and the transparency and accountability of the decision-making process, together with the engagement of citizens and other urban stakeholders, increase citizens' trust in policy makers and public administration (Savoldelli, Misuraca, & Codagnone, 2014; Welch, 2012). It can also stimulate a city's adoption of services (Cosgrave, Tryfonas, & Crick, 2014; Feeney & Welch, 2012; Savoldelli, Codagnone & Misuraca, 2014).

Citizen engagement is therefore a fundamental cornerstone of smart city governance. Scholars, experts, and leaders are beginning to agree that the traditional methods for governing the complex interplay of technological knowledge, political constraints, and value conflicts underpinning public value creation and management are no longer sufficient for the current demands of public decision making. A new form of public participation is both valuable and necessary (Nam & Pardo, 2011a, 2011b; Savoldelli, Codagnone, & Misuraca, 2013).

Traditional engagement approaches involve stimulating citizen participation in policy decisions through suggestions and indications that follow a typical top-down decision-making process. Public services are first shaped by the municipality and then citizens are engaged through a mix of online and off-line initiatives which collect their points of view, criticisms, and suggestions to improve the services. ICTs, and especially social media, are used to widen the number of participants in the public debate and to give a voice to individuals who are not usually willing to participate in person in public debates.

Recent positive experiences such as the Community planIt in a Boston municipality (Gupta, Bouvier, & Gordon, 2012) show that adequate use of new media and in-person meetings increases by 10 times the number of participants in public debate, and helps the decision makers to make choices that are closer to the population's needs.

More recent trends suggest that citizens are participating more in their city's governance and playing a more central role in the creation and management of public value (Aversano et al., 2013). They do this through social innovation and multistakeholder codesign, cofunding, codelivery, and coevaluation of products and services (Linders, 2012; TEPSIE, 2015).

This represents a new approach in which citizen participation starts from the bottom in a spontaneous way that does not require abstract solutions. Instead, new and concrete actions address problems that citizens face every day (Bencardino & Greco, 2014).

Reinventer Paris (http://www.reinventer.paris/en/sites/) is a typical example of this trend. The initiative is looking for new and self-sustainable approaches to urban innovation where different urban actors (investors, architects, project owners, prime contractors, operators, users, researchers, artists, designers, start-ups, etc.) work together from the generation of the idea to the project financing, implementation, and service management of 1 of the 23 public sites located in the city center. These are made available by the city hall for innovative and value-added services to citizens.

New Urban mechanics, an ICT-based platform in Boston (http://newurbanmechanics.org/), is another example of the central role played by citizens in a smart city's public value creation and management process. This initiative relies on the crowdsourcing approach. The city administration has provided an ICT platform where every citizen can report unsolved issues, inefficiencies, and failures detected in the urban environment and related services, propose solutions and even act together with other citizens.

London Datastore (http://data.london.gov.uk/) uses open data to increase citizen engagement and social innovation. It makes available more than 600 public data sets connected together and openly available to developers and users for generating innovative services for the citizens of London. To date, several thousand developers have registered to use the data sets and have already created hundreds of applications, reaching millions of active users.

These few examples show how ICTs and social media can play an important role as enablers for public value cocreation in an urban setting, by making services smarter and addressing issues that citizens recognize to be of great importance in their daily lives (Design Action Research with Government [DARG], 2014).

Based on these observations and the discussion in the third section, Figure 1 below represents the key elements of a holistic approach to the assessment of smart city governance and their interrelations.

Figure 1 provides a snapshot of the key dimensions of smart city governance: citizens' needs and institutional settings drive the decision-making process that underpins the—optimal—allocation of

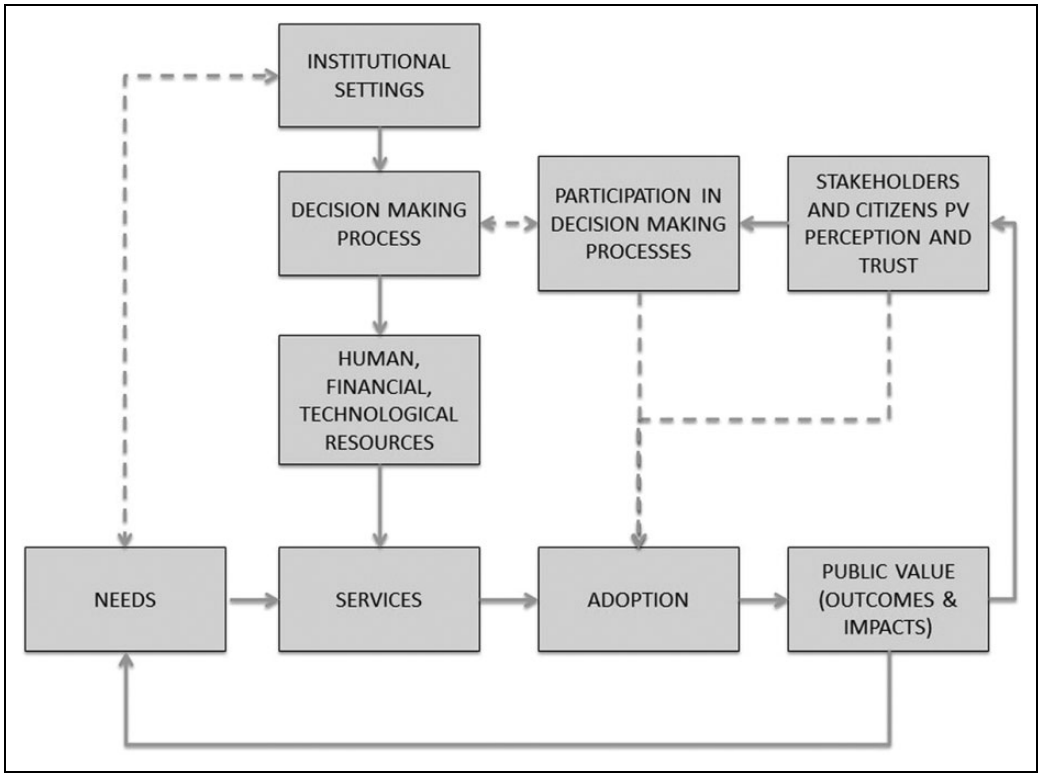

Figure 1. Key elements of a smart city's governance assessment framework.

resources for public value services. Their degree of adoption by beneficiaries shows how city governance can generate public value—measured in relation to the achieved outcomes and impacts—and also influence the perceptions of stakeholders (including citizens) of the public value associated with the services provided and hence the level of trust in government. This latter dimension can influence multistakeholder participation in the decision-making processes, which in turn can influence both the decision-making process itself, and service adoption. Finally, the degree of public value generated by the services provided can influence citizens' needs, creating a continuous improvement process underpinning smart city governance, which is coherent with the changing needs of the citizenry, the availability of resources, and a smart city's overall strategic vision.

In our opinion, the key elements of smart city governance presented in Figure 1 constitute a good starting point for defining a holistic framework to assess a smart city's capability to generate public value, which is the ultimate goal of smart city's governance. Therefore, our holistic approach considers the city as an environment whose capability to survive and grow depends on its stakeholders and policy makers having a clear strategic vision, the engagement of the relevant urban actors (community of individuals), and the efficient and effective organizations of its public value generation and management processes (Moore, 1995, 2013).

Figure 2 advances the model further, outlining the structure of the holistic framework we propose for measuring a smart city's capability of generating and managing public value, with and for its community. The framework reflects the citizen centricity of smart city governance and is based on the application of traditional balanced scorecard approaches to the public sector (Kaplan & Norton, 2001) along the lines described in (Moullin et al., 2007).

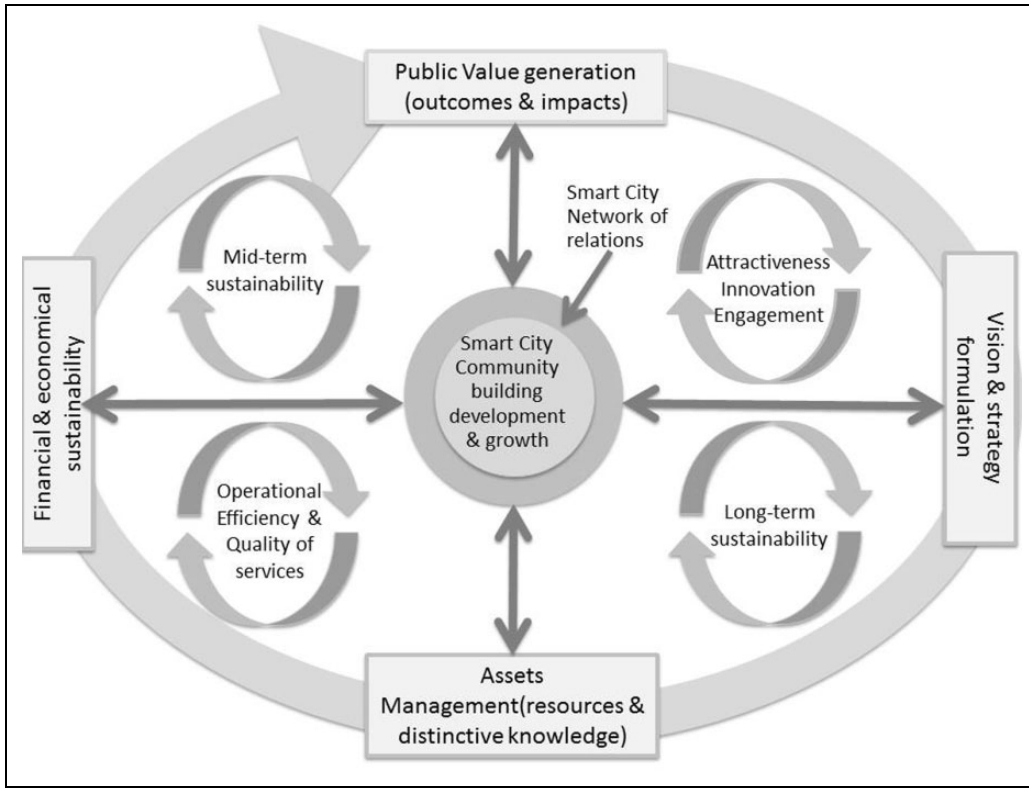

Figure 2. The logic structure of the proposed smart city's governance holistic assessment framework.

Our holistic framework comprises the following five dimensions, namely:

- "Community building and management", which aims to assess urban stakeholders' engagement in smart city governance and decision-making processes. This dimension also considers the strengths of a city's networks of relations with other urban communities and relevant stakeholders, both inside the urban context and outside of it.
- "Vision and strategy formulation", which aims to assess a smart city's capability of using strategic planning and implementing monitoring and evaluation techniques to generate evidence to inform future strategic plans.
- "Public value generation", which aims to measure the outcomes and/or the long-term impacts of the initiatives implemented. This value generation usually includes the more general social objectives that the interventions address, such as economic growth, employment, social inclusion, and well-being.
- "Asset management", which aims to assess the generation of knowledge to benchmark the city's performance and provide an evidence base for the enhancement of current interventions and the development of future plans.
- "Economic and financial sustainability", which aims to assess a smart city's long-term sustainability and its ability to attract investment and manage change. This dimension also focuses on the availability of economic and financial resources and evaluates their efficient and effective use.

The intersections of the five dimensions as described in Figure 2 define four perspectives from which smart city governance can be measured. This allows us to identify some clusters of key

performance indicators to assess smart city governance and decision-making processes from a holistic point of view. The following sets of key variables are examples, rather than a finalized list:

- The interaction between community building and management, public value generation, and vision and strategy formulation represents the smart city's capability to create and maintain a proper identity over time. This is important for strengthening the citizen's sense of belonging to the urban territory and for creating long-lasting relationships between investors, other relevant stakeholders, and the entire smart city community. Key variables that could be monitored to this end are related to: stakeholder involvement in the strategic processes of smart city governance, engagement of citizens in smart city policy and strategy development, capability of developing and managing strategic planning processes and evaluation techniques, and public value creation and socioeconomic impacts.
- The interaction between community building and management, vision and strategy formulation, and assets management provides evidence of the long-term sustainability of the smart city. In fact, it is important for smart cities to translate their vision into specific strategic plans, coherent with the availability of existing resources (i.e., human, knowledge, technological and financial). The lack of clear strategic processes could result in fragmentation of the available resources. This would create inefficiency in their allocation (i.e., resources redundancy; losses of possible synergies among services/departments, differences between needed services delivery capacity and available ones) and a long-term failure of the city to provide high-quality services. There would be a risk that resources would be wasted and unsustainable services provided. Key variables that need to be monitored to avoid this are related to the degree of service management processes integration; degree of technological and organizational integration of the smart city infrastructures, and use of change management and process reorganization/reengineering techniques.
- The interaction between community building and management, assets management, and financial and economic sustainability addresses the service delivery capability of the smart city and its operational efficiency. Like any other organization, smart cities have to make efficient use of available resources to survive in the short to medium term. Hence, smart cities have to increase and maintain their continuous improvement process capability in service management over the time. Key variables that need to be monitored to this end are related to cost efficiency of the services provided, knowledge management capability, use of resource planning management systems, and use of activity base costing systems.
- The interaction between community building and management, public value generation, and financial and economic sustainability contributes to the short-to-medium-term sustainability of smart cities. It measures the capability of a smart city to create and renew services and to generate social innovations in a self-sustainable way. It also represents the smart city's capability to understand the evolving structure of its population's needs, thus improving the trust its citizens have in the city's administration and an effective adoption of the proposed services. Key variables that need to be monitored to this end are related to service and product innovation capabilities, evidence of cost-effectiveness of the services provided, user satisfaction measures, and service adoption measures.

Conclusion and Future Research Directions

In this paper, we have argued for the need to adopt a holistic approach to assessing the smartness of cities, paying particular attention to city governance and the management of the policy decision-making process. We reviewed an illustrative sample of smart cities' performance

assessment frameworks already put forward in the literature and practice and concluded that despite their scientific soundness, the majority of them are either too normative or sectorial in the scope. Moreover, they were often too oriented toward the evaluation of ICT as the enabling factor for ''smartening'' urban areas.

In our informed opinion, in measuring what makes a city smart, current benchmarking and assessment frameworks mainly focus on determining to what extent ICTs improve the performance of urban systems and on how the governance of ICT performs. However, they fail to address the performance measurement of what we define as ICT-enabled city governance. As a result, they fail to account for the ''dark side of ICT'' (e.g., the digital risks, divides, and vulnerabilities), or for the hidden costs, and long-term effects. In fact, we are creating technological lock-in by driving fast toward a planned future (full of ICTs and ICT-enabled services), without the appropriate instruments for checking whether we are going into right direction.

We propose shifting the focus of assessment from the performance of smart city public services to the city's capability to generate and manage public value. For this purpose, we reaffirm the central role of citizens in the decision-making process and their fundamental contribution to public value creation in the city context.

In line with these considerations, we propose a holistic assessment framework comprising five key evaluation dimensions to measure how city governance performs in pursuing sustainable and participatory public value generation. The intersections of the five dimensions of the framework (as described in Figure 2) define four perspectives from which to assess smart city governance.

We believe that this approach overcomes the traditional sectorial benchmarking and assessment models and contributes to expanding and completing the general frameworks we found in the literature. The most innovative element of the proposed framework is the central role given to the citizen engagement process. In our approach, citizen engagement is not considered simply as a way to stimulate citizen participation in the public debate but as a process of social innovation that allows citizens to coproduce public value. It increases the adoption and the sustainability of public services, in line with the changing needs of the citizenry, the availability of resources, and the smart city's strategic vision.

Our framework confirms the pervasive role of ICTs in smart city governance and their instrumental/enabling role for public value creation and management. At the moment, however, the proposed framework only defines the key building blocks to be used in the assessment process; indicators and metrics are not yet fully addressed. While we acknowledge this is an important limitation of our current work, it also represents an opportunity to steer future research on reaching consensus on smart city governance measurement processes. It could also allow us to standardize them for practical use in smart city contexts. An interesting perspective emerging from this research is the further definition of measurement indicators, metrics and tools for citizen engagement, and social innovation for smart city governance and public value generation.

Author's Note

The views expressed in this paper are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

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References

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

Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory*, *18*, 543–571.

Aversano, P., Raju, A., Mechant, P., & Ballon, P. (2013, May 23–25). Reuse potential assessment framework for gamification-based smart city pilots. In D. Charitos, I. Theona, D. Dragona, M. Meimaris, & C. Rizopoulos (Eds.), *Proceedings of the International Biennial Conference Hybrid City, Subtle Revolutions* (pp. 17–23). Athens, Greece: University Research Institute of Applied Communication.

Baccarne, B., Mechant, P., & Schuurman, D. (2014). Empowered cities? An analysis of the structure and generated value of the smart city Ghent. In R. P. Dameri & C. Rosenthal-Sabroux (Eds.), *Smart city—How to create public and economic value with high technology in urban space* (pp. 157–182). Heidelberg, Germany: Springer

Ballas, D. (2013). What makes a 'Happy city'? *Cities*, *32*, S39–S50.

Bartenberger, M., & Grubmüller-Régent, V. (2014). The enabling effects of open government data on collaborative governance in smart city contexts. *eJournal of eDemocracy and Open Government*, *6*, 36–48.

Bătăgan, L. (2011). Smart cities and sustainability models. *Informatica Economică*, *15*, 80–87.

Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., . . . Portugali, Y. (2012). Smart cities of the future. *European Physical Journal*, *214*, 481–518.

Belissent, J. (2010, November 2). *Getting clever about smart cities: New opportunities require new business models*. Cambridge, MA: Forrester Research.

Bencardino, M., & Greco, I. (2014, June 4–6). *Smart communities. Social innovation at the services of smart cities.* Paper presented at Eighth international conference INPUTSmart city—Planning for energy, transportation and sustainability of the urban system, Naples, Italy.

Benington, J., & Moore, M. (Ed.). (2011). *Public value: Theory and practice*. Basingstoke, England: Palgrave Macmillan.

Bugg-Levine, A., & Emerson, J. (2011). *Impact investing. Transforming how we make money while making a difference*. San Francisco, CA: John Wiley.

Caragliu, A., Del Bo, C., & Nijkamp, P. (2009, October 7–9). Smart cities in Europe. *Paper presented at 3rd European conference in regional science—CERS 2009*, Košice, Slovak Republic.

Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., . . . Scholl, J. R. (2012, January 4–7). *Understanding smart cities: An integrative framework*. Paper prsented at the 45th Hawaii International Conference on System Sciences, Maui, HI (pp. 2289–2297).

Cosgrave, E., Tryfonas, T., & Crick, T. (2014, August 24–27). The smart city from a public value perspective. In *ICT for sustainability 2014, ICT4S 2014* (pp. 369–377). Stockholm, Sweden: Atlantis Press.

Design action research with government [DARG]. A guide book. (2014). Boston, MA: Engagement Lab of Boston Public School District for MacArthur Foundation.

Deakin, M. (2014). Smart cities: The state-of-the-art and governance challenge. *Triple Helix*, *1*, 1–16.

Dirks, S., Keeling, M., & Dencik, J. (2009). *How smart is your city? Helping cities measure progress*. Somers, NY: IBM Institute for Business Value.

Epstein, M. J., & Yuthas, K. (2014). *Measuring and improving social impacts*. Sheffiled, England: Greanleaf.

Feeney, M. K., & Welch, E. W. (2012). Electronic participation technologies and perceived outcomes for local government managers. *Public Management Review*, *14*, 815–883.

Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanović, N., & Meijers, E. (2007). *Smart cities: Ranking of European medium-sized cities*. Vienna, Austria: Centre of Regional Science (SRF), Vienna University of Technology.

Gil-Garcia, J. R., Vivanco, L. F, & Luna-Reyes, L. F. (2014). Revisiting the problem of technological and social determinism: Reflections for digital government scholars. In M. Janssen, F. Bannister, O. Glassey, H. J. Scholl, E. Tambouris, M. Wimmer, & A. Macintosh (Eds.), *Electronic government and electronic participation* (pp. 254–263). Amsterdam, the Netherlands: IOS Press.

Gupta, J., Bouvier, J., & Gordon, E. (2012). Exploring new modality of public engagement. An evaluation of digital gaming platforms on civic capacity and collective actions in the Boston public school district. Public Agenda, Engagement Game Lab. Retrieved from http://engagementgamelab.org/wp-content/uploads/2011/03/Engagement_Game_Lab_CPI-Eval_6.11.12.pdf (accessed November 6, 2015).

Hall, R. E. (2000, September 28). *The vision of a smart city*. Proceedings of the 2nd International Life Extension Technology Workshop, Paris, France.

International Telecommunication Union. (2014). *Smart sustainable cities—Analysis of definitions*. International Telecommunication Union—Focus Group on Smart and Sustainable Cities. SSC-0100-rev-3. Retrieved from http://www.itu.int/en/ITU-T/focusgroups/ssc/Pages/default.aspx (accessed November 6, 2015).

Hills, D., & Sullivan, F. (2006). *Measuring public value 2: Practical approaches*. London, England: The Work Foundation.

Hoon Lee, J. H., Phaal, R., & Lee, S.-H. (2013). An integrated service-device-technology roadmap for smart city development. *Technological Forecasting & Social Change*, *80*, 286–306.

Jacquier, C. (2008, September 15). *Urban governance: Forging a path between complications and complexity*. Paper presented at the symposium "Towards New Territorial Governance", Reims, France.

Kaplan, R., & Norton, D. (2001). *The strategy-focused organisation*. Boston, MA: Harvard Business School Press.

Komninos, N. (2011). Intelligent cities: Variable geometries of spatial intelligence. *Intelligent Buildings International*, *3*, 172–188.

Kourtit, K., Macharis, C., & Nijkamp, P. (2013). A multi-actor multi-criteria analysis of the performance of global cities, *Applied Geography*, *49*, 24–36.

Lazaroiu, G. C., & Roscia, M. (2012). Definition methodology for the smart cities model. *Energy*, *47*, 326–332.

Linders, D. (2012). From e-government to we-government: Defining a typology for citizen coproduction in the age of social media. *Government Information Quarterly*, *29*, 446–454.

Lombardi, P., Giordano, S., Farouh, H., & Wael, Y. (2011, June 15–18). An analytic network model for Smart cities. *Proceedings of the 11th International Symposium on the Analytic Hierarchy Process*, Sorrento, IT.

Meijer, A., & Rodríguez Bolívar, M. P. (2013, September). *Governing the smart city: Scaling-up the search for socio-techno synergy*. Edinburgh, Scotland: EGPA.

Meijer, A., & Rodríguez Bolívar, M. P. (2015). Governing the smart city: A review of literature on smart urban governance. *International Review of Administration Science*, *0*, 1–17.

Misuraca, G. (2010). Concept paper. *Theoretical framework and key principles towards the development of a policy assessment framework for ICT-enabled governance at city level*. Seville: European Commission JRC-IPTS.

Misuraca, G., Ferro, E., & Caroleo, B. (2010, August 29–September 3). *Assessing emerging ICT-enabled governance models in European cities: Results from a mapping survey*. 9th IFIP WG 8.5 International Conference, EGOV 2010, Lausanne, Switzerland.

Misuraca, G., Reid, A., & Deakin, M. (2011). Exploring emerging ICT-enabled governance models in European cities: Analysis of the mapping survey to identify key city governance policy areas most impacted by ICTs. Seville: European Commission, JRC Technical Notes.

Misuraca, G., & Rossel, P. (2012, October 22–25). Report of the thematic session on smart cities: Sustainable urban innovation. In *ICEGOV 2012: Theory and practice of electronic governance*. Albany, NY.

Moore, M. H. (1995). *Creating public value: Strategic management in government*. Harvard, MA: Harvard University Press.

Moore, M. H. (2013). *Recognizing public value*. Cambridge, MA: Harvard University Press.

Mosannenzadeh, F., & Vettoriato, D. (2014). Defining smart city. A conceptual framework based on keyword analysis. *TeMa—Journal of Land Use, Mobility and Environment*, *6*, 683–694.

Moullin, M., Soady, J., Skinner, J., Price, C., Cullen, J., & Gilligan, C. (2007). Using the public sector scorecard in public health. *International Journal of Health Care Quality Assurance*, *20*, 281–289.

Nam, T., & Pardo, T. A. (2011a, September 26–28). Smart city as urban innovation: Focusing on management, policy, and context. *Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance—ICEGOV2011*, Tallinn, Estonia, pp. 185–194. New York, USA: ACM Press.

Nam, T., & Pardo, T. A. (2011b, June 12–15). Conceptualizing smart city with dimensions of technology, people, and institutions. *In Proceedings of the 12th Annual International Conference on Digital Government Research*, College Park, MD, pp. 282–291. New York, USA: ACM Press.

Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in Smart City initiatives: Some stylised facts. *Cities*, *38*, 25–36.

Rodin, J., & Brandenburg, M. (2014). *The power of impact investing, putting markets to work for profit and global goods*. Philadelphia, PA: Wharton Digital Press.

Roseland, M. (1997). Dimensions of the eco-city. *Cities*, *14*, 197–202.

Savoldelli, A., Codagnone, C., & Misuraca, G. (2013, April). *Assessing the impacts of ICT-enabled services in public sector: A participatory evaluation process to overcome the eGovernment paradox*. Paper presented at the 2nd International EIRBUS-TAIPS conference on: "Innovation in the public sector and the development of e-services", Urbino, Italy.

Savoldelli, A., Codagnone, C., & Misuraca, G. (2014). Understanding the eGovernment Paradox: Learning from literature and practice on barriers to adoption. *Government Information Quarterly*, *31*, 563–571.

Savoldelli, A., Misuraca, G., & Codagnone, C. (2014). Measuring the public value of e-Government: The eGEP2.0 model. *Electronic Journal of eGovernment*, *11*, 373–88.

Scholl, H. J., & Scholl, M. C. (2014). Smart governance: A roadmap for research and practice. In M. Kindling & E. Greifeneder (Eds.), *iConference 2014 Proceedings* (pp. 163–176). Urbana-Champaign, USA: iSchools.

Shapiro, J. M. (2006). Smart cities: Quality of life, productivity, and the growth effects of human capital. *Review of Economics & Statistics*, *88*, 324–335.

Sinkiene, J., Grumadaite, K., & Liugailaite-Radzvickiene, L. (2014, May 15–16). *Diversity of theoretical approaches to the concept of smart city*. Paper presented at 8th International Scientific Conference "Business and management 2014". Vilnius, Lithuania (pp. 933–940).

TEPSIE. (2015). *Growing the field of social innovation in Europe*, a *deliverable of the project: "The theoretical, empirical and policy foundations for building social innovation in Europe" (TEPSIE)*. European Commission Framework Programme. Brussels, Belgium: European Commission, DG Research.

Van Ryzin, G. (2009, October 1–4). *Outcome, process and citizens' trust of the civil services*. Paper prepared for the 10th National Management Research Conference, Columbus, OH.

Washburn, D., Sindhu, U., Balaouras, S., Dines, R. A., Hayes, N. M., & Nelson, L. E. (2010). *Helping CIOs understand "smart city" initiatives: Defining the smart city, its drivers, and the role of the CIO*. Cambridge, MA: Forrester Research.

Welch, E. W. (2012). The relationship between transparent and participative government: A study of local governments in the United States. *International Review of Administrative Sciences*, *78*, 93–115.

Author Biographies

Walter Castelnovo, PhD, is assistant professor of Information Systems and Inter-organizational Networks at the University of Insubria (Italy). His research interests include technological and organizational innovation in Public Administration and Interorganizational Information Systems. He served as member of the committee for many international conferences on E-Government and ICT evaluation. He is also the e-government advisor of

the Association of the Municipalities of the Region Lombardia (Italy) that represents more than 1,000 municipalities. Email: walter.castelnovo@uninsubria.it

Gianluca Misuraca is senior scientist at the European Commission's JRC-IPTS, where, since 2009, he is conducting research in the area of ICT for governance and social inclusion. He is currently leading the research on ICT-enabled Social Innovation in support of the Social Investment Package (IESI) carried out in collaboration with DG Employment, Social Affairs, and Inclusion. Before joining the European Commission, Gianluca was the managing director of the Executive Master in eGovernance at the Ecole Polytechnique Fédérale de Lausanne. During his career, he held several positions as policy advisor for different International Organizations, cooperation agencies, and consulting in the area of E-Government, regional development, research, and innovation. Gianluca's background is economics with focus on the interface between ICTs and public sector innovation. He holds a diploma of Specialization in EU Economics and Law, a diploma in Security Management, an executive master in E-Governance, and a PhD in Management of Technology. Email: gianluca.misuraca@ec.europa.eu

Dr. Alberto Savoldelli has worked for more than then 20 years as contracting professor at the Politecnico di Milano, and member of the Faculty of the MIP, the Politecnico di Milano Business School, where he undertook researches on innovation and change management in public sector and for nonprofit organizations. Now he works as an independent researcher and acts as an advisor to Italian and foreign consultancy companies and public sector organizations on projects focusing on change management, knowledge management, business process reengineering, and performance measurement. Email: savoldellia@gmail.com