Information and communication technologies and public participation: interactive maps and value added for citizens

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ABSTRACT

Cities are restless systems. Increasing urbanisation and the cumulative growth of urban management issues are pressing local governments to provide valuable services. Information and Communication Technologies (ICTs) are established as drivers of this new wave of change in the redefinition of the relationship between the city and its citizens. Smart Cities rely strongly on strategies and solutions enabled by ICTs involving directly local governments, citizens and communities. Open data alone, though a relevant component of these strategies, cannot provide enough incentives for the engagement of citizens necessary to establish a collaborative and open governance system; data need to be appropriately elaborated, communicated and used. The main objective of this paper is to investigate how open data together with simple and standardised elaborations and innovative visualisation techniques may be used to provide new and updated services to citizens and communities: free and readily available services based on the wealth of information 'owned' by local governments. Adopting a design science research methodology we develop and test a collaborative ICT-based tool called UrbanSense. We use it to highlight how systemic connections between citizens and city-government may be devised. On this point, the focus is on the feedforwarding of open data integrated with basic elaborations and visualisations as a means for the local government to create new and open services for citizens and communities. The use of the services prompts citizens to feedback new information in real-time to the city government. These interactions may be used to foster an open innovation ecosystem.

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1. Introduction

The increasing urbanisation and the cumulative growth of urban management issues are leading any city to comply with the imperative of providing value added services[1] to its citizens and the communities residing therein. The city, as the unit of administrative government, is the direct interlocutor of the government authority with the citizens and as such it is in the first line with regards to cogent issues such as economic and social development (Appadurai & Holston, 1996; Chourabi et al., 2012).

The city is a system in constant mutation abiding to dynamics which are characteristic of out-of-equilibrium systems. Whether cities' evolutions are seen as emerging configurations or systems in permanent crises, from a historical perspective, it emerges that characteristics such as size, scale and shape are constantly, although at a relatively slow pace, uniquely redesigned. Several theories have been proposed and tested empirically to ascertain regularities and fundamental laws of growth and decline of cities in the last few decades. The Smart City, perhaps the latest wave of these emerging new systemic interpretations of the city, may be traced to the evolution of those general purpose technologies – ICTs – that are increasingly ubiquitous. ICTs are in fact widely employed in any city's key socio-technical structures as well as in the lives and modes of communication of citizens and urban communities. Whether this wave will set the basis for a more manageable or governable city is to be seen, but certainly it has initiated a race to the exploration, identification and study of reference models (Batty, 2015). Thus the forward-looking city is becoming the context of continuous experimentation and research, an open-air laboratory where to experiment new features and interpret continuous changes.

The conceptualisation of Smart City relies strongly on strategies and solutions enabled by ICTs. They are the drivers of change in the

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[1] By value added services we intend services that can be readily accessible, usually free of charge to citizens and communities. These services can be useful as support to their decision making process, to inform behaviours or cause behavioural change.

redefinition of relations between government and citizens. Nonetheless, enabling technologies and the wide access to a copious amount of data could provide an inroad into the investigation of economic, social, governance, environmental and cultural drivers of city dynamics. Many studies already provide a number of perspectives on the innovation originated from the use of open data platforms within the Smart City contexts. These studies concern solutions providing value added information to stakeholders on specific topics or applications focusing on systemic/multidimensional issues. Examples tackling specific topics can be found in Smart Mobility (Bie et al., 2012; Poslad, Ma, Wang, & Mei, 2015) and energy consumption (Depuru, Wang, & Devabhaktuni, 2011). Applications focusing on multidimensional issues may relate to city-living such as the London CityDashboard[2] (Suakanto, Supangkat, & Saragih, 2013; Hudson-Smith, 2014) or complex scenario modelling for policy analysis (Misuraca, Mureddu, & Osimo, 2014). These are cutting-edge examples of information science applied to raw data which are also service-oriented. In these cases citizens are either the beneficiaries of elaborations of data or the passive providers of information. Whilst solutions exploiting open data to produce new, real-time information through the active engagement of citizens are starting to emerge (i.e. collaborative awareness platforms), pathways to impact and stakeholders' agency are still under-researched revealing a gap in the literature.

The main objective of the research is to describe and discuss the opportunities offered by an ICT-based tool that integrates simple elaborations on open data and provides freely available information by means of interactive visual cues. The utilisation of these services prompts citizens and communities to interact in a meaningful way with the service provider through the application. Interactions convey real-time indicators that may be fed back and added to the original data sources providing valuable information to the local government. These might lead to policy actions with social impact.

We use the lens of open innovation linked to the Smart City (Paskaleva, 2011). Whilst open innovation is massively used in innovation management and economics, it has only started to be introduced in city management. This work is not a pedantic translation of the open innovation principles to the case at hand. It builds on the principles of collaborative ventures and mutual benefits from collaborative innovation (Chesbrough, 2003, 2006; Enkel, Gassmann, & Chesbrough, 2009; West, Salter, Vanhaverbeke, & Chesbrough, 2014) to tease out the agency of the stakeholders within the city. We look at potential ways of interaction that may benefit all. In this setting, ICT plays the central role of intermediary between the city government and citizens.

Our research question relates directly with the practical problem linked to the use of these data in terms of analysis and explores ways for such analysis to inform the policy making process and citizens/communities involvement. In other words, given the data availability, we try to answer the following questions: how can the city return these data in the form of valuable knowledge to citizens? How can governments engage citizens to produce complementary knowledge, creating a virtuous circle of active participation?

The remainder of the paper is organised as follows. In the next section we focus our attention on the theoretical background for positioning our research. This includes the emerging theory of the city. Further, we explore the relationship between the Smart City and Open Innovation framing our research within the complex and evolving socio-economic constructs of e-Government and citizen engagement. In section 3 we present the methodology. Section 4 focuses on the case study. Here we highlight issues related to the sources of data and their standardisation, the ICT tool employed and the logic behind our exercise. We present our findings for the City of Milan highlighting how the interpretation of the results related to a specific neighbourhood may be employed by policy makers and citizens. We then discuss our

findings with a keen eye on the practical applications of UrbanSense and the implications for theory and practice. In the final section we conclude by highlighting the wider research framework, the limits and the next steps of this research.

2. Research background

2.1. The complex city

The modern theory of city emerged from earlier studies on city planning and city dynamics which increasingly explored regularities and laws in the formation, growth and decline of cities (Blumenfeld, 1949; Lynch, 1961).[3] The modern theories of the city are providing new and interesting ideas on how cities are ordered and structured and what are the dynamics that affect the evolving of order and the changing of structures.

Bettencourt (2013) recognises that within each city there is a plethora of interdependent factors affecting its dynamics. These relate to the social and economic sphere and are exerting their pressure on the city dynamics locally and bottom-up. These forces follow unique power law functions some of which, wealth creation and innovation, present increasing returns to scale, others, such as infrastructure, present decreasing returns to scale. One of the consequences of this conceptualisation is that continuous city growth is tightly linked with accelerating wealth creation and faster innovation cycles (Bettencourt, Lobo, Helbing, Kühnert, & West, 2007).

Batty (2005, 2008, 2009, 2015) posits that the city's dynamics and its evolutionary trajectories are developing responding to forces originating from the structural change in key urban dimensions such as transportation, energy, economic and social relationship which are typically bottom-up occurrences. However, changes in city's structures are likely more comparable to biological entities than mechanical/functional systems. Therefore, complex cities, characterised by open relationships moulded by the ensuing evolutionary processes, originate unexpected, cumulative and innovative behaviours (Portugali, 2000; Batty, 2015). In this context, emerging behaviours may be shaped in networks arrangements similar to those found in nature. Society shares with these constructs generic properties such as a high degree of clustering. Moving the focus away from the changes of the physical structure or the topologies of the city, this conceptualisation creates room for the application of novel key concepts around which new forms of simulation and visualisation of cities are possible (Batty & Longley, 1994; Erzsébet & Barabási, 2003; Newman, Barabási, & Watts, 2005).

2.2. How smart is a city?

The literature on Smart City is constantly growing in the academic and policy debate since the late 1990s. Hollands (2008) argues that a precise definition does not exist even if the concept has been part of the public debate for some time. Key factors defining the smartness of a city rely on the network-type activities in different spheres of city life characterising it. These spheres or dimensions focus on enhanced business performance and opportunities, culturally-based initiatives in the arts, digital media and creative industries, community-use of ICTs and involvement of the local government (Hollands, 2008). The growth of these networks though, relies on the provision and the level of exploitation of networked physical infrastructures - for example the transport network or the telecommunication networks – but also of the software or service infrastructure such as business services, higher education,

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[2] An example of CityDashboard can be accessed at the following website: citydashboard.org/London.

[3] Blumenfeld (1949) reviews a first and important wave of theories distinguishing between spatial planning and socio-economic planning. The author poses the question whether the city dynamics is the result of a conscious design or it emerges and grows organically. Blumenfeld argues that city dynamics may be dependent from the socio-economic imperatives that govern life within its boundaries. Lynch (1961) focused on the structural aspects of the city including the network of infrastructure for communication and transport and their spatial development patterns.