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Citizen Empowerment and Innovation in the Data-Rich City

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Preface

Cities are more than infrastructure; they are communities of individuals and families with different backgrounds, needs and aspirations. Properly understood, managed and planned, cities have the potential to provide great benefits, where cities can be part of the solution to many of today's challenges from an ageing population to developing sustainable strategies for water, waste, land use and energy. For example, cities where residents have easy access to convenient public transport, social gathering places, and shops and cultural amenities within walking distance, tend to be places with a significantly lower carbon footprint per capita, in part because the urban form does not necessitate daily car usage. Less driving and more walking can translate into less obesity in cities, and fewer deaths and injuries due to vehicle crashes. Likewise, access to more social activities tends to reduce social isolation and thus improves physical and mental health. The higher intensity of economic stimuli and opportunities encourages the search for enjoyment and self-expression.

If cities have the potential to be part of the solution, it is important to know more about what makes cities attractive or liveable places. Whilst part of this challenge is about improved technology, greener buildings, and energy efficiency, it is also about understanding how to make cities more liveable places for people. Of course, cities are not all the same; there are attributes and public policies that make some cities more attractive to live in than others. Given the importance of cities for the foreseeable future, there is an urgent requirement to go far beyond technocratic perspectives and understand how urban design, planning, public policy and management, and other aspects of the city affect or determine whether a city is people friendly. In other words, there is a need to clarify what makes a city most liveable so researchers can advise policymakers and others as to the "best practices".

In a world rich with digital data from street sensors, social media and municipal open data sources, it is crucial—in particular—to identify how this additional data might provide a more informed perspective on the needs and aspirations of city dwellers whilst promoting greater citizens' participation in urban planning and design. This should lead to cities being both "smart and liveable cities" that bring communities together and encourage social inclusion. Services, products and

places are needed to leverage on data richness to allow people of different backgrounds, ages, abilities, shapes and sizes to engage with their environment and with each other. To understand their needs, citizens need to be engaged in a dialogue about their cities and develop a sense of co-ownership not only of the hardware, but also of the software of cities. However, most of the practical questions on how to progress in this direction are still unanswered.

Part I

Some of these questions have been the topics of conversation and debate for the last three years as part of a European research network funded by the COST organisation attracting participation from 28 countries ranging from Iceland to Israel. This publication provides a snapshot of some of the innovative ideas emerging from the network. From the outset, the publication provides a radical view of cities through a Manifesto for Cities that challenges traditional approaches and argues the merits for a greater bottom-up model to compliment top-down city planning approaches. This is followed by a new framework for collaborative urbanism based on the concept of soft and hard city infrastructures as well as commentary on the mutual benefit of using both 'small' and 'big' data.

Part II

Given the importance attached to the subject of big data, the next section of the book focuses on the growing topic of crowdsourcing which is influencing local and national politics and by implication urban planning and design. The evolution of crowdsourcing is explored as spontaneous bottom-up socio-technological networks that produce non-planned forms of citizens' empowerment in urban governance. Self-empowering practices performed by social actors with the aim of improving the organisation and functioning of the city are here discussed.

The theme of technology is continued by examining urban design in the context of data-rich urban environments and networked society, focusing on human activities, experiences and behaviours. It does so by examining how urban design theory deals with social and spatial changes within network society, i.e. by examining urban design through the lenses of integral theory. In this context, a chapter is devoted to describing a case study for the City of Amsterdam that used visualisation tools and Planning Support Systems (PSS) to promote dialogue between planning practitioners, citizens and decision-makers as part of a collaborative process.

Another innovative approach presented is the so-called ModularCity that combines computer-assisted planning, geography and social work. The model allows planning representatives to analyse the socio-spatial context of future development projects by editing, collecting and visualising geo-referenced, objective, as well

as subjective, data in one planning tool. The focus is on the translation between stakeholders' different planning concepts, goals and languages in order to develop strategies of integration, visualisation to the translate demand in sustainable urban planning. In contrast, Time Quality Assessment (TQA) is presented in the subsequent chapter as a time–people–place-oriented approach to evaluate the quality of living environments. The model links quality of time spent for certain activity in certain place as an indication of the quality of living environments, based on the assumption that time is an universal expression and measure of quality of living that challenges the preconceptions of planners, decision-makers and city dwellers.

Part III

Of course real data from case studies are needed to verify and calibrate innovative tools and techniques for the future design of Smart and Liveable cities. With this in mind, a number of case studies are presented towards the end of the publication. The first of these is the development of a Social Urban Network called SUN4Matera for the Italian town of Matera. The methodology is based on a bottom-up citizen participation approach to collect and aggregate data from citizen interviews that feed into urban design decision-making. Continuing the theme of case studies, the experience of introducing Digi Tel digital tool is critiqued, where the City of Tel Aviv embarked on a collaborative urbanism prototype where citizens were invited to join the Digi Tel club. Registered citizens were awarded a membership card that provides access to certain municipal facilities and furthermore enables citizens to express priorities for future developments in the city.

In comparison, the digital tool called WAY is presented as a smart phone application linked to an iCloud Web service that facilitates citizens' participation in the planning and design of public parks and places as part of the Cyber Parks initiative. The tool was tested in the cities of Barcelona, Lisbon and Ljubljana. Lastly, the experience of introducing Web-based services for the Romanian city of Bucharest is described in the context of municipal administration.

In summary, by the very nature of collaborative urbanism, the book has attracted contributions from a wide range of disciplines. The resulting variety of perspectives on data-rich cities provides stimuli for a further consolidation of the field, which emerges as still in an early structuration phase. Yet all the concepts and methods ultimately aim to engage citizens more in urban planning and design in order to increase the livelihood and liveability of cities in the twenty-first century. We hope you find the wealth of information a valuable depository of knowledge and ideas to promote your own strand of collaborative urbanism.

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The Emergence of Collaborative Urbanism

Chapter 1
Manifesto for Collaborative Urbanism

Dick Gleeson and Mark Dyer

Abstract This chapter will consider some key factors affecting cities at the global scale, before addressing the forces at play in the contemporary 'given-city' This will provide a platform to review the emergence of the 'Smart-City' and consider how a radical approach to data may be required in order to enable a collaborative culture of citizen engagement to emerge.

1.1 Introduction

The European refugee crisis resulting from the war in Syria, the terrorist attacks on Paris, and the focus on the critical negotiations in COP 21 remind us that we live in a highly globalized world. The fact that the Paris Agreement took 21 years to achieve consensus, that this agreement is aspirational rather than binding, and relates to emissions and not to production of fossil fuels, indicates the relative weakness of the institution of national governments in tackling complex global challenges. However under the umbrella of national government, cities are also highly globalized and operate as relatively free agents to leverage their competitive edge in the external market place. While housing a majority of the world's population and thus contributing to global environmental problems, cities have been able to keep a low profile in terms of their specific environmental footprints, and thus evade collective political responsibility. There is little doubt nevertheless that cities will have to provide the innovation and solutions for the future.

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While millions of citizens will have watched the media reports on COP 21, and perhaps felt themselves aligned with the NGOs and frustrated protestor groups lining the streets, they will also have felt largely detached from the governance and institutional processes that frame both national and city response to global crises. This sense of powerlessness and a perception that it is difficult to intervene and make a difference is perhaps nothing new when considering urban governance or the making of the city. Within this traditional frustration of feeling powerless, the widespread availability of the Internet suddenly opens the opportunity for ordinary citizens to connect with city institutions. As a result individual citizens have never been more connected and can interact through multiple personal devices that are increasingly more networked. The availability of web 2.0 enables open-source collaboration. These resources would suggest that the technology exists to build a new platform for a much more dynamic and active form of citizen participation. While there are interesting and inspiring examples happening in many cities, crowd-sourcing being one significant area, a culture of Internet inspired citizen participation has not entered the mainstream.

The reasons for this continuing disengagement with urban development are multiple. Firstly it is inherently difficult for the individual citizen to make sense of the contemporary city, with its complex weave of pattern, scale, function, and apparent disorder. Furthermore the city authorities have over time learned how to control the processes of city management and urban plan-making, work with a small number of 'trusted partners', and fear the opening up of the process will lead to paralysis and loss of control. There is also the difficult question of data and its relationship to the citizen, and how data is interpreted to produce knowledge, which feeds into decision-making and policy.

Whilst modern city planning rests on an evidence base which is derived from data, analytics and research; the reality is that the citizen is generally disconnected from the production of an evidence base through the lack of skill sets necessary to commission research and manipulate raw data. This fundamentally undermines any serious attempt to champion citizen engagement. The availability of technology alone however may not be sufficient to generate a culture of collaborative urbanism. Turning urban processes into ones which are people centric will require a fundamental re-positioning of relationships where the citizen can relate constructively to the scale of the planet, to the scale of the city and to the scale of the neighbourhood in order to understand the interaction and impact of economic, social and environmental dimensions operating at different scales.

The present book analyses the current transformation of the data-rich cities through inter- and trans-disciplinary experts' contributions, with particular attention paid to innovative people-centred solutions in urban planning and management. The purpose is to explore a new perspective on the actual possibility for technological innovations in urban infrastructure and functioning processes to effectively involve ordinary citizens in collective knowledge-production and decision-making processes. The included chapters explore ways to complement technical and procedural improvements of urban efficiency with an engagement towards social cohesion and cultural dialogue, green regeneration and

inclusiveness (including removing obstacles to participation). The rationale for intuitive and attractive user interfaces is thus reinterpreted to integrate smart systems into citizens' lives in a meaningful and easily accessible way. It builds upon the consideration that cities are multi-layered entities where a "physical layer" (i.e. urban infrastructures), a "meta layer" (i.e. the data layer in the on-line world) and a "control layer" (i.e. the real or virtual places where people make sense of data) are networked. Authors' contributions suggest that the alignment of these layers can be reworked in order to produce a collaborative form of urban planning, governance and management. Evidence-based and grounded-in-theory approaches not always converge, thus failing to provide researchers and practitioners with an adequate understanding of how to exploit opportunities from a data rich urban environment. To this end, innovative strategies are investigated through cases and examples in order to explore the mutable, multi-scalar and complex character of participatory processes (out of the formalism of traditional approaches) in both design, production and application of smart solutions. These can narrow the gap between research results and policy applications by bringing heterogeneous social actors to work together.

The following pages serve as an introduction to the book and, at the same time, advance the proposal of a Manifesto for Data-rich Cities. These exploit Internet capacity, and respond to citizens need to connect, communicate, collaborate, change and control by acknowledging and factoring this capacity into city governance, policy, and operational life. Moreover, this requires to review the emergence of the 'Smart-City' and consider how a radical approach to data may be required in order to enable a collaborative culture of citizen engagement to emerge.

1.2 Global Challenges

The historic distribution of the population across the great expanse of the globe tended to create an impression that the Earth was endlessly resilient. We now know this is not the case. The sheer impact of the numbers alone, 7 billion, with the demand for food, shelter and raw materials, combined with waste production from the daily process of living, is now stressing the planet's capacity to absorb such pressure. Our dependence on carbon and fossil fuels is linked directly to climate change, melting ice-caps and rising sea-levels. Climate change impact is felt in different ways, increases in inland temperature is drawing new population to coastal areas, for example along the east coast of Africa and along the coast of California, water scarcity is generating conflict at a regional scale and contributing to political instability, and population pressure on ecologically vulnerable regions has resulted in 20 % of the Earth's surface being described as degraded. The term Anthropocene has been used to denote a new geological era on Earth, equal in scale to past geological eras, except that in this instance it is caused by the impact of 7 billion people living on the planet, the majority of which now live in urban areas.

Levels of population increase, combined with the rate of urbanization and the upsurge in the scale of individual cities, means that cities are firmly in the dock in relation to the environmental crisis at the global scale. National governments tend to be the major players politically in the search for solutions, but have proven themselves weak in building a consensus towards effective and binding agreements. National governments however are happy to delegate significant freedom to cities to manage their challenges, seek out competitive edge, and develop their profile internationally. Many cities quickly realize that in tackling the complex challenge of sustainability, the global environmental focus quickly extends to include global economic and social dimensions. Cities operate within the framework of a global economy, with its cycles of high energy, decline and unpredictability.

The evolution of the global economy over recent decades has expanded the number and scale of cities that have managed to create the competitive platforms necessary to compete internationally. In those cities where a global economy has anchored itself, a range of supportive infrastructure combines with a skilled and highly paid workforce to create class and wealth distinctions, exaggerate local disadvantage and poverty, and contribute to political tensions. The global economic recession from 2006 onward has deepened these structural faults across the city landscape with property values collapsing, a severe contraction in investment caused by a banking crisis, and city budgets unable to sustain service provision. What we are seeing in a range of global context is a deep-seated malign convergence of environmental, economic and social crises, leading to various levels of street protest and citizen anger.

The reasons for these problems exist at both the international and global scale and critically at the scale of the city. In terms of citizen perception however, the specific city context becomes the point of frustration and attack, the global forces too elusive, remote and non-tangible. A major challenge therefore is to forge collective citizen perspectives, which can begin to impact on the practice of large corporations, global economic networks and cities. Such citizen perspectives are likely to be strongly informed by value systems and a consensus on human need. In practice this means organizing the objective component of cities in the form of physical and institutional infrastructures to support the subjective qualities and value systems of citizens and communities. Furthermore, we are beginning to see how environmental performance is impacting on the reputation of companies in the market-place and prompting the adoption of more sustainable strategies. This responsiveness and sensitivity of the market-place to demands from citizens is likely to grow, with an increasing appetite from consumers for information on food provenance and the impact of food on health.

The city or city networks, sitting between the planet scale and the neighbourhood/citizen scale, may have to provide the joint platforms to solve problems at both the global and the city-scale. Harnessing the energy of citizens and creating an awareness of the inter-connectedness of fundamentally different scales is challenging. It may be more fruitful to work with citizens at the scale of the city, to find urban models that are more sustainable, while building more awareness and a

sense of responsibility towards the scale of the planet. A good starting point is to ponder on the question of who shapes the city, and how they do it.

1.3 The City Dimension

This question of who is allowed to shape cities is not an easy question to answer. A city is not a handbag, or a dining chair, or even a domestic house. It is more like a complex organism, built over time, constantly changing and evolving, the product of multiple hands and designers. In his acclaimed documentary-movie, 'Urbanized' (Hustwit 2011), Gary Hustwit explores a spectrum of challenges in 40 different cities across the globe, drawing in stories from hugely varying contexts and scales. While taking a clear line on what makes cities habitable, the movie comes down firmly on the need for citizen participation, revealing along the way the processes and decisions made by city designers and the impact they have on our day-to-day lives. Hustwit, who spent almost three years on the movie, realized early on that he would almost certainly fail in his 'grand-project', to make sense of cities; the topic was just too broad and complex. What he does achieve is a work of art and a fast-paced compelling documentary; weaving footage from multiple locations with live interviews and a great sound-track from the band Wilco. The central message is that if you don't have a say in how your city is shaped, somebody else will shape it for you.

While there are frequently some good intentions on the part of City Authorities, progress towards meaningful partnership with citizens is slow and is often frustrated by privileged stakeholder and interest groups who pursue narrow goals. Public engagement is often perceived as weak, as it often fails to deliver stated aims. The culture of citizen engagement is frequently hampered by the following;

- By polarization between top-down and bottom-up stakeholder groups.
- By a process which just pays lip-service to requirements for consultation.
- By a process which is quite technical and which is really only legible to specialist groups with the knowledge and skill of how and when to intervene.
- By agencies and regulatory bodies following a core brief, who don't see the need to interface with a wider picture.
- By a lack of any appetite or belief in the value of collaboration.

The City Authority itself of course, also encounters deep challenges in building a collaborative partnership with the citizen. There is often embedded silo thinking within its own ranks. The need to strictly meet legislation and policy requirements also tends to result in rigidity and lack of spontaneity and flexibility. The over-use of external consultants, due to scarce internal resources, breeds a culture of dependency and hands the initiative elsewhere. Authoritarian top-down is seen as less risky in terms of retaining control and ensuring the genii is not let out of the bottle. Communicating the story of the 'big-picture is challenging in a context where local issues are the only game in town politically.

We can see therefore that cities are complex and stubbornly resist simplification. Many disciplines, however, dealing with the urban context feel the need to define a specialist viewpoint, and this can often develop into a silo mentality. A holistic approach therefore, will help to acknowledge complexity, and create awareness and need for systems thinking in order to meet the multiple challenges facing the city. A systems approach to cities will try to create a framework, which can include a consideration of city issues from multiple themes and perspectives. Urbanism is a philosophy that nurtures and celebrates the complexity of cities and the need for a multi-disciplinary approach and awareness. Urbanism also supports the need for collaborative processes and is committed to using and developing new tools and methodologies in tackling issues arising in complex urban contexts.

1.4 The Neighbourhood

Despite an increasingly globalized economy, the Internet, and multiple platforms for communication, specific local place and physical context are still the primary reference for urban dwellers. The local neighbourhood with its familiar physical and social infrastructures is complemented by other city locations, sourced for culture, recreation, retail, or as the destination for a daily job commute. From these various city contexts, citizens build a platform from which they extract a range of services to support a daily life. Increasingly the internet and user-friendly software is changing the manner in which the individual citizen relates to an urban context, firstly in providing a powerful new way to access local services and secondly in terms of communication and the construction of new social networks.

However the neighbourhood has proven to be a very enduring concept and is built around our idea of place. It is usually characterized by a particular street pattern, land-use mix, architectural style, and by the communities that dwell or do business within its spatial area. Most people have a very strong affinity with their own neighbourhood and when probed about city issues, tend to list concerns about their local area, rather than articulate strategic issues. While the scale of the city neighbourhood is well suited to building a culture of engagement, urban governance tends to operate at the larger city scale, and is challenged to harness local citizen energy. Things may be beginning to change however. There is now evidence of a widespread trend of urban interventions being initiated from the scale of the neighbourhood, with or without the support of the formal City Authority. These local neighbourhood projects are often driven by a small number of committed champions, using social media to generate profile, and gaining community support in the imaginative way they respond to perceived gaps in the city infrastructure. A feature of these local initiatives is their tendency to be temporary in nature, to draw in the pro-bono support of artists and local resident professionals, and to colonize vacant, derelict, or under-used property. While there may be some revenue generating activities there is usually a strong community and culture focus with

a programme of events designed to attract local residents. The presence of such innovative energy in the local context can prompt a questioning of the status quo, and generate a sense of new possibility about what can be achieved at the local level. Rather than accept the generic and predictable top-down process of occasional local plan review, bottom-up neighbourhood initiatives can release a surge of creative thinking, generating confidence and a feel-good factor which strengthens local community capital, and creates the capacity and confidence to challenge the top-down city narrative.

If we refer to the city of today as the 'given city' we could argue that the ordinary citizen has had an extremely limited role in its production. Nonetheless the citizen gets on with the challenge of a daily life, mining a personal biography from both the physical context of the 'given city' and the new technology of the Internet. What of the future city? Could we imagine a future in which the citizen could be a co-producer of the city, both its hard infrastructure of building fabric, utilities, and landscape, and its soft infrastructure of facilitating institutions and responsive citizen focused software. In this future city, the citizen would play a central role in shaping the city and in ensuring its weave of infrastructures would respond more directly to human need. Today urban planning and governance remains hugely challenged in building a culture of citizen participation.

Digitization and innovative Internet technologies are providing a new urban context. Can the power of a user-friendly Internet help harness the creative energy of citizens to share in the design and making of more people-centric cities? How can a platform be achieved to facilitate this possibility. To do this we will need to reflect on how the 'given city' has been shaped to date, on the role of the city and various crises that need new direction and an urgent response, and how exemplars in specific locations are prompting new urban models around the theme of people-centric urbanism.

For example in the case of the Dublin City, the years following the economic downturn from 2008 onwards witnessed the emergence of multiple bottom-up initiatives across the neighbourhoods of the inner city of Dublin ranging from neighbourhood social enterprises located in otherwise prohibitively expensive development zones to young professional community start-ups providing work and leisure opportunities (Aliperti et al. 2016).

1.5 Smart City

The discussion so far has revolved around the need to engage citizens and communities in the future decision-making about cities and especially their neighbourhood. In this context, the term Smart City might suggest a capacity and commitment to marshal a collective civic intelligence to tackle city challenges via the presence of so-called Big Data created on the Internet through social media or increasingly by the internet of things. The phenomenon of Big Data is now an inherent component of modern complex cities, an essential element of

infrastructure, underpinning the functionality of city systems across the spectrum of both the public and private sectors. The term ‘data-rich city’ might seem initially to be something wholly desirable, conjuring up a consolidated platform and an image of bountiful supply, and perhaps generating an assumption that this vast resource will be put to good effect.

The critical debate is currently attracting a growing interest in scientific international and interdisciplinary communities that are trying to answer questions such as “do people really need more data to live better in cities? or is data richness compatible with the centrality of people in the urban environment?” In recent years, “smart city” rapidly turned into a buzzword that has been used with reference to almost any technology-driven urban initiative, encompassing a broad range of urban life aspects (e.g. quality and welfare, sustainability, social cohesion, economic growth, etc.). This makes the concept itself ambiguous and difficult to be operationalized. Moreover the interest for the technical improvement of city infrastructure and technological application of data-driven solutions, often disregards the evidence that although these are important, they are not endpoints in themselves. This book provides some critiques and speculation on this theoretical perspective as well as practical implications that emerge from the analysis of lighthouse experiences. Certainly there are numerous everyday examples of real time data being used to practical effect e.g. traffic management and flood defence to name two, while competitive economic participation in the global market place relies on sophisticated frameworks of constant data generation and analytics. However not all urban stakeholders enjoy equal opportunity in terms of capacity to access and exploit data platforms. The ordinary citizen in particular has a very poor relationship with data, seeing the term as abstract, unsure of its neutrality in terms of personal freedom, and not at all optimistic that it can become a day-to-day resource available through user-friendly channels. This detachment of the citizen from data is worrying. Data is the basic raw material used to generate an evidence base in order to engage with other stakeholders, influence policy, and negotiate with urban governance.

In order to understand this detachment from data, we need to look at the wider urban system. In doing so we need to recognize that technology and data are not ends in themselves but are available as powerful infrastructures to serve a range of goals emerging from a complex landscape of urban stakeholders where the citizen is often billed as a key player but is frequently side-lined. In which case the term Big Data might be better used when linked explicitly to promote a people and citizen perspective and prompt us to reflect on the relationship between citizens and data. So for example even though the terms Data-rich Cities and Smart Cities have a close relationship, neither of these terms could be considered to align comfortably with the concept of ‘People-friendly Cities’. One of the reasons might be that the evolving terrain of Smart-City activity has colonized the sphere of urban data, where commercial/technical interests, seek close working relationships with City administrations to deliver smart infrastructure, in a context where there is little incentive to create any meaningful role for the citizen. Another reason might be the abstract nature of data, and a history of detachment of the citizen from urban research.

This tendency of the Smart City to leave the citizen out of the loop is perhaps not surprising. Urban governance and city planning has been challenged for decades to harness the energy of citizens in the making of better cities. It is curious however that at a time when the infrastructure of the internet is creating optimism about openness, communication, and connection, that the 'black-box' technology of Smart Cities might be consolidating a status-quo where the citizen remains an outsider. This suggests a need not only to review the concept of Smart Cities but also to consider a much wider frame of reference where the citizen is placed at the centre of urban challenges, and is facilitated to read the city in terms of its complexity, sectorial interests and multiple scales. While data will constitute a 'red-thread' critical to forging a bedrock of evidence, the theme of 'people-centric Urbanism' better describes the thrust of the chapter. A central question will be a consideration of the critical scales relevant to the achievement of a platform.

Continuing with this line of thought, there is widespread deep concern among a range of professional disciplines regarding the current trends in Smart City development. Murakami (2015) considers Smart City as the archetypal urban form of the data-driven society. These pervasive distributed sensor networks, generating big data for forms of centralized urban management, bring together previously unconnected infrastructures such as video surveillance, met stations, traffic-lights and sewage systems, and while presented as largely civic, corporate and managerial, these systems have a parallel history in military strategic thinking and policy. Murakami reflects on the capacity of diverse human beings to flourish in cities where people are increasingly monitored and managed as logistical flows. He argues that if smart cities are to truly serve human flourishing, they need to be detached from narrow techno-economistic purposes and more truly grounded in social ecological thinking.

Likewise Bates (2015) is concerned with the increasing use of data analytics to gain insight in how to manage cities. She suggests that instead of seeking the truth of cities in data, we might better illuminate the flows of power and influence in the contemporary urban environment through close critical examination of these emerging, intersecting local data cultures in practice. Similar to Sassen (2012), Bates argues that by focusing on the complex and contested assemblages of political, economic, social and cultural processes that data product and flow are embedded within, we begin to understand data practices as specific articulations of social platforms situated within time and space.

Ruppert (2015) has also raised questions about smart city and data and the implications for citizens. If we are to increasingly know experience and enact cities through data, then we need to understand who are the subjects of that data and the space of relations they occupy. In a world where the Internet of things connects everything, and where data is produced about movement, location, activities, interests, encounters and public relationships, and where conduct is being governed through myriad arrangements and conventions, we need to question how data subjects become data citizens. Ruppert goes onto to challenge the separation between the real space and the virtual space. In doing so she defines cyber space as a space of social struggles, a space of transactions and interactions between and among bodies acting through the Internet. She asserts that these struggles constitute part and parcel of the programmable city.

These concerns about the need to contextualize data is raised by Thatcher (2015) who investigated data provenance and the need to critically frame data. He states that data sources and existing data appear in the literature as uncritical, pre-existing, de-contextualized representations of the world, and the dimension of provenance recedes into a technical issue. The intentionality of data is not signalled and the inscription of meaning that goes into data objects as socio-technical, emergent indicators is left out. The data is therefore taken to represent the world as objective reality.

The role and nature of data in cities has received the attention of Kitchin (2015) who explores citizen related data privacy/protection, arising from the development of smart cities in Ireland. Kitchin refers to a consistent link between the generation of data and various kinds of data informed urbanism. However, he contends that data informed urbanism is being complemented but increasingly replaced by another form of data generation termed data-driven networked urbanism. Whilst cities are becoming ever more instrumented and networked, with vast amounts of big urban data being generated and used to manage and control urban life in real time, Kitchin asserts that data driven networked urbanism is the key mode of production for what has widely been referred to as 'smart urbanism'. In doing so, he raises valid concerns about the politics of urban data, data ownership, data control, and data convergent access. Whilst data-driven networked urbanism purports to produce a common sensical, pragmatic, neutral, apolitical, evidence form of responsive urban government, it is nonetheless selective, crafted, flawed, normative and politically inflected. Hence data-driven networked urbanism provides a set of solutions for urban problems within limitations and in the service of particular interests.

1.6 City Futures

The debate about the future creation of Smart Cities has increasingly attracted the attention of both new technology driven companies and more tradition engineering design companies. Recently the company Arup (2010) outlines a very optimistic and enlightened view about how cities can benefit from smart technology. They define a smart city as one 'where the seams and structures of the various urban systems are made clear, simple, responsive and even malleable. The implication is that the networked connection between everyday objects provided through the 'Internet of Things' will provide all the necessary tools to deliver smart cities. However, this perspective raises the question about how can we harness the power of these emerging technologies in order for the individual citizen to take co-ownership of the issue not just traditional stakeholders. Otherwise the informed users of smart cities are in danger of developing architecture in which technology evolves solely to provide spaces for global players to create economic value, and start-ups to innovate.

For this economic argument to be relevant it must be complemented by an articulation of a strong vision for the role of citizens in future cities. This is a

city future where citizens are not only engaged and informed in the relationship between their activities and their neighbourhood but also the wider urban ecosystem. The citizen should be enabled to see the city as something they can collectively tune, such that it is efficient, interactive, engaged, adaptive, and flexible. In this strong emphasis on the social, Arup echo early smart city ideas of social science in the 1990s which saw the potential of information and communications infrastructure to enable not only economic development but also underpin quality of life improvements.

To achieve this improved quality of life in cities by means of digital connectivity, Mason (2015) raises genuine concerns about the nature and organization of systems in a smart city. These are systems comprising critical networks of the communication grids, energy systems and the 'Internet of Things', where every recorded change triggers change elsewhere. This real-time interconnection demands a new type of urban governance where the traditional restriction on flow between public and private sectors can no longer prevail.

Without wishing to be alarmist, cities are under great pressure from tech companies to initiate complex and costly smart city initiatives, which undoubtedly deliver tangible benefits to a city but may also evade or fail to address difficult social challenges. The initiatives run the risk of obsolescence and of getting locked into specific platforms. Critical questions arise as to who controls the system, who owns the data, and what are the implications for democracy.

Hence it is critical to be clear about the role of technologies in cities. The urban technologist Robinson (2015) for example advocates that any city that is really smart must combine both of these ideas, that technology in isolation is amoral and often banal, and that a vision for a better future is merely an aspiration without the means to achieve it. Hence there is an argument to reclaim the smart concept from technologies such as 'analytics' the 'Internet of Things' and 'Big Data' and return to its original meaning, using the increasingly ubiquitous and accessible communications technology enabled by the internet to give people more control over their lives, businesses, and communities. As a result Robinson proposes that, a richer debate should takes place between cities and tech companies, which includes a wider set of more holistic objectives. However as big business realizes big profits can be made from delivering objectives, a different dynamic takes over. The emphasis switches from research, exploration, and development to the marketing and selling of well-defined products and the subtle inter-twining of social, economic, environmental, and technical ideas get ground out.

In terms of re-focusing technology on citizen-supported objectives the city of Madrid has put forward radical ideas. The Podemos project backed Lord Mayor, Manuel Carmena, conceives of the city as an eco-system of diverse, competing, and uncontrolled human networks. Instead of asking which of the city's grids and networks we want to automate, she asked advisors; what are the social problems we want to solve. Commenting on a discussion document circulated by the Madrid City Authority, Mason (2015) pointed out that this identified three principles unwelcome in the world of high-profit tech companies; namely openness, democratic participation, and clarity in policy that the data generated from public

services should be publicly owned. The thrust of the City of Madrid's perspective is that city authorities should preferably fund open-source collaborative technology, underpinned by a value-system, which promotes open-access to power and a real debate about what we want technology to do for our cities. A good starting point is to ask what technology would look like if it served the people.

Reclaiming the smart city through wider perspective is echoed in several other significant initiatives. Coe et al. (2001) set out the stall in reflecting on how the collective intelligence of a community based model of governance would operate in an era of new technology infrastructure. More recently The Digital Enlightenment Forum [DigEnlight] a not for profit organisation established in Brussels whose aim is to achieve a better understanding of ways in which citizens, government and enterprises are redefining their relationships through technology. The initiative is inspired by the Enlightenment movement of the 18th century, which produced a seismic intellectual and societal shift that allowed innovation and creativity to flourish. As such, DEF seek, to apply the core principles of the Enlightenment; knowledge should be shared, people can think for themselves, and intellectual and scientific enquiry should be in the service of all, to release a similar era of creativity through technology. It is committed to an inter-disciplinary approach, drawing engineers, anthropologists, social scientists, and designers, into working relationships to see how humans engage with digital life and to see what options they have.

A similar outlook is being promoted by "Insight", the Research Centre for Data Analytics at University College Dublin, that operates at the interface of multiple sectors, including academia, applied health research, business analytics, and social media. Following a realization that there was an organization-wide concern about the place of the citizen in data research, Insight set out to achieve consensus on an agreed set of values. An Insight delegation presented a discussion paper in Brussels 'Towards a Magna Carta for Data' aimed at lifting the discussion above area of data protection and privacy and framing the challenge in a wider context.

Lastly the wider context for data was also the subject of contributions at the 2015 Canadian Open Data Summit held in Ottawa. Davies (2015) affirmed that while Open Data had been overtaken in many settings by talk of Big Data, Smart Cities, and even by talk of data driven governance, open data was still a big idea. He questioned the original framing of Open Data as another data community, and referred to the recent African data consensus, which had agreed 15 thematic categories of data. He suggested in this context that the role of the Open Data community could be to frame the over-arching and ethical manner in which data is approached across all thematic areas. Furthermore, Davies raised the concept of the commons, suggesting we need to reclaim the politics of open data as a way of challenging secrecy, and as a way of promoting a foundation for transparency, collaboration, and participation.

At the same Open Data Summit, Panthea Lee of REBOOT (2015) reflected on the political change sought by citizens is not always aligned with the focus of discussion in the Open Data community, which is often more concerned with the granular dimensions of Open Data. We thus lose sight of the larger ways in how Open Data promises change. Lea stressed the importance of asking, how we can achieve the impact we desire, before seeking technical solutions. She felt that as

citizens we are asking systemic macro-level questions about say health and the environment, but as an Open Data community we are largely pursuing incremental micro level change. If the Open Data community can enable more informed, vibrant, democratic dialogue, then it is their responsibility to help facilitate such dialogue.

1.7 The City Sounding Board

It is all very well criticizing the shortcomings of top down approaches to future city development based largely on a techno centric Smart City agenda, however it is the responsibility of urban planners to develop alternative frameworks and processes to promote a citizen centric bottom up approach. Recently an opportunity arose via a European research network funded by COST research organization that promotes Cooperation for Science and Technology. The COST Action TU1204 focused on the concept of People Friendly Cities in a Data Rich World by critiquing the parallel concepts of Collaborative Urbanism with Smart City.

Although the term Smart City might suggest a capacity and commitment to marshal a collective civic intelligence to tackle city challenges, the People Friendly Cities project seeks to debunk such perceptions, pointing to the fact that Smart City initiatives are often overly focused on achieving narrow objectives in utility efficiency, and seldom focus on human need. Instead, 'People friendly Cities' draws on an urban planning inspiration, incorporating broad notions of sustainability and community resilience, built around a central challenge of enabling citizenship. The general thrust is to explore how a rich vein of collaborative urbanism can be facilitated, and supported by efficient processes, methodology, and tools.

Emerging from the COST Action is the concept of the City Sounding Board [CSB] that constitutes a framework placing the citizen at the centre of the urban process. The CSB incorporates the thrust of an urban planning platform, works within a systems sensibility, and seeks to create a user-friendly framework aimed at making city process intelligible and inviting to the everyday citizen. Central to the framework is the metaphor of the 'table', a place where conversation takes place, where you feel welcome, and where you can bring ideas or access a network. The concept of the CSB centres on a dynamic framework which can include a spectrum of activities ranging from data collection, storytelling, identification of issues and needs, analytics, and actions under various themes. The word 'Sounding' in the title strives to indicate a search for an integrated and broad spectrum collaborative response to an understanding of 'place' and facilitating an open-ness to participate critically in that response through all phases in taking the pulse of the urban landscape.

Embedded in the concept of the City Sounding Board is the methodology of 'City Infrastructures' which can help interrogate aspects of governance, the role of institutions, and the weight and role of the citizen in any chosen city or city neighbourhood.

The term Infrastructure has a much broader meaning than the traditional physical parts of the built environment. Instead, City Infrastructures comprise the full range of soft and hard infrastructures including utilities, services, networks, social groupings, and personal skills that we as a citizen can call on in achieving success in our life's objectives. Of course, the reality is that it is not a level playing pitch, and many citizens are denied access and are disadvantaged. Part of the reason is the lack of clarity about the role and delivery of infrastructure, and the relationship to livelihood and livability. This is partly explained by a perception of infrastructure as being just utilities, though sometimes utilities and institutions. The CSB seeks to draw out and interpret the integrated role of all categories of infrastructure outlined above and to leverage 'Interrogative Infrastructure' to produce new insights on the relationship between the citizen and institutional society. As such, the CSB offers the opportunity to create a dynamic framework, inspired by an urban planning philosophy and systems thinking which acknowledges complexity and can relate to multiple city scales, sectors and themes. The CSB is thus supported by a methodology of Interrogative City Infrastructure aimed at unlocking the structure, rationale, and performance of services, utilities and social capital in relation to human need.

1.8 Conclusions

We have explored how citizens can harness the infrastructure of the Internet and make a real difference in how we tackle the challenges facing the planet, the city, and the urban neighbourhood. We have outlined how these three scales are interconnected, and how aspects of population growth, economic activity, and social inequality, have international dimensions which also impact on the scale of the city, and become visible even at the most local level. We have also acknowledged however, that even before the evolution of the Internet, the citizen had a very marginal role in city governance and the making of cities. Nevertheless, we are now in a new era with a new set of conditions and challenges prevailing that requires a new perspective on the integrated nature of soft and hard City Infrastructures. The emergence of World Wide Web 2.0 with the emphasis on user-generated content, usability, and interoperability along with multiple social media platforms, should enable us to share, communicate, collaborate and even co-produce together. It is curious therefore that at a time when we face serious risk in terms of the future of the planet, and when our cities suffer from an inability to marshal a collective intelligence to creatively address challenges, we have not seen a revolution in how the virtual world might deliver a new culture of urban governance.

It is obvious that social media has quickly developed as a personal infrastructure for family and friends, plays a big role in terms of recreation and entertainment and education, and is seen as increasingly important to one's social esteem. At the same time, it is evident that a new form of creative Internet is emerging where individual citizens configure as groups to achieve some economic or social objective. It does

seem that the exploitation of the Internet for social media and to achieve specific objectives represents a welcome increase in capacity for the citizen. We must ask however, how the imagination of the citizen might be re-tuned towards those larger ambitions outlined above, and how this might be enabled. It does seem that the fundamental objective to achieve a sustainable planet and a sustainable city must include openness, transparency, and a generous partnership with citizens underpinned by trust. In the 12 principles of the Freiburg Charter (2010) for Sustainable Urbanism, for example, the four final principles relate to the contract with the citizen. The 'Learning from Cities' series on Utrecht (2012), stressed five dimensions of citizen engagement; connecting, communicating, collaborating, controlling and changing.

Let us assume therefore, that it is a very desirable objective to build a citizen capacity towards awareness, sharing responsibility, and making a contribution. Let us also assume that many citizens have a varying awareness of global, city, and neighbourhood challenges, want to connect and contribute but feel powerless and detached. The challenge therefore is to identify what is needed to change the status quo and unlock the potential of the citizen to be a key player. The arguments aired suggest there are multiple inhibitors acting against a culture of citizen engagement but there are also new forces.

In building a framework to support a culture of citizen engagement, the concept of the 'civic commons' is a useful starting point. One reason why citizens do not engage is a lack of opportunity for meaningful public discourse, and a shrinking in the true public domain of cities. Increasing privatization across residential, economic and even cultural sectors removes a sense of public entitlement and erodes the footprint of the civic. There is also a retreat on the part of city institutions, labouring to fulfil narrow briefs, which limit an engagement with an open civic discourse. In parallel is the technocratic trend in city governance and city-planning which sees a small number of partners working closely with City Authorities and where citizens are drip-fed progress reports and informed of decisions actually made. In this more privatized technocratic city, there is a bleaching in public life, an absence of debate on value systems, and a danger of colonization by powerful economic interests who will seek to manipulate city infrastructure to their own ends. The nurturing of the public commons is therefore critical to foster a public life and create space for citizen conversation. A culture of public discourse set within a landscape of the civic, will also permeate city institutions and city agencies, and will almost by definition affirm the right of the citizen to connect and be involved. Such a culture will be motivated to evolve institutional and process support to draw in citizens as real partners. The question is, how can a culture of civic stewardship and creative citizen engagement be developed, maintained and enriched.

In conclusion there is a tendency in the contemporary city, for the nuts and bolts of arguments to revolve around specific projects or policy proposals, or around a response to a crisis. This tends to produce a compartmental logic and a silo type perspective, which fails to address the challenge of unity. In asserting a need for a 'civic Commons', we must reach beyond a narrow functionality and become comfortable with ideas, innovation, and cultural renewal coming off the floor of the city. This needs a new mind-set and new institutional alignments.

References

Aliperti, G., Dyer, M., Littman, I., Marra, G. (2016), "Exploring Collaborative Urbanism in Dublin". Paper accepted at Royal Geography Society-IBG Annual International Conference 2016, 30 Aug–2 Sep. Royal Geographical Society in London, UK

AoU. (2010). The Freiburg Charter for Sustainable Urbanism. The Academy of Urbanism [AoU] and the City of Freiburg. https://www.academyofurbanism.org.uk/freiburg-charter/

AoU. (2012). Places of Connection, [Learning Cities Platform]. INTA [International Urban Development Association] Urban ImPulse, Utrecht.

Arup Publications. (2010). Smart cities 'Transforming the 21st century city via the creative use of technology'. http://publications.arup.com/publications/s/smart_cities

Bates, J. (2015). *'Data-cultures: Power and the city'. Programmable city*. Maynooth.

Coe, A., Paquet, G., & Roy, J. (2001). E-governance and smart communities, a social learning challenge. *Social Science and Computer Review, 19*(1):80–93.

Digital Enlightenment Forum [web-site]. https://digitalenlightenment.org

Davies, T. (2015). Trends and attitudes in the global open data community. Canadian Open Data Summit.

Hustwit, G., Director. Documentary movie 'Urbanized' 2011. http://www.hustwit.com/about-rbanized/.

Kitchin, R. (2015). *'Data-driven networked urbanism'. Programmable city*. Ireland: Maynooth.

Lee, P. (2015). Data and public money. Canadian Open Data Conference. http://open.canada.ca/en/content/international-open-data-conference-canada-first-time.

Mason, P. (2015). The Guardian. We cant allow the tech giants to rule smart cities. https://www.theguardian.com/commentisfree/2015/oct/25/we-cant-allow-the-tech-giants-to-rule-smart-cities.

Murakami, D. W. (2015). *'Smart city surveillance city'. Programmable city*. Ireland: Maynooth.

Ruppert, E. (2015). *'Where are data citizens'. Programmable city*. Ireland: Maynooth.

Robinson, R. (2015). The Urban Technologist. https://theurbantechnologist.com/2016/02/.

Sassen, S. (2012). *Cities in a world economy*. Pine Forge Press.

Thatcher, J. (2015). *Provenance and possibility. Programmable city*. Ireland: Maynooth.

Chapter 2
Framework for Collaborative Urbanism

Mark Dyer, Dick Gleeson and Thomas Grey

Abstract In a stable society we tend to take infrastructure for granted. It is only when we experience extreme natural events or economic melt-down or when conflict extends into violence that society begins to appreciate the critical role of infrastructure in daily life. Collaborative Urbanism addresses many of these short comings based on a philosophy of integration and inter-connectedness. Yet the structures underpinning the organization of infrastructure in society are frequently informed by a top-down mind-set, and a rigid separation between functional sectors, and between hard and soft infrastructure. The culture of citizen engagement is hampered by the lack of a user-friendly 'Why-System' to prise open the rationale of why infrastructure operates the way it does and who it serves.

2.1 Introduction

The design, construction and maintenance of the physical fabric of cities is largely undertaken by town planners, architects and engineers based on their professional judgement with often minimal input from the people living and working in these urban spaces. This detached relationship between the professional expert, and the citizen as a primary user, is further complicated by the near lack of scientific

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objective research into how city infrastructures actually perform and in particular meet the needs of users. This situation is partly because design and scientific research occupy 'two very different worlds' where design is more intuition led rather than an evidence based approach that would involve tools such as post occupancy evaluation (Nisha and Nelson 2014; Grey et al. 2015). On the other hand, scientific research is defined by rigorous "systematic inquiry". Furthermore, with the notable exception of a few urban design professionals (Gehl 2010), built environment professions are often trapped in a grid of aesthetics or technical competence without engaging with factors that constitute long-term socio-economic sustainability, such as inclusion and social justice.

No doubt these claims will be met with a barrage of complaints from urban designers as experienced by Jacobs (1961) but are nevertheless true today. For example a bibliometric review of scientific literature (Dyer et al. 2016) confirms that a clear disconnection exists between urban design and urban governance resulting in a minuscule number of documented case studies where public participation played any significant part into the design and planning of urban communities. In majority of cases (less than two hundred in total over the thirty year period) public participation did not feedback directly into design decision making for city infrastructures. This track record no doubt makes uncomfortable reading. Furthermore where consultation did take place in strategic city planning for infrastructure planning, it tended to relate to major economic and business stakeholder groups leaving the two other legs of sustainability (social and environmental) largely unrepresented.

To deal with these shortcomings, a framework for Collaborative Urbanism based on Interrogative Infrastructures has been developed to explore the symbiotic relationship between hard and soft infrastructure. The methodology is geared towards enabling citizen engagement through cultivating open processes of urban exploration, and advocating the need for 'connected infrastructures' thinking [as opposed to disconnected infrastructures]. As such it aims to create the capacity among citizen and stakeholder groups to critique infrastructural provision and participate in strategic design thinking about how urban qualities are under-pinned by connected infrastructures, can strengthen resilience and increase sustainable governance as we face an uncertain global future.

2.2 Cities as Complex Systems

Before examining the structure of the Framework for Interrogative Infrastructures in more detail, it is worth reflecting on the character of cities. By their very nature, cities are complex systems. Back in the early sixties, Jane Jacobs referred to cities as "Organisms that are replete with unexamined, but obviously intricately interconnected, and surely understandable relationships" (1961). Furthermore Vale and Vale describe the city as dynamic interactive systems that demand systems thinking in order to unpick the many challenges. Likewise, the systems approach has informed the work of Newman and Jennings (2008) who promoted the 'Cities as

Sustainable Ecosystems'. This approach, which focuses on relationships and processes, gives a better insight into emergence and complexity; while also acknowledging the importance of context where "Ecosystems are nested, as we are nested within ecosystems—systems within systems, wholes within wholes". It was argued that cities will be more sustainable if they reflect the ecological principles that operate within natural systems.

In light of the challenges to create sustainable urban ecosystems, urban spatial planning has come under pressure due to greater urbanisation, and recognition that cities must be considered as complex adaptive systems. According to Albrechts (2006) urban development issues call for a holistic planning approach, where strategic spatial planning is 'Selective', rather than trying to solve all problems at once, it is 'Relational-Inclusive' with a focus on relations and processes while being inclusive of many stakeholders. Strategic spatial planning can then be thought of as being 'Integrative' in that it brings vertical and horizontal integration between institutional processes. The outlook is based upon 'Visioning' with creative thinking about possible and desirable futures for a place; whilst finally strategic spatial planning is 'Action oriented' where the focus is on implementation and getting things done.

This emphasis on implementation prioritises connections between various authorities, institutions, private organisations, community groups and individual citizens. However, many authors in this area acknowledge that the implementation of strategic spatial planning is undermined by a lack of political will, existing patterns of technocratic and hierarchical planning, and the inability of many actors (politicians, planners, community bodies, or private organisations, citizens etc.) to grasp or engage with alternative, more collaborative forms of planning (Healey 2004, 2006a, 2006b; Albrechts 2006). Likewise Newman (2008) is not surprised that strategic spatial planning has not taken hold to any significant degree. It is suggested that this form of planning demands "imaginative actors to help forge new forms of collective action" but such collective action, which seeks to bring government and civil society together, is frequently undermined as these actors often have contradictory views. Newman discusses these challenges and states that ""Collective action needs participants to commit time and resources. The asymmetric distribution of information causes potential partners to view risk and uncertainty differently. …Getting diverse actors to focus on strategic objectives presents a challenge. Understandably in some cities "collective actor capacity" may not be achieved or necessarily be desired by some actors. Actors may only want short-term commitment to collective action and not the long-term cooperation that fits the ideal of strategic spatial planning." (p.1377) Newman's analysis of the challenges faced by collective action emphasises the difficulties in bringing diverse actors together around shared objectives. To compound this, even when there is consensus in relation to objectives, different perspectives and governance and institutional barriers that divide various actors, will make collaborative and integrated governance and planning very difficult."

2.3 Framework for Interrogative Infrastructures

Given the difficulties facing the implementation of strategic spatial planning and the need to bridge the perennial gap between top down and bottom up approaches as documented by others (OECD 2001a, b; Murray et al. 2009; Campbell 2011; EC-EIP 2013; Pissourios 2014; Campbell and Cowan 2015), a Framework for Interrogative Infrastructure is proposed based on the inter-relationship between hard and soft city infrastructures. It acknowledges the need to develop a framework that explicitly links soft infrastructures comprising institutional, communal and personal infrastructures with the hard infrastructures including utilities in order to improve the liveability and livelihood for people living, working and visiting cities. The proposed framework is illustrated in Fig. 2.1.

This framework presents a number of infrastructures as support systems that influence quality of life within an urban area. These infrastructures do not represent actual conditions within a community. As such they employ a framework that can be employed to examine the key support systems within a community that influence a range of social, environmental and economic urban issues such as mobility, quality of urban space, provision of community services etc.

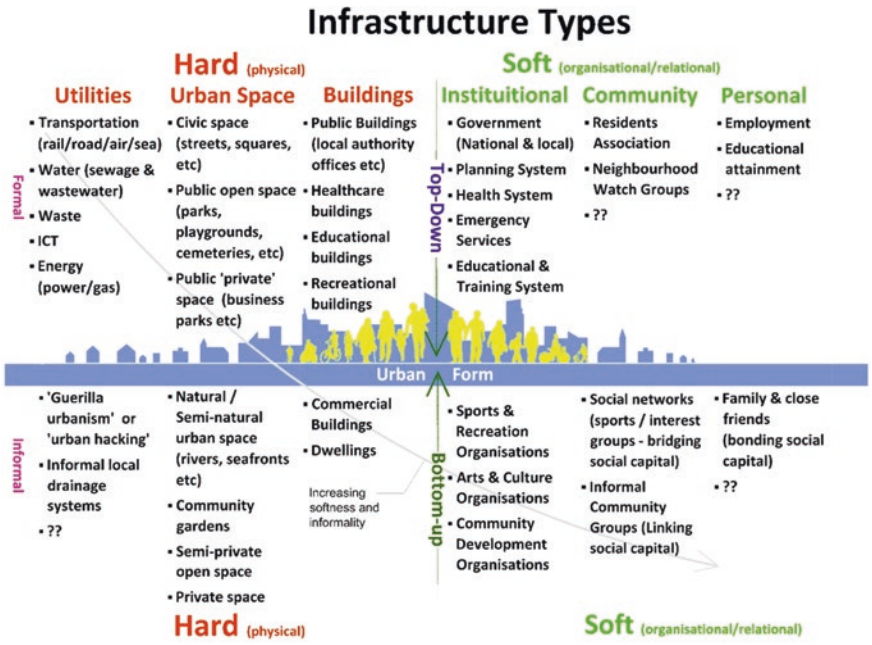

Fig. 2.1 Framework for interrogative infrastructures

The framework outlines three hard infrastructures as follows.

Utilities: Utilities ate taken to refer to physical services such as transportation, water and waste systems, ICT, etc. These utilities connect and operate equally across all urban scales, including national and international interconnectivity.

Urban Space: Urban space is considered largely as bounded space, in the form of streets, urban plazas, or local squares, playgrounds parks etc. Urban space is typically identifiable at the neighbourhood scale or district scale, depending on the nature of the open space.

Buildings: The Building Infrastructure refers largely to architectural space defined as single or grouped buildings forming part of an urban block. This will include dwellings, educational buildings, healthcare buildings etc.

By their nature soft infrastructures are harder to define or map onto specific spatial scales. However, referring to previous work of Landry (2006), Tonkiss (2014), and Casey (2005), three primary soft infrastructures can be defined as follows.

Institutional: Institutional infrastructures refer to public and private systems, which provide certain services within the city such as local government, healthcare services, or educational services. It may also include sporting, art and culture, or official community support organisations. These institutions are typically top-down and more formal in nature.

Community: Community infrastructures refer to informal networks or community groups that occur within neighbourhoods or districts. These infrastructures rely on bridging and linking social capital. While 'Communities of Interest' or online communities may not be location specific, many community organisations will relate to a specific physical community delineated by political, parish or physical boundaries (a river, large street etc.). In this regard community infrastructures will often operate within the district scale and arguably at a more identifiable level at the neighbourhood scale.

Personal: Personal infrastructure refers to the support systems a person will have at an individual, family, or friendship level. This will often involve bonding social capital where membership of a family or social group is critical to a sense of belonging. It will also include educational attainment and other support systems that occur at an individual level. One of the most significant characteristics of modern society is the ease, speed and inexpensive movement of people and information. The evolution of transport and ICT means that people can commute great distances or communicate and maintain personal, business, educational, or recreational relationships regardless of geographic location.

In this context the framework is seen as a starting point and there may be other infrastructures worth including. However, the six infrastructures currently outlined will characterise many issues within a community across many social, environmental and economic domains. It is also important to recognise that these infrastructures can and will overlap and intertwine across the city and at different scale as shown in Fig. 2.2.

Fig. 2.2 Overlapping of city infrastructures

Based on this approach an iterative process can be developed that starts with an initial brief or design question that collects, collates, and communicates the contextual data and intelligence about soft and hard infrastructures as a means of bridging the gap between top down and bottom up processes. Furthermore it provides a structure to overlay (investigate) the various infrastructures in the context of local urban design or planning initiatives or design.

2.4 City Infrastructures

A wealth of published literature is available to develop further the Framework for Interrogative Infrastructures. Landry (2006) helpfully differentiates between hard and soft infrastructures, particularly in relation to soft infrastructures. The hard infrastructure is perceived as buildings, roads, transport systems, utilities etc. that connects people and communities that in turn generate ideas based on social and imaginative capacity. Landry provides more detailed about soft infrastructure by defining seven forms of urban capital in the form of Human capital; Social capital; Cultural capital; Intellectual capital; Creativity capital; Leadership capital; and Environmental capital. The first six forms of capital, and the natural landscape component of Environmental Capital, are all part of soft infrastructure, while the built environment component makes up the remaining part of Environmental Capital (Fig. 2.3).

In comparison, Tonkiss (2014) defined physical infrastructures as the bone structure of a city while the various soft or social infrastructures are its arteries. As such the "hard Infrastructure of things" comprises networks (pipes, rail lines etc.), nodes (stations, interchanges etc.) and flows (water, energy, etc.); whilst the "soft infrastructure of social systems" focuses on human activity and relationships. This approach lends itself for modelling the Framework for Interrogative Infrastructures with the introduction of the terms networks, nodes, flow, activity and relationships.

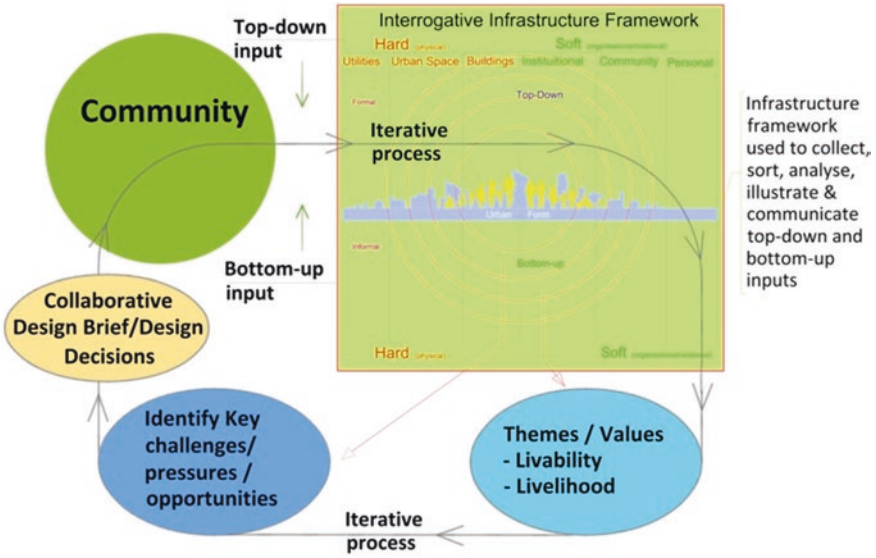

Fig. 2.3 Decision support system for city infrastructures linked to themes and values within a top-down and bottom-up process

At a more abstract level, Simone (2004) further extends the concept of infrastructure by proposing hybrid infrastructures based on the ability of residents to engage in complex combinations of objects, spaces, persons, and practices that are themselves infrastructures to provide and reproduce life of a city.

In a more formulaic manner, the recently published ISO/TR 37150:2014 (E) for Smart Community Infrastructures provided a review of hard city infrastructures using the terms 'Community Infrastructures' and 'Community Facilities'. These are considered to support to 'Community Services' that has a significant impact on economic prosperity, growth, and quality of life. The ISO identify the following five keys 'Community Infrastructures': namely Energy, Water (including sewage and wastewater), Transportation, Waste and ICT. The model comprises three layers underpinned by a Community Infrastructure as illustrated in Fig. 2.4. In relation to Framework for Interrogative Infrastructures, the ISO provides a greater emphasis on hard infrastructures, whilst offering less focus on soft infrastructures compared with Urban Capital defined by Landry (loc cit).

In a similar fashion, Robinson (2012) set out a series of layers to understand the urban context in relation to the design of smart cities (Robinson 2012). Starting with the Goals a city sets itself, the models comprises subsequent layers relating to People, Ecosystems, Soft Infrastructures, City Systems and Hard Infrastructure. Similar to other authors, Robinson (2012) argues that successful smart city infrastructure design requires an understanding about how these layers of infrastructures interact with each other.

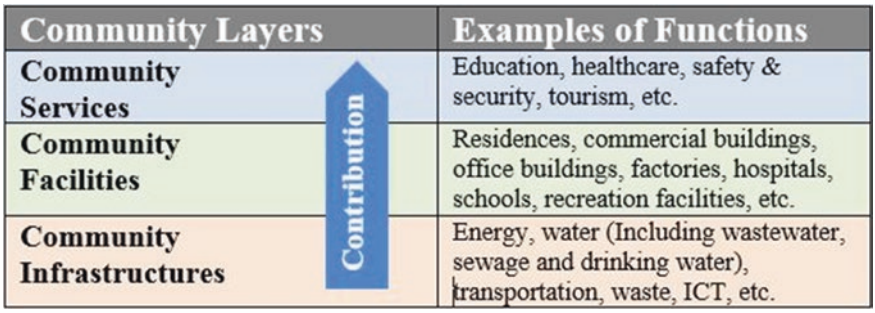

Fig. 2.4 Layers of a community (modified from ISO 2014)

While the ISO and to some degree Robinson multi-layered urban system focussed on hard infrastructure, research completed for a number of local councils in Australia 'Establishing Standards for Social Infrastructure' aims to integrate the hard and soft components of community infrastructure (Casey 2005). Moving the emphasis away from standard utilities as infrastructure (i.e. water, energy etc.), the author focuses on infrastructures that meet the needs of communities by enhancing the quality of life, equity, law and order, stability and social well-being through community support services including safety, security, sports, recreation, culture, justice, housing, health and education. As such the study refers to this as 'Social Infrastructure'. The corresponding hard infrastructure includes physical community facilities and public buildings. It is not simply about providing physical assets but about enhancing skills and knowledge and access to a range of appropriate services and responses. Thus soft infrastructure is shown to support the well-being of both the individual and the community and is therefore related to enhancing Human Capital and Social Capital (Putnam 1995). Similar past studies by Leyden (2003), Araya et al. (2006), Wood et al. (2008), Williams and Pocock (2009) have likewise focussed on impact of the built environment on Social Capital in terms of bridging Capital, Bonding Social Capital and Linking Social Capital as defined in Table 2.1.

Table 2.1 Description of social capital (after Williams and Pocock 2009)

Social capital	Description
Bridging social capital	Broad, superficial social connections that are inclusive of diversity, for example, membership of varied social or interest groups
Linking social capital	Social connections that link ordinary people to various levels of administrative or political power. Membership of a grass roots community group that has access to representatives on the local council is an example of linking social capital
Bonding social capital	Restricted, exclusive social connections that may be exemplified by family groups, exclusive social groups built on a specific ideology

Table 2.2 Comparison between the different city infrastructure frameworks and models

Framework for interrogative infrastructures	Landry (2006)	Tonkiss (2014)	ISO (2014)	Casey (2005)	Robinson (2012)
Physical infrastructures (utilities, urban space, buildings)	Environmental capital	Networks, nodes and flows	Community infrastructure Community facilities	Utilities community facilities Public buildings	Hard infrastructure
Institutional infrastructures	Urban capital		Community services	Social infrastructures	City systems Ecosystems
Community infrastructure	Urban capital	Human activities and relationships		Social infrastructures (social capital)	Soft infrastructure
Personal infrastructure	Urban capital	Human activities and relationships		Social infrastructures (human capital)	People

Each of these past studies contribute towards a Framework for Interrogative Infrastructures that helps frame a discussion about the interaction between people, as well as between people and the institutional and physical fabric of a city. A comparison between the different models and frameworks is summarised in Table 2.2.

2.5 Platforms for Collaborative Planning and Design

Having discussed largely academic models for analysing urban systems and society, at grass roots level and professionally, the Internet as spawned a number of community and professional platforms to support the growing interest in public participation for collaborative urban design and in so doing bridge between top-down and bottom-up engagement process. A brief summary of some of the leading initiatives is described in Table 2.3.

While these engagement platforms go a long way towards bringing people together, they are still challenged by conflicting views and the danger that many stakeholders will be overwhelmed by the complexity of the city and its associated social, environmental and economic processes. It further highlights the need for a holistic framework for cities that bridges the gap between top down and bottom up participation processes.

Table 2.3 Online platforms for collaborative urbanism

Initiative	Site	Value proposition	Organization	Total sites linking In
Smart urbanism	http://www.smarturbanism.org.uk	Collective power of many small ideas and actions to make a big difference	University	7
Creative citizens	http://creativecitizens.co.uk/community-led-design/	Understanding how media can support and add value to community-led design projects	University	24
Soundingsoffice	http://www.soundingsoffice.com	Platform for public and stakeholder consultation	Company	8
Urbanscale	http://urbanscale.org	Toolkit for user-centred interaction design to the specific problems of cities.	Company	56
Oiengine	http://oiengine.com	Platform inviting people to submit insights and ideas in response to a big question	Company	16
Urbaninteractivestudio	http://urbaninteractivestudio.com/engagingplans/	Informs, and involves citizens and stakeholders in public projects and decision making by maintaining documents, events, news	Company	71

2.6 Conclusions

As built environment professionals we have tended not to reflect on how physical infrastructure in cities are commissioned, or what evolving role it plays in society, or indeed how the status quo of infrastructure favours certain stakeholder groups.

In response to these shortcomings, a range of initiatives has been highlighted which provide various platforms and tools to support collaborative urbanism. However it is argued that these efforts would be strengthened if there was a framework that rendered urban complexity more comprehensible, while also providing a tool to examine the various urban support systems that underpin quality of life within the city. Following a review of published literature, A Framework for Interrogative Infrastructure outlined comprising three hard infrastructures including: Utilities; Urban Space; and Buildings, and three soft infrastructures including: Institutional, Community, Personal. These infrastructures are designed to examine the key support systems within a community that influence a range of

social, environmental and economic urban issues. The framework is seen as a starting point to build upon. These infrastructures will overlap and intertwine but it is intended that the infrastructure framework will highlight key support systems, make these more visible to all stakeholders, and help provide a filter to identify key issues, blockages and enablers as part of a collaborative planning and design process.

References

Albrechts, L. (2006). Shifts in strategic spatial planning? Some evidence from Europe and Australia. *Environment and Planning A, 38*, 1149–1170.

Araya, R., Dunstan, F., Playle, R., Thomas, H., Palmer, S., & Lewis, G. (2006). Perceptions of social capital and the built environment and mental health. *Social Science and Medicine, 62*, 3072–3083.

Campbell, K. (2011). Smart urbanism: Making massive small change. *Journal of Urban Regeneration and Renewal, 4*, 304–311.

Campbell, K. & Cowan, R. (2015). *Massive Small Compendium (sample of upcoming publication)*. Urban Exchange.

Carmona, M., Tiesdell, S., Heath, T. & Taner, OC. (2010). *Public places, urban spaces: The dimensions of urban design.* Amsterdam [etc.]: Elsevier.

Casey, S. (2005). *Establishing standards for social infrastructure*. UQ Boilerhouse, Community Engagement Centre.

Cremer-Schulte, D. (2014). With or Without You? 1 strategic spatial planning and territorial re-scaling in Grenoble Urban Region. *Planning Practice and Research, 29*, 287–301.

Dobbins, M. (2011). *Urban design and people*. Wiley.

Dyer, M., & Corsini, F. (2016). A bibliometric analysis of published literature in the field of urban governance and urban design. *In Conference Proceedings INPUT*, Turin.

EC-EIP. (2013). European innovation partnership on smart cities and communities—strategic implementation plan. In: E. I. P. E. O. S. C. A. C. (Ed.), *European commission*.

Fourie, J. (2006). Economic infrastructure: A review of definitions, theory and empirics. *South African Journal of Economics, 74*, 530–556.

Friedmann, J. (1973). *Retracking America; A theory of transactive planning*. Garden City, N.J.: Anchor Press/Doubleday.

Gehl, J. (2010). *Cities for people*. Washington DC: Island Press.

Grey, T., Cahill, S., Pierce, M., & Dyer, M. (2015). *Universal guidelines for people friendly dwellings for people with dementia, family and carers*. NDA Ireland: CEUD publication

Healey, P. (2004). The treatment of space and place in the new strategic spatial planning in Europe. *International Journal of Urban and Regional Research, 28*, 45–67.

Healey, P. (2006a). Relational complexity and the imaginative power of strategic spatial planning. *European Planning Studies, 14*, 525–546.

Healey, P. (2006b). *Urban complexity and spatial strategies: Towards a relational planning for our times*. Routledge.

Hirschman, A. O. (1958). *The strategy of economic development*. Yale University Press.

ISO/TR 37150. (2014). Smart community infrastructures review of existing activities relevant to metrics.

Jacobs, J. (1961). *The death and life of great American cities.* New York: Random House.

Jerome, A. (1999). *Infrastructure in Africa: The record*. African Development Bank.

Jollands, N., Kenihan, S. & Wescott, W. (2008). *Promoting energy efficiency best practice in cities*. IEA.

Landry, C. (2006). *The art of city-making*. Routledge.

Leyden, K. M. (2003). Social capital and the built environment: the importance of walkable neighborhoods. *American Journal of Public Health, 93*, 1546–1551.
Lowndes, V. (2005). Something old, something new, something borrowed…. *Policy Studies, 26*, 291–309.
Murray, M., Greer, J., Houston, D., Mckay, S., & Murtagh, B. (2009). Bridging top down and bottom up: Modelling community preferences for a dispersed rural settlement pattern. *European Planning Studies, 17*, 441–462.
Newman, P. (2008). Strategic spatial planning: Collective action and moments of opportunity. *European Planning Studies, 16*, 1371–1383.
Newman, P., & Jennings, I. (2008). *Cities as sustainable ecosystems: Principles and practices*, Island Press.
Nisha, B., & Nelson, M. (2014). Making a case for evidence-informed decision making for participatory urban design. *Urban Design International 17*(4), 336–348.
OECD. (2001a). *Citizens as partners: Information, consultation and public participation in policy*. OECD Publishing.
OECD. (2001b). *Citizens as partners: OECD handbook on information, consultation and public participation in policy-making*. OECD Publishing.
Peirce, N. R., Johnson, C. W., Peters, F., & Rockefeller, F. (2008). *Century of the city: No time to lose*. New York: Rockefeller Foundation.
Pissourios, I. A. (2014). Top-down and bottom-up urban and regional planning: Towards a framework for the use of planning standards. *European Spatial Research and Policy, 21*, 83–99.
Putnam, R. D. (1995). Bowling alone: America's declining social capital. *Journal of democracy, 6*, 65–78.
Robinson, R. (2012). *The new architecture of smart cities* [Online]. Available: http://theurbantechnologist.com/2012/09/26/the-new-architecture-of-smart-cities/. Accessed February 1, 2015.
Sabatier, P. A. (1986). Top-down and bottom-up approaches to implementation research: A critical analysis and suggested synthesis. *Journal of Public Policy, 6*, 21–48.
Simone, A. (2004). People as infrastructure: Intersecting fragments in Johannesburg. *Public Culture, 16*, 407–429.
Tonkiss, F. (2014). *Cities by design: The social life of urban form*. Wiley.
UN-HABITAT. (2013). *State of the world's cities 2012/2013*: *Prosperity of cities.* Earthscan.
UN WCED, Environment, U. N. W. C. O. & Development, A. (1987). *Our common future—report of the world commission on environment and development.* Oxford, UK: Oxford University Press.
UNEP. (2014). *United Nations environment programme year book 2014: Emerging issues in our global environment*. Nairobi, Kenya: United Nations Environment Programme.
United Nations. (2005). *2005 World Summit Outcome* [Online]. New York: United Nations.
United Nations. (2006). *World urbanization prospects the 2007 revision* [Online]. New York: United Nations. Available: http://www.un.org/esa/population/publications/wup2007/2007wup.htm
United Nations Human Settlements, P. (2011). *Cities and climate change: Global report on human settlements, 2011.* Nairobi; London; Washington, DC: UN-Habitat; Earthscan.
Urban Task Force and Rogers, R. (1999). *Towards an urban renaissance.* London: Spon.
Vale, B., & Vale, R. (1991). *Green architecture: Design for a sustainable future*. London: Thames and Hudson.
Williams, P., & Pocock, B. (2009). Building 'community' for different stages of life: Physical and social infrastructure in master planned communities. *Community, Work & Family, 13*, 71–87.
Wood, L., Shannon, T., Bulsara, M., Pikora, T., Mccormack, G., & Giles-Corti, B. (2008). The anatomy of the safe and social suburb: An exploratory study of the built environment, social capital and residents' perceptions of safety. *Health & Place, 14*, 15–31.
World Watch Institute. (2013). *U.N. Raises "Low" population projection for 2050* [Online]. Available: http://www.worldwatch.org/node/6038. Accessed January 13, 2013.

Chapter 3
Using Big and Small Urban Data for Collaborative Urbanism

Thomas Grey, Mark Dyer and Dick Gleeson

Abstract The purpose of this chapter is to explore Big and Small Data available in cities, and to investigate how this data relates to different urban infrastructures and spatial scales. Whether dealing with Big Data or Small Data, it is argued that urban data, if used appropriately, can help bridge the gap between top-down, and bottom-up processes, whilst helping stakeholders to recognise that cities are complex systems that operate through various spatial scales of urban form.

3.1 Introduction

The Smart City movement that began to emerge in the late 1990s (Mahizhnan 1999; Caves and Walshok 1999) gave rise to the concept of Big Data for cities. This data involves large digital datasets that dwarf traditional data, or Small Data (Kitchin 2014), which is often held in hard copy. However, when attempting to improve livelihood and liveability in cities, the critical question is how can this data inform decision-making, and foster better public participation in complex and highly bureaucratic planning processes.

Before considering data in this context it is important to agree what is generally meant by data. In simple terms, data represents the plain facts of a particular situation that can be processed, organized, structured and transformed into information.

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Putting it more eloquently data can be described as "the raw material produced by abstracting the world into categories, measures and other representational forms—numbers, characters, symbols, images, sounds, electromagnetic waves, bits—that constitute the building blocks from which information and knowledge are created" (Kitchin 2014: 1). Within this working definition, good-quality data can be further characterised as discrete, intelligible and potentially linked to other datasets to provide insights not available from a single dataset.

Not surprisingly, those working to improve urban communities have always wanted better data about conditions in their neighbourhoods (Ahlbrandt and Brophy 1975; Kingsley and Pettit 2014). However, data was traditionally limited to infrequent data buried in hard copy files within myriad organisations. Hence, relevant and timely community-based data was always scarce on the ground. We are now faced with exponential growth in data brought about by advances in technology, digitisation of records and improvements in location-based data through the use of Geographic Information System (GIS) technology, where greater amounts of higher quality data is available for mapping and analysis. So perhaps the first question we should be asking is who produces this digital data and what is the data about.

3.2 Types of Data

Traditionally government agencies, local authorities, researchers, and planning and design professionals were the main creators and users of data in relation to urban development. According to Kingsley and Pettit (2014), this data came from a number of streams including among others:

- **Administrative records**: Administration data compiled by government organisations such as tax records, property data, school records, court records, births and deaths, etc. Businesses also collect administrative data regarding credit data or data pertaining to customer loyalty cards, while Non-Profit Organisations also hold client records or property information.
- **Surveys**: Surveys conducted on many levels and focussed on individuals or households, comprising quality of life surveys, surveying and mapping of local assets such as housing, parks or schools, or issues such as graffiti or vacant lots.
- **Qualitative methods**: Data collected from stakeholder interviews, focus groups or community meetings provide valuable data in terms of understanding local conditions, issues, and motivations. They are also critical in capturing the voice of the community and in "ground-truthing" or checking the validity of existing data sets (Minkler 2014).

While the above forms of data represent some of the traditional methods of obtaining information for planning purposes, there is now a range of data collection methods available and these will be discussed in detail in Sect. 3.4. However, before this, there are a number of key terms used in this chapter that should be clarified and these are now outlined below.

Small Data
Surveys and qualitative methods used to collect data at a smaller scale, in contrast to Big Data (discussed below) could be termed what Kitchin (2014) calls 'small data'. This involves data produced in studies with limited scale and scope, using non-continuous collection, and designed to answer very specific questions.

Big Data
More recently, advances in information and communications technology (ICT) and the movement toward community participation and greater data availability has widened the range of organisations and people producing and using data. Enabled by advances in ICT, Big Data is typically generated in large volumes and is often the by-product of ICT systems, rather than primary data gathered to investigate a particular phenomenon (Kitchin and Lauriault 2015). For example, Big Data may result from traffic sensors, capturing huge amounts of data at hundreds of locations around a city, or comprise of social media data such as Facebook or Twitter posts, or photos uploaded to Google StreetMaps (Kingsley and Pettit 2014).

Furthermore, Big Data is characterised by quantity and frequency, rather than being tied to a specific data type, and therefore many data types may be described as Big Data, if they are available in large volumes and at a high velocity.

Open Data
Availability and transparency is central to the use of all data for urban transformation. In this context 'Open Data' is data that is freely available to all users in a usable file format. Shaw (2014: 110) refers to the Open Knowledge Foundation and states that "data are open when they are available to everyone, free for use and reuse, and when data sets have a minimalist form of licensing that, at its most stringent, requires author attribution and the obligation to make subsequent derivative works similarly open." The Open Knowledge Foundation has three qualifying criteria for open data: legally open and free from restrictive licensing; socially open, where information supports collaboration; and technologically open, where the data files are available in non-proprietary formats.

The availability and accessibility of both Big and Small Data through Open Data formats presents a real opportunity for urban planning. However as pointed out by Kitchin (2014) there has been little research into how these new forms of data are being produced (or not produced), how they are being mobilised by business, government and citizens, and the implications of real-time data analytics.

Within this complex and growing field of Big Data, there is the thorny issue of promoting meaningful public participation in response to the increasing demand for enhanced urban democracy. Murray et al. (2009: 446) acknowledge these failures and asks "How can the approaches of the top-down stances of central government and the bottom-up stances of communities be reconciled?". They argue that many contemporary societies are based on complex relationships between government and various private or community stakeholders, and that civil society should seek to increase the "responsiveness of political organisations" and that "Participatory governance is central to that project" According to the authors, the top-down approach has become increasingly centralised, de-politicised, and expert

and managerial driven. In contrast, bottom-up planning is based on public participation in the decision-making process, greater accountability for local authorities and scepticism around technical expertise.

However, bottom-up planning approaches are difficult to interpret and apply in practice (Pissourios 2014). Nevertheless, there is a general consensus that top-down and bottom-up approaches need to be reconciled. The OECD has published reports (OECD 2001a) and handbooks (OECD 2001b) to guide government-citizen interaction. More recently the European Innovation Partnership (EIP) on Smart Cities and Communities (EC-EIP 2013: 7) has put forward 'Citizen focus' as both a priority area and an enabler. In this context, the EIP asks how to "include citizens into the process as an integral actor for transformation".

So what Big Data or Small Data is available and how might we interpret the data to better understand the workings of cities as complex systems? And how can this help promote better decision making with greater public participation in collaborative urbanism?

3.3 Urban Form and Spatial Scales: Using Urban Infrastructures to Organise Data

The 'City Infrastructures Framework' put forward in Chap. 2 helps to structure some of the key urban systems influencing livelihood and liveability in cities. This framework characterises the city in terms of 'hard' infrastructures that include: Utilities; Urban space; and Buildings, and also 'soft' infrastructures including: Institutional; Community; and Personal. However, in order to identify and measure the different elements of these infrastructures, which by definition are interrelated, data collection and mapping of these infrastructures is required. Before exploring these data collection and mapping methods, it is important to consider the influence of urban form and spatial scales in this context.

Urban form or urban structure refers to "the pattern or arrangement of development blocks, streets, buildings, open space and landscape which make up urban areas" (English Partnerships & Housing Corporation 2003: 33). The urban form influences urban living patterns by determining movement, accessibility to services, travel patterns, and housing, work or school location choices. It also forms the framework for planning and development policy at a local authority and regional level, and thus influences urban development and regeneration. Urban form also shapes urban morphology, which influences the sustainability of the urban environment by determining density, building height, building form and shape, plot-ratio, site coverage, building set-back and street widths.

Urban form must be considered at a number of scales and it is in this context that Calthorpe (2010: 3) emphasises the interaction between various urban scales, arguing that "each scale depends on the others and that only a whole systems

Fig. 3.1 Range of urban scales

approach, with each scale nesting into the other, can deliver the kind of transformation we need to confront climate change".

The various spatial scales that exist within urban areas and their influence on integrated planning and design have been discussed by various authors (Alexander et al. 1977; Moughtin and Shirley 2005).

This attention to spatial scales provides a richer description of the city and recognises the various elements and uses that exist in urban areas. The spatial scales commonly referred to include Regional, City, District, Neighbourhood, Street, Block, and lastly the Building Scale.

These spatial scales are rarely clearly defined or bound within a certain perimeter. In fact, the modern city is characterised by increased flows of people, materials, waste, energy and information across global, regional, city and local scales. However, as Calthorpe (2010) argues earlier, it is vital to take a whole systems approach, and this requires an understanding of the various scales within the system.

This means that data collection, mapping and interpretation must be cognisant of urban scale and form as illustrated in Fig. 3.1. Otherwise there is a real danger of generating false negatives and positives due to analysing inappropriate data sets.

While the relationship between spatial scales and city infrastructures are complex and will vary from one city to another, it is worth briefly examining how they might interact. Referring back to the infrastructures outlined in Chap. 2, this current chapter suggests the following relationship between city infrastructures and the various spatial scales as follows:

Utilities: Based on the interpretation of utilities in this research (i.e. transportation, water and waste systems, ICT, etc.), it becomes clear that the utilities

infrastructure connects and operates equally across all urban scales, including national and international interconnectivity.

Urban Space: In the context of this research urban space is considered largely as bounded space, delineated within a certain scale. Therefore, it is typically identifiable at the District Scale, or more commonly the Neighbourhood Scale, in the form of parks, streets, urban plazas, or local squares.

Buildings: While an organisation may have a building portfolio that stretches across all urban scales, or part of an urban block, the building scale itself is typically a self-contained unit.

The relationship between the soft infrastructures and various spatial scales is harder to map onto specific spatial scales. Nonetheless, in terms of urban design, it is useful to examine the relationship between spatial scales and soft infrastructures to understand the broad issues that influence quality of life within the city.

Institutional: Institutional infrastructures are similar utilities in that they connect and operate across all urban scales, and also across regional and national boundaries.

Community: While 'Communities of Interest' or online communities may not be location specific, many community organisations will relate to a specific physical community delineated by political, parish or physical boundaries (a river, large street etc.). In this regard community infrastructures are often more apparent within the district scale, and are arguably even more identifiable at the Neighbourhood Scale.

Personal: One of the most significant characteristics of modern society is the ease, speed and inexpensive movement of people and information. The evolution of transport and ICT means that people can commute great distances or communicate and maintain personal, business, educational, or recreational relationships regardless of geographic location. Therefore, it can be argued that personal infrastructures can operate across all urban scales and beyond.

Figure 3.2 illustrates this relationship between the spatial city scales and urban infrastructures while outlining the extent to which each infrastructure and scale interact.

The relationship between city infrastructures and spatial scale provide a valuable framework for understanding how different stakeholders might collect and map data in the urban environment. Furthermore, it helps structure how stakeholders might present and interpret data to support community participation and collaborative urbanism.

For example, when collecting data from stakeholders, Moughtin et al. (2005) contend that public engagement is most effective at the city quarter, or neighbourhood level, as these represent a scale where residents can contribute their local knowledge and expertise. This is because neighbourhoods, quarters or districts of the city have a somewhat identifiable boundary, recognisable to both residents and outsiders alike. These neighbourhoods are structuring elements which are common to most cities and act on people's perception of the city, thus making the urban

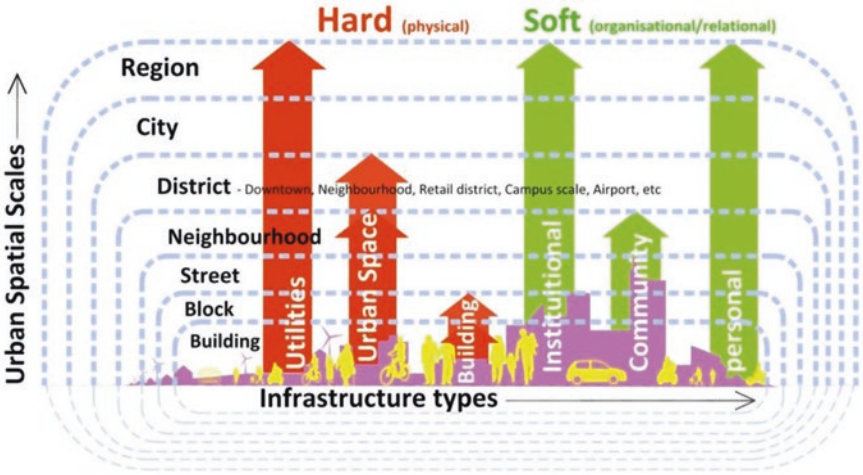

Fig. 3.2 Infrastructure and spatial scales

environment more intelligible and legible (Lynch 1960). In addition, most people interact with the urban environment on a daily basis at the neighbourhood scale, and therefore this scale has a significant impact on their quality of life.

Supporting this argument Hamann and April (2013: 13) argue that successful collaborative and participatory processes "are more likely at a scale, in which participants have a personal relationship with and a better cognitive overview of the issues and plans under discussion."

In line with this location-based sense of community, the collection of data as part of a collaborative urban transformation process should be underpinned by local intelligence. Dobbins (2011: 199) discusses the need for useful and relevant information to inform the community design process and proposes that "Any place-changing dynamic, regardless of sophisticated or detailed information sources, should always begin with interacting with the citizens there, usually the best database, often overlooked or downplayed by professional practitioner."

While it might be agreed that data should be collected at a local level, Kingsley and Pettit (2014) point out that data at the community scale has often been difficult to procure. In his analysis of data use and community change, Chaskin (2013: 150) acknowledges the challenges around effective neighbourhood data due to the complexity of neighbourhoods, stating that;

> Neighbourhoods are complex, open systems, variously defined and subject to myriad influences beyond those shaped by any given community-change effort. This complexity complicates efforts to outline theories of change that specify causal expectations between input and intended outcome and makes identifying comparison communities to establish a counterfactual difficult. In addition, community-change efforts themselves tend to be similarly complex, seeking to address several issue areas (social, economic, physical) across sectors (public, private, non-profits) and at different levels (individual, organization, community).

Chaskin (2013) also identifies the issue of scale in relation to neighbourhoods, arguing that, while an understanding of the neighbourhood scale and its associated dimensions (e.g. neighbourhood social capital), are critical to community building; there is often a lack of data available at this scale. Defining the spatial scale at which data is collected is therefore an important consideration and one that is often undervalued in research, prompting Messer to declare that "the neighbourhood effects literature is plagued by a lack of attention to scale" (Messer 2007: 870).

Even in situations where planning is more effective or efficient at a larger scale, it is often wise to collect data at a local level as a starting point. In support of this approach, Fraser contends that data should be "collected and made available at the finest possible scale, but that it be aggregated into larger planning units using a transparent process" (Fraser et al. 2006: 126).

While it is advisable to use neighbourhood data to improve conditions within communities, it is also important to use data to compare performance between communities. Pettit et al. (2013) point out that the ability to compare data across communities is important for a number of reasons. Firstly, it highlights the impact of a particular place or neighbourhood on community well-being; secondly, it facilitates the creation of neighbourhood-based indicators; while thirdly it illustrates social issues specific to certain communities.

As such, the concept of City Infrastructures provides a useful framework for collecting and mapping data within a community in relation to specific issues such as transport or housing. The City Infrastructures approach has the advantage of ensuring that no major component is being ignored in terms of data collection, analysis or proposed intervention. For example, a combination of local authority documentation and traditional on-street audits will reveal a great deal about hard infrastructure such as utilities or open space, but little about community and personal infrastructures. As a consequence, alternative data gathering tools such as questionnaires or crowdsourced community data can be collected to compare and contrast hard and soft infrastructures.

3.4 Data Collection and Mapping Methods

Given the attention being paid to bridging top-down and bottom-up planning processes through collaborative urbanism, the following section focuses on data approaches that: (a) prioritise sustainable-development; (b) can be used directly or indirectly (through an agent) by both the community and local authorities; and (c) that concentrate on community issues such as the quality of the built environment, housing, community assets, local environmental conditions, transport or similar.

When considering the various uses for urban data it is useful to categorise this data into the following classifications:

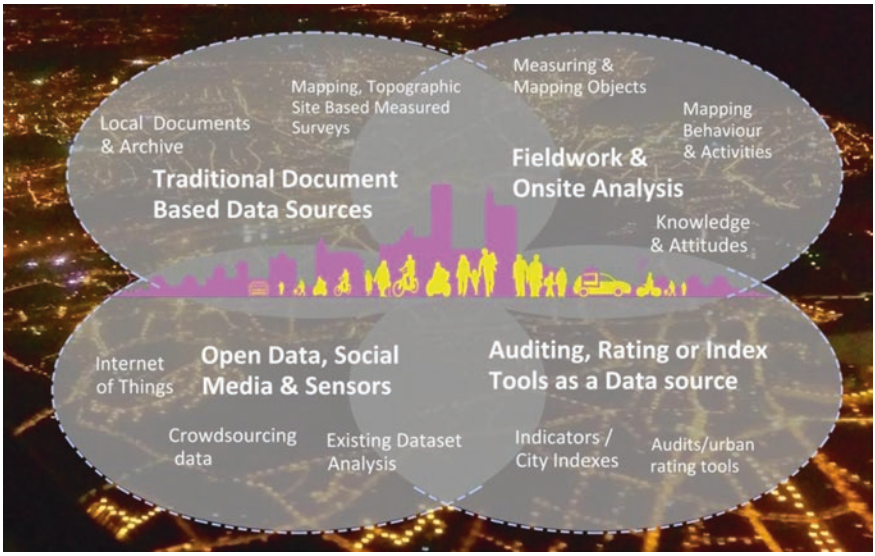

Fig. 3.3 Data collection and mapping categories

- Data sourced from traditional documentation and archives.
- Data derived from fieldwork and onsite surveys.
- Data from auditing, rating tools, indicators or city indices.
- Data from online Open Data and Social Media Sources.

Within each category there is a number of data collection methods available as outlined in Fig. 3.3. These four categories, along with the associated data collection, are now briefly discussed in the next few sections.

Traditional Document Based Data Sources

Firstly considering *traditional local document and archives*, this is often a starting point for any local development and is central to many planning or urban design approaches, such as the New Zealand based Urban Design Toolkit (Ministry for the Environment (NZ) 2009), or the American Institute of Architects Urban Design Assistance Team Program (AIA 2004). These documents may include local authority development plans or strategies, local historical information, research reports, environmental impact statements, or similar document based information relating to a specific area.

Given the wide spectrum of environmental, social, and economic issues referred to in these documents, they may cover, to varying degrees, the six infrastructures. In terms of spatial scale, these documents will deal with a variety of scales, depending on the document focus.

With regard to data collection tools and techniques, many of these documents are available online, and with the introduction of city-based portals such as the DublinDashboard (NUI Maynooth 2015) or the London DataStore (Greater

London Authority 2015), there are increasing numbers of documents and datasets available in open format for public use.

The second form of data in this category concerns *mapping, topographic, and site-based measured surveys*, which provides data regarding fixed objects in the urban environment. These will include: topographical maps, historical maps, aerial photography, boundary data, and building height maps using LIDAR (Light Detection and Ranging). While geo-surveying can be used for more detailed information about ground conditions and buried utilities.

In relation to City Infrastructures this category of mapping refers primarily to physical forms and therefore will only cover hard infrastructures i.e. Utilities, Urban Space, and Buildings. In terms of spatial scale, mapping can be carried out from the smallest to the largest scale and therefore can be applied across any urban scale as required.

Although there is typically a cost for mapping data from various national ordnance survey offices, there are services such as OS OPENDATA (Ordnance Survey 2015) in the UK which provide free detailed digital maps containing open datasets with raster and vector mapping, showing boundaries and building heights.

Fieldwork and Onsite Analysis

Measuring and mapping objects at a local level is one of the first data collection methods employed in fieldwork. While the data collection outlined in the previous section largely relates to dimensional measurements of the physical environment, there are many other elements that need to be measured or mapped as part of the planning or design process. These may include: fixed built environment features such as street types or public squares; an analysis of connectivity or permeability; natural features such as fauna or flora; local amenities such as parks or playgrounds; local businesses or services such as healthcare or educational facilities; or transport nodes.

Mapping to scale, using ordnance survey maps or measured site plans, allows quantitative analysis of the physical environment, provides a base for illustrating proposed design changes, and provides a mechanism to record changes over time (Ministry for the Environment (NZ) 2009).

A finer level of site analysis may involve what Martin et al. (2012) refer to as 'Artifact Analysis' where "A systematic examination of the material, aesthetic, and interactive qualities objectives contributes to an understanding of their physical, social and cultural contexts" Such a detailed investigation can reveal much about a location and greatly inform proposed or future planning and design.

In line with this approach to artefact analysis, Zeisel (2006) refers to the usefulness of 'Observing Physical Traces' or evidence left behind in the physical environment that reveals usage and activity by occupants and users of the space. Zeisel outlines a range of traces starting with 'By-products of Use' reflecting "what people do in settings" which include: erosions, or wear and tear from usage; leftovers, or objectives left behind; and also missing traces that suggest activities that are not taking place. Three more traces include: 'Adaptations for Use', involving props, the creation of separations, or the creation of connections; 'Displays of

Self', including personalisation, identification, and group membership; and finally Public Messages, which take the form of official signage, unofficial messages such as poster, and illegitimate messages such as graffiti. Zeisel contends that this trace observation will provide valuable insights for a design project and can be employed throughout all stages of a research.

Although fieldwork is traditionally carried out by professionals it can be undertaken by local citizens and communities, sometimes referred to as Citizen Science. For example, it can involve the collection or mapping of data about local phenomena, such as animals or birds, offers a finer level of observation by on-the-ground volunteers than would normally be possible with local authority resources or macro analysis such as satellite imagery. This citizen engagement also improves participation in the local planning and decision-making process and can engender a greater sense of ownership and stewardship (UNEP 2011). In terms of City Infrastructures, it can play a valuable role addressing many of the environmental, social and economic issues in a location, and thus capture data across all infrastructures from utilities, such as water or transportation systems, to institutional or community infrastructure, through to objects that influence personal infrastructures.

Recent data collection projects using local youths have proven to be very successful in terms of capturing valuable intelligence about communities and also engaging young people in research and local development. US based initiatives such as CARE (Community Alliance Research and Engagement at Yale) (Santilli et al. 2011) or MAPSCorps (Lindau et al. 2012) have used smart phones and web-based mapping software to enable students gather data about overall street quality (Wong et al. 2011) and specific data relating to the number and location of shops, restaurants, parks, recreational facilities etc.

GIS software such as ArcGIS (2015) has developed rapidly as a mapping platform and now includes applications for field data collection and public engagement. Efforts are also underway to develop GIS as Public Participation GIS (PPGIS) to enable greater collaboration between top-down and bottom-up decision making (Bugs et al. 2010; Thompson 2015). These PPGIS initiatives typically involve providing community groups with GIS software, training, access to existing data and the tools required to collect and map data in their own communities.

In line with this community driven approach to data collection, cloud-based mapping platforms such as LocalData (2015), are being developed to enable communities and city authorities to collect, visualize and analyse local data to underpin data-driven planning decisions. This platform simplifies this data management process and makes it accessible to community groups.

Mapping human behaviour and activities in a location forms another critical part of data collection in fieldwork and onsite analysis. According to Lynch (1960) the movement, behaviour and activities of people is as important as the stationery physical parts of a city. Other seminal research, such as Whyte's (1980) study of urban social space, focused on direct observation of human activities in the public realm. The key to this formational research is the prominence of the human-environment interaction and an understanding of how the built environment supports

or hinders human activity. Gehl emphasised this interaction and declared that "Life between buildings comprises the entire spectrum of activities, which combine to make communal spaces in cities and residential areas meaningful and attractive" (Gehl and Koch 2011: 14).

Following this tradition of observation based research, Gehl and his urban design practice have collated a range of site-based, human-centred data collection practices to understand urban contexts and to inform their design process (Gehl and Svarre 2013). These fieldwork methods include: (a) carrying out head counts of people using a space; (b) mapping of behaviour of human activity (i.e. walking, sitting, eating, reading etc.); (c) tracing, or the registering and illustration of human movement to investigate walking sequence, direction, flow etc.; (d) tracking, where observers follow a randomly selected individual to collect data about walking speed, behaviour, route preferences etc.; (e) photography, including time-lapse photography or video; (f) diary keeping to record activities over a prolonged period; and (g) test walks, where the researcher walks a fixed route and records their experience.

This place-centred observation approach can address many environmental, social and economic issues in a location by focusing on how humans interact with others, and the setting. These observational methods can facilitate the collection of data across all infrastructures, both hard and soft, ranging from utilities to personal infrastructure. A good example of how personal infrastructure can be mapped through observation is illustrated by Appleyards et al. (1981) and their research into the impact of traffic on the 'friendliness' of streets.This research counted the social interactions between neighbours and mapped these onto a plan of three streets, each with differing levels of traffic, to illustrate the impact of traffic on neighbourhood interaction.

Place-centred observation allows the researchers as observers to place themselves in the environment (whether directly or through video or time lapse photography) in order to understand the location in the first person. Naturally this limits the scale of observation and therefore, typically place-centred observation is carried out at the building, block, street, or neighbourhood level. To automate data collected in this context, MIT Media Lab (www.media.mit.edu) are currently developing a tool called 'Placelet' (Poon 2015) which uses on-street sensors to track the number and speed of pedestrians in a particular urban space. It will also collect data about vehicle movement, noise levels and air quality in an effort to understand the overall sensory experience of the place.

Placemeter is another innovative platform designed to collect data about human behaviour and activity in the urban environment through the analysis of data from dedicated sensors or video footage (e.g. CCTV footage) (Placemeter Inc. 2015). The platform uses computer algorithms to recognise moving objects such as people and vehicles then uses this to produce data about pedestrian and vehicle quantities, movement, direction, etc. The creators of this platform discuss how their

product can be used in the commercial and retail context, as part of a planning and design process, or to inform research and "civic activism" (see Fig. 3.4 below).

It is worth noting that such technology is not without its critics and some observers have pointed to the danger of this data invading people's privacy or falling into the wrong hands (Rust 2015).

Lastly, in this category, data collected regarding *knowledge and attitudes* through interviews, questionnaires, focus groups, or workshops are central to field based data. Interviews allow "direct contact with participants to collect first-hand personal accounts of experience, opinions, attitudes, and perceptions" (Martin et al. 2012: 2729). Questionnaires facilitate the collection of similar data through self-reporting, and in addition allow easy numerical analysis and reporting through the use of statistical methods.

Workshops and focus groups can also be a valuable source of data. Beyond the data collected, they can create a valuable group dynamic where a carefully chosen group, guided by a well-organised moderator, will provide much data through sharing experiences and stories.

The methods outlined above can provide data for all infrastructures as they can record feedback in relation to all human experiences. Feedback can be captured across all spatial scales; however, it is worth noting that people will often have more definite opinions about their own neighbourhood or community.

Nowadays online survey platforms provide valuable and simple tools that can be readily employed by all stakeholders, including community groups to collect and analyse data. Other more powerful statistical analysis tools available include IBM's SPSS software (Statistical Package for the Social Sciences), but this typically requires an expert user.

Fig. 3.4 Placemeter data capture (Image courtesy of Placemeter Inc.)

Many of the above fieldwork and onsite analysis methods are often combined as part of the Post Occupancy Evaluation (POE) approach. The term POE describes the systematic study and assessment of occupied buildings for example in terms of evaluating accessibility, indoor environment quality (IEQ), indoor air quality (IAQ) and thermal performance, as well as more subjective and interactional issues (i.e. space use, user satisfaction, etc.). The POE process is now employed in a wide variety of buildings types and urban spaces (Malkoc and Ozkan 2010) and as outlined draws on a wide array of tools to measure the performance of the built environment and contribute to an evidenced-based approach to design and planning (Meir et al. 2009).

Audits, Rating Tools and Indicators

A number of audit and rating tools, such as BREEAM for Communities (BRE 2014) or LEED Neighbourhood Development (Talen et al. 2013), have been developed to assess the sustainability of proposed urban development or existing urban areas. While these tools are not data collection methods per se, they highlight the wide variety of data that is required to systematically and holistically assess the sustainability of a neighbourhood or an urban community. Once completed they also represent a useful database for that community, and can be used as a resource in the future.

These tools base their assessment, to varying degrees, on a range of social, environmental and economic themes including: management; energy; transport; health and wellbeing; water; materials; land use and ecology; pollution and sustainable site issues. These categories are typically measured by diverse criteria requiring detailed data inputs to produce an assessment. The data required for all of the above tools is both quantitative and qualitative.

These assessment tools are quite onerous and typically demand an expert or certified user. However, a number of other assessment platforms have recently been developed that use open data to produce overall rating or scores for a particular location. For example, PlaceIlive.com, a location based platform provides scores for defined locations or communities using a ‘Life Quality Index’ (LQI) based on various data including: Transportation; Entertainment (i.e. cinemas, restaurants etc.); Sports and leisure (parks, sports facilities etc.); Demography (i.e. age, marital status, employment etc.); Daily Life (i.e. schools, supermarkets etc.); Health (medical services, air pollution etc.); and Safety (Crime rates, police stations etc.). The LQI score is calculated by an algorithm that uses a range of open data, everything from census data, to data from social media such as Foursquare, to obtain an overall score for a specific location (PlaceILive.com 2015).

Indicators and city indexes facilitate baselining of current performance within a city, allow targets to be set, and provide a framework for monitoring progress over time (Siddall et al. 2013). In a similar manner to the assessment tools identified above, urban indicators and city performance rating indexes are not data collection methods, but again provide a valuable framework for bringing data together in an integrated format, while also providing an excellent source of data across many categories.

While there are many urban indicator suites currently in use, there have been recent efforts to standardise these indicators across the international community. The Global City Indicators Facility (GCIF) has recently developed an international standard for city indicators in conjunction with the International Organization for Standardization (ISO). This has been developed as part of a series of standards developed by the ISO around sustainable development of communities. This standard titled, ISO/TR-37120-2014-Sustainable development of communities—Indicators for cities services and quality of life, covers a number of themes including: Economy; Education; Energy; Environment; Finance; Fire and emergency response; Governance; Health; Recreation; Safety; Shelter; Solid waste; Telecommunications and innovation; Transportation; Urban planning; Wastewater; and Water and Sanitation (ISO 2014).

Due to the wide variety of social, environmental and economic issues covered by these indicator suites, a number of hard and soft infrastructures are examined. The hard infrastructures of Utilities, Urban Space and Buildings are covered by ISO themes such as Transportation; Urban planning; Wastewater; Water and Sanitation etc. Since the ISO document is concerned with quality of life, as well as city services, it is not surprising that the soft infrastructures such as Institutional, Community and Personal Infrastructures are also covered. Themes such as Economy contain core indicators around poverty and youth unemployment, while the Governance theme contains indicators in relation to voter participation and citizen representation.

As identified earlier, portals such as the DublinDashboard (NUI Maynooth 2015) or Citydashboard.org (2015) are now providing live data relating to many indicators. Kitchin et al. (2015) discuss how these and other real-time dashboards are being increasingly used to manage and communicate data, pointing to the Centro de Operacoes in Rio de Janeiro where data from 30 agencies and local authority employees is fed into this control centre.

Beyond managing, analysing and communicating data, Kitchin (2015: 1) argues that indicators and dashboards may have a more powerful role to play and he proposes a "conceptual re-imaging of such projects as data assemblages—complex, politically-infused, socio-technical systems that, rather than reflecting cities, actively frame and produce them."

Online, Open Data and Social Media

The development of Big Data and Open Data facilitate the analysis of existing datasets to inform planning and urban design. Initiatives such as Dublinked (2015), creators of the DublinDashboard, host hundreds of open datasets sourced from a wide range of government departments, agencies and business organisations, which are categorised and searchable. Similarly, Citydashboard.org (2015) uses data from OpenStreetMap, the British Broadcasting Corporation, Yahoo, Port of London Authority, Transport for London, ScotRail, Twitter, and others. Other platforms such as the NYC (New York City) Business Atlas, which is run by the NYC Department of IT and Telecommunications, uses various NYC local

government department data, census data, and other open data sources such as data from Placemeter to map a range of data including population, business conditions and traffic activity.

Within the online environment, *social media* provides a rich source of data. Gehl Studios are examining the digital stamps on photographs uploaded to Instagram (Scharnhorst 2015) to see where photos are being taken within an urban area, and from these deduce what areas are most popular among visitors and residents alike. According to the author, social media related data provide a form of "passive engagement" as the data is public and can be easily accessed.

Likewise, crowdsourcing is a growing source of online urban data, where the 'crowdsourcer' (individuals, institutions, and companies) elicit views and opinions from a wide group of diverse individuals, and ask them to voluntarily undertake a task or provide feedback (Certomà et al. 2015; Estellés-Arolas and González-Ladrón-De-Guevara 2012).

For example, 'OpenStreetMap' is a powerful example of how crowdsourcing can be harnessed in the production of a collaborative piece of work, in this case bottom-up mapping of space. OpenStreetMap is a user-generated map built on local knowledge, it is community driven, and is based on open data format (OpenStreetMap Foundation 2015). If maps are "more than tools for negotiating in and intervening in social space rather than static representations of territory" (Evans 2015: 144), then a project like OpenStreetMap breaks with the traditional approach to mapping and turns to crowdsourcing in an effort to create a "knowledge collective" to produce these user generated maps (Haklay and Weber 2008).

A recent Nesta report (Saunders and Baeck 2015) supports these assertions and points to crowdsourcing as a smarter way to collect data for decision making process. The authors refer to platforms such as 'FixmyStreet', or two Jakarta based initiatives, the first called 'Qlue' that allows citizens to highlight issues by uploading photos, while the second referred to as 'PetaJakarta', captures tweets about floods to create real time, crowdsourced maps regarding urban flooding.

Another trend worth noting in this regard is the surge in location based social media (LBSN) and its ability to contextualise data through the use of locative technologies such as smart phones (Evans 2014). Evans discusses how a LBSN such as Foursquare (Foursquare 2015) encodes a location with information that offers "a depth that traditional cartography cannot; the comments offer a decentralized, user-generated source of information on the location that acts as a social gazetteer that can be used by application users" (p. 78).

Crowdsourced data is now being used in multiple ways to inform planning and design. While Fixmystreet (mySociety Ltd. 2015) allows users report on the physical conditions, other apps such as Safecity.in (2015) allows women in India to report incidences of harassment to highlight harassment hotspots in the city. This data can also help persuade authorities to take action and identify solutions within the neighbourhood. In an interview with the Guardian newspaper (Violet Bramley 2015), Elsa D'Silva, one of the founders of Safecity, maintains that data is key to pinpointing issues and forcing a response from the relevant authority.

Lastly the Internet of Things (IoT), which largely uses dispersed sensors, is emerging as a key source of urban data collection. According to a recent Goldman Sachs report (Jankowski et al. 2014) IoT has the potential to connect up to 28 billion things to the Internet by 2020; ranging from connected wearable devices to connected cities and the industrial Internet. Adler (2015) describes how IoT brings formerly inert objects into the dynamic world of information technology. It encompasses a range of technologies, from sensors that monitor environmental conditions to RFID tags that can allow users to interact with objects.

While the benefits of IoT for government, local authorities and businesses are obvious enough, it is important to understand if, or how it serves the community. Haklay (2015: 7) argues that "DIY Science" is now feasible due to decreasing costs in hardware and the increasing sophistication of smart phones, which have built-in sensors for sound (microphone), light (camera), location (GPS), direction (compass), etc. In the hands of concerned citizens or community activists, this technology can be used to collect data regarding air or noise pollution, but more importantly create a common sense of purpose.

In terms of infrastructures, IoT is largely linked to physical objects and therefore will be suitable to collect data on hard infrastructures such as utilities and buildings. As discussed briefly above, IoT is also ideally placed to gather and measure environmental conditions. In addition, due to the development of wearable technologies and the use of smart phones, data will also be available in relation to people's movements, wellbeing or health. In light of this, it is possible that IoT will be capable of harvesting data across both hard and soft infrastructures across all spatial scales.

3.5 Bridging Top-down and Bottom-up Planning

While it seems obvious enough that good planning must be data and evidence driven, Kingsley and Pettit (2014) point out that in the past relevant community based data was not always available. New technologies and the multitude of data collection, mapping and analysis tools outlined in this chapter now offer an opportunity for what Kitchin (2014: 2) describes as "evidence-informed policy development" .

Not only do traditional and digital based data methods provide a rich source of accessible data, they can also provide data collection, mapping and analysis across a wide range of infrastructures and spatial scales. While much data may have been collected in the past, it was often buried in hard copy files within organisations, or is simply too costly to retrieve and analyse (Kingsley and Pettit 2014).

Hence, if cities are to be properly considered as complex systems (Vale and Vale 1991; Newman and Jennings 2008; Campbell 2011), then continuous change through evolution, emergence and sharing of knowledge must be factored into all planning and design policy (William McDonough & Partners 1992).

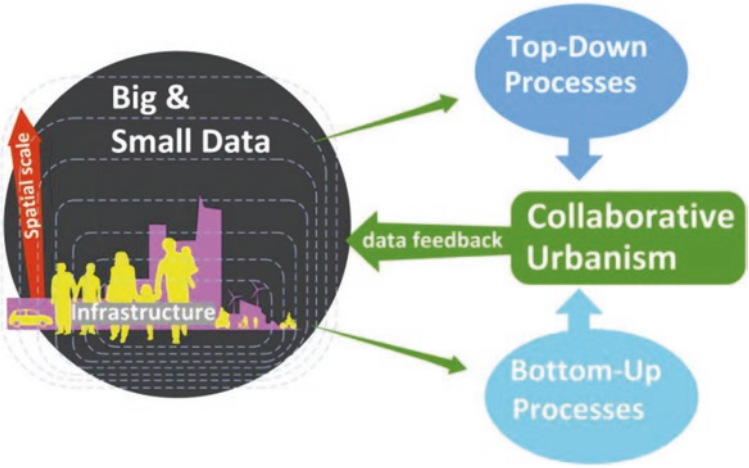

Fig. 3.5 Big and small data informing top down and bottom up processes

This constant improvement and sharing of knowledge is greatly assisted by the quantity, frequency and availability of data in relation to the natural and built environment made possible by the various data collection, mapping and analysis as outlined in this chapter and as illustrated in Fig. 3.5.

However, in practice there is often a breakdown between top-down and bottom-up planning, nevertheless, as argued by Campbell (2011), both approaches are required for sustainable and equitable planning. There must be greater equity between all stakeholders where "Restrictive command-and-control practices are replaced with enabling leadership that facilitates a greater level of bottom up self-organisation and collaboration" (Campbell and Cowan 2015: 5). Continuous feedback loops must replace the static, endstate thinking that currently dominates. New online digital technology and social media has an important role to play "monitoring and feedback processes to build consensus."

In this regard, community generated information is central to the relational planning approach promoted by Healey (2006: 258), who warns against the strict separation of expert and lay knowledge. What is 'known', she contends, results from "a process of making meanings in social contexts" whereby "meanings and valuing are wrapped together and co-evolve". Any planning process must use this community based intelligence as part of a systematic approach to ensure that the decision making process is grounded in the realities and needs of the local community.

However, a bottom-up process will only exist if community members are motivated enough to self-organise and engage with the planning and design process. As outlined by Haklay (2015) community engagement can be strengthened through citizen science or local mapping exercises, thus supporting greater agency and control for local community members. In a similar manner Certomà et al. (2015)

highlight the benefits of crowdsourcing for participatory governance as a data-collection and ideas-sharing process. This can broaden appreciation of sustainability challenges in the urban context and encourage innovative forms of collaboration.

In addition to local empowerment, the collection of local community based data simply makes sense as it informs good planning. In this regard Dobbins maintains that planning must be underpinned by solid data, and argues that the local community is often the best database. He declares that "Information from the community about itself, about what matters, about its values and patterns is the pivotal information base on which successful place-improvement strategies can be built" (Dobbins 2011, p. 199). This is of particular concern in developing countries, especially in locations where little information is available on informal settlements. In recent years UN-HABITAT have adopted 'street-led city-wide slum upgrading'. This approach has been designed to tap into local knowledge and promote community autonomy which "reinforces community and residents' participation in enumeration, mapping, and data collection for plan making as well as in deciding on the street pattern and which streets to prioritize" (Mboup et al. 2013: 37).

Many cities are experiencing budgetary difficulties and therefore large scale investment in redevelopment is often not feasible. In any case, Marshall (2009) argues for incremental urban development as opposed to wholesale change. This aligns with Lerner's (2014) 'Urban Acupuncture' which promotes small scale, carefully chosen interventions in the urban environment; this may involve a small pocket park, the widening of footpaths, or planting trees. Given that urban acupuncture is quite a precise activity, it requires accurate data to ensure that the right location and intervention is selected. A good example of data-driven urban acupuncture is represented by the 'Red de Innovación y Aprendizaje' (RIA), or Learning and Innovation Network, which is a network of small community centres in Mexico (OECD 2011). The location for each centre is carefully selected following analysis of population density, income and education level, location of schools, public transport and other urban transport infrastructure. These centres are placed in urban 'pressure points' to respond quickly and economically to community needs.

Technologies such as GIS bring a new dimension to urban acupuncture. Projects such as the University of California's 'Local Code' which identified over 600 sites for small scale projects, is testament to the effectiveness of technology-driven data collection and mapping in this context (Kaye 2011). The use of crowdsourcing was already discussed in the context of FixmyStreet and Safecity, but another crowdsourcing platform worth noting is 'Dublin Fifth Province' (Creative Dublin Alliance 2015). While this platform is not for direct reporting of issues, it is designed to enhance citizen engagement and elicit opinions to support "informed discussion and deliberation about Dublin as a whole, while drawing out from each round of consultation, several coherent priorities that can be delivered by local government in Dublin."

In all of the above cases, whether it involves urban acupuncture or crowdsourcing, multiple sources of data across various infrastructures and spatial scales are required to highlight the most pressing issues, identify key locations and 'pressure points', and reach consensus on the most appropriate solutions.

3.6 Conclusion

The identification, collection, sharing, and analysis of relevant data is critical to people centred planning and urban design. In order to engender a collaborative approach to urbanism, this data must capture the needs and preferences of all stakeholders. It must also help with building awareness and understanding, while developing a sense of ownership of this data.

The chapter has assembled a wide variety of traditional and digital sources of data for mapping and analysis of Soft and Hard City Infrastructures. The four main categories comprise: Traditional Document Based Data; Fieldwork and Onsite Analysis; Auditing or Rating Tools as Data sources; and Online, Open Data and Social Media Sources. It is argued that such an approach to data collection, which is informed by City Infrastructures, and is cognisant of spatial scales, can underpin collaborative urbanism through bridging top-down and bottom-up planning, and through recognising citizens and communities as a primary source and owner of data.

This collaborative, people-centred approach to data that acknowledges human and spatial complexity of cities is a central concern of this COST Action. It supports the main objectives of the action which include: the specification and evaluation of an evolving framework for collaborative urbanism; and the facilitation of a dialogue regarding how the software of a city can be combined with the hardware of a city, to promote smart and liveable cities.

Hence this chapter has examined the city as a complex, emergent system composed of multiple social, environmental and economic subsystems. The City Infrastructures Framework, informed by urban spatial scales, is offered as a useful concept to support planning and design in this context. With this complexity in mind, it is recognised that a multitude of traditional and digital data tools are required to underpin the Infrastructure Framework. These data tools should be usable by a range of stakeholders and produce accurate, timely and community based data to support evidence-driven policy, planning and design.

References

Adler, L. (2015). *The urban internet of thingssurveying innovations across city systems* [Online]. Available: http://datasmart.ash.harvard.edu/news/article/the-urban-Internet-of-things-727. Accessed September 15, 2015.

Ahlbrandt, R. S., & Brophy, P. C. (1975). *Neighborhood revitalization: Theory and practice*. Lexington Books.

Aia. (2004). *Urban design assistance team program*. American Institute of Architects.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction*. New York: Oxford University Press.

Appleyard, D., Gerson, M. S. & Lintell, M. (1981). *Livable streets*. University of California Press.

Arcgis. (2015). *ARCGIS*, [Online]. Available: https://www.arcgis.com/features/. Accessed September 15, 2015.

BRE. (2014). The case for BREEAM Communities. British Research Establishment Report. Available online at http://www.breeam.com/filelibrary/BREEAM%20Communities/The_Case_for_BREEAM_Communities_-_Fact_Sheet_-_January_2014.pdf

Bugs, G., Granell, C., Fonts, O., Huerta, J., & Painho, M. (2010). An assessment of public participation GIS and Web 2.0 technologies in urban planning practice in Canela, Brazil. *Cities, 27*, 172–181.

Calthorpe, P. (2010). *Urbanism in the age of climate change*. Washington, DC: Island Press.

Campbell, K. (2011). Smart urbanism: Making massive small change. *Journal of Urban Regeneration and Renewal, 4*, 304–311.

Campbell, K., & Cowan, R. (2015) *Massive Small Compendium (sample of upcoming publication)*. Urban Exchange. Available online at http://www.massivesmall.com/wp-content/uploads/2015/09/Draft-Structure-of-Sourcebook.pdf

Caves, R. W., & Walshok, M. G. (1999). Adopting innovations in information technology: The California municipal experience. *Cities, 16*, 3–12.

Certomà, C., Corsini, F. & Rizzi, F. (2015). Crowdsourcing urban sustainability. Data, people and technologies in participatory governance. *Futures*.

Chaskin, R. (2013). Neighborhood data and locally driven community change. In: Pettit, K. L. S., Kingsley, G. T., & Coulton, C. J. (Eds.), *Strengthening communities with neighborhood data.* Urban Institute Press.

Citydashboard.org. (2015). *London* [Online]. Available: http://citydashboard.org/london/. Accessed September 21, 2015.

Creative Dublin Alliance. (2015). *Dublin fifth province* [Online]. Available: http://www.fifthprovince.ie/. Accessed September 9, 2015.

Dobbins, M. (2011). *Urban design and people*. Wiley.

Dublinked. (2015). *Dublinked* [Online]. Available: http://www.dublinked.com/. Accessed September 21, 2015.

EC-EIP. (2013). European innovation partnership on smart cities and communities—strategic implementation Plan. In: E. I. P. E. O. S. C. A. C. (Ed.), *European commission*.

English Partnerships & Housing Corporation. (2003). *Urban design compendium*. London: English Partnerships.

Estellés-Arolas, E., & González-Ladrón-De-Guevara, F. (2012). Towards an integrated crowdsourcing definition. *Journal of Information Science, 38*, 189–200.

Evans, L. (2014). Maps as deep: Reading the code of location-based social networks. *Technology and Society Magazine, IEEE, 33*, 73–80.

Evans, L. (2015). *Locative social media: Place in the digital age*. Palgrave Macmillan. Kindle Edition (page no.s in reference refer to Kindle location)

Foursquare. (2015). *Foursquare* [Online]. Available: https://foursquare.com. Accessed September 21, 2015.

Fraser, E. D. G., Dougill, A. J., Mabee, W. E., Reed, M., & Mcalpine, P. (2006). Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. *Journal of Environmental Management, 78*, 114–127.

Gehl, J., & Koch, J. (2011). *Life between buildings: Using public space.* Washington, DC [etc.]: Island Press.

Gehl, J., & Svarre, B. (2013). *How to study public life*. Island Press.

Greater London Authority. (2015). *London Datastore* [Online]. Available: http://data.london.gov.uk/. Accessed September 15, 2015.

Haklay, M. (2015). Beyond quantification: A role for citizen science and community science in a smart city. Presented at Data and City Workshop. Maynooth University, Dublin, Ireland. Available online at http://discovery.ucl.ac.uk/1470344/

Haklay, M., & Weber, P. (2008). OpenStreetMap: User-generated street maps. *Pervasive Computing, IEEE, 7*, 12–18.

Hamann, R., & April, K. (2013). On the role and capabilities of collaborative intermediary organisations in urban sustainability transitions. *Journal of Cleaner Production, 50*, 12–21.

Healey, P. (2006). *Urban complexity and spatial strategies: Towards a relational planning for our times*. Routledge.
ISO. (2014). *ISO/TR-37120-2014-sustainable development of communities—indicators for city services and quality of life*. Switzerland: International Organization for Standardization (ISO).
Jankowski, S., Covello, J., Bellini, H., Ritchie, J., & Costa, D. (2014). The internet of things: Making sense of the next mega-trend. *Goldman Sachs*.
Kaye, L. (2011). Could cities' problems be solved by urban acupuncture? *The Guardian* 21st July
Kingsley, G. T., & Pettit, K. L. S. (2014). Data and community—foundation for an agenda. In: Cytron, N., Pettit, K. L. S., Kingsley, G. T., Erickson, D., Seidman, E. S., Urban, I., & Federal Reserve Bank of San, F. (Eds.), *What counts: Harnessing data for America's communities.* San Francisco: Federal Reserve Bank of San Francisco.
Kitchin, R. (2014). The data revolution: Big data, open data, data infrastructures and their consequences. 2014: SAGE Publications.
Kitchin, R., & Lauriault, T. (2015). Small data in the era of big data. *GeoJournal, 80*, 463–475.
Kitchin, R., Lauriault, T. P., & Mcardle, G. (2015). Knowing and governing cities through urban indicators, city benchmarking and real-time dashboards. *Regional Studies, Regional Science, 2*, 6–28.
Lerner, J. (2014). *Urban acupuncture*. Island Press.
Lindau, S. T., James, R., Makelarski, J. A., Sanders, E., & Johnson, D. (2012). Comments from the south side of Chicago on New Haven's inspiring initiative. *American Journal of Public Health, 102*, e3–e4.
Localdata. (2015). Better data makes better cities [Online]. Available: http://localdata.com/ [Accessed September 15, 2015].
Lynch, K. (1960). *The image of the city.* Cambridge, Mass.: Technology Press.
Mahizhnan, A. (1999). Smart cities: The Singapore case. *Cities, 16*, 13–18.
Malkoc, E. & Ozkan, M. B. (2010). Post-occupancy Evaluation of a Built Environment: The Case of Konak Square (İzmir, Turkey). *Indoor and Built Environment, 19*, 422–434.
Marshall, S. (2009). *Cities design and evolution*. Routledge.
Martin, B., Hanington, B., & Hanington, B. M. (2012). *Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions*. Rockport Publishers. Kindle Edition (page no. s in reference refer to Kindle location)
Mboup, G., Warah, R. & United Nations Human Settlements, P. (2013). *Streets as public spaces and drivers of urban prosperity*. United Nations Human Settlements Programme (UN-Habitat).
Meir, I. A., Garb, Y., Jiao, D. & Cicelsky, A. (2009). Post-occupancy evaluation: An inevitable step toward sustainability. *Advances in Building Energy Research, 3*, 189–219.
Messer, L. C. (2007). Invited commentary: Beyond the metrics for measuring neighborhood effects. *American Journal of Epidemiology, 165*, 868–871.
Ministry for the Environment (NZ). (2009). *Urban design toolkit—third edition*. Available online at http://www.mfe.govt.nz/publications/towns-and-cities/urban-design-toolkit-third-edition
Minkler, M. (2014). Enhancing data quality, relevance, and use through community based participatory research. In: Cytron, N., Pettit, K. L. S., Kingsley, G. T., Erickson, D., Seidman, E. S., Urban, I. & Federal Reserve Bank of San, F. (Eds.), *What counts: Harnessing data for America's communities.* San Francisco: Federal Reserve Bank of San Francisco.
Moughtin, J. C., & Shirley, P. (2005). *Urban design green dimensions* [Online]. Burlington: Elsevier. Available: http://public.eblib.com/EBLPublic/PublicView.do?ptiID=269926
Murray, M., Greer, J., Houston, D., Mckay, S., & Murtagh, B. (2009). Bridging top down and bottom up: Modelling community preferences for a dispersed rural settlement pattern. *European Planning Studies, 17*, 441–462.
mySociety Ltd. (2015). *FixmyStreet* [Online]. Available: https://www.mysociety.org/projects/fixmystreet/. Accessed September 15, 2015.
Newman, P., & Jennings, I. (2008). *Cities as sustainable ecosystems: Principles and practices*. Island Press.

NUI Maynooth. (2015). *DublinDashboard* [Online]. Available: http://www.dublindashboard.ie/pages/DublinDataStore

OECD. (2001a). *Citizens as partners: Information, consultation and public participation in policy*. OECD Publishing.

OECD. (2001b). *Citizens as partners: OECD handbook on information, consultation and public participation in policy-making*. OECD Publishing.

OECD. (2011). *Designing for education*. OECD Publishing.

OpenStreetMap Foundation. (2015). *OpenStreetMap* [Online]. Available: https://www.openstreetmap.org/about

Ordnance Survey. (2015). *OS OPENDATA* [Online]. Available: https://www.ordnancesurvey.co.uk/business-and-government/products/opendata-products.html. Accessed September 15, 2015.

Pettit, K. L. S., Kingsley, G. T. & Coulton, C. J. (2013). *Strengthening communities with neighborhood data.* Urban Institute Press.

Pissourios, I. A. (2014). Top-down and bottom-up urban and regional planning: Towards a framework for the use of planning standards. *European Spatial Research and Policy, 21*, 83–99.

PlaceILive.com. (2015). *Can big data measure livability in cities?* Available from: https://blog.placeilive.com/can-big-data-measure-livability-in-cities/. Accessed September 15, 2015.

Placemeter Inc. (2015). *Placemeter* [Online]. Available: https://www.placemeter.com/platform. Accessed September 15, 2015.

Poon, L. (2015). *MIT puts pedestrians at the center of urban design* [Online]. Available: http://www.citylab.com/tech/2015/08/mit-puts-pedestrians-at-the-center-of-urban-design/401285/?utm_source=nl__link2_081815. Accessed September 15, 2015.

Rust, E. (2015). Should we be concerned about Placemeter—an app which monitors street views from apartment windows. *The Guardian* (pp. 15–09).

Safecity.in. (2015). *Safecity* [Online]. Available: http://safecity.in/. Accessed September 15, 2015.

Santilli, A., Carroll-Scott, A., Wong, F., & Ickovics, J. (2011). Urban youths go 3000 miles: Engaging and supporting young residents to conduct neighborhood asset mapping. *American Journal of Public Health, 101*, 2207–2210.

Saunders, T., & Baeck, P. (2015). *Rethinking smart cities from the ground up*. Nesta

Scharnhorst, E. (2015). What your instagram feed has in common with a Ballot Box. In: Next City.org (Ed.), *The public life reader.* Next City.org.

Siddall, E., Grey, T., & Dyer, M. (2013). Indicators and stakeholder engagement: A Dublin case study. *Proceedings of the ICE—Engineering Sustainability* [Online], 166. Available: http://www.icevirtuallibrary.com/content/article/10.1680/ensu.12.00004

Shaw, E. (2014). Making the most of open data. In: Cytron, N., Pettit, K. L. S., Kingsley, G. T., Erickson, D., Seidman, E. S., Urban, I. & Federal Reserve Bank of San, F. (eds.) *What counts : harnessing data for America's communities.* San Francisco: Federal Reserve Bank of San Francisco.

Talen, E., Allen, E., Bosse, A., Ahmann, J., Koschinsky, J., Wentz, E., et al. (2013). Leed-ND as an urban metric. *Landscape and Urban Planning, 119*, 20–34.

Thompson, M. M. (2015). Public participation GIS and neighbourhood recovery: Using community mapping for economic development. *International Journal of Data Mining, Modelling and Management, 7*, 24–38.

UNEP. (2011). *United Nations Environment Programme Year Book 2011: Emerging issues in our global environment*. Nairobi, Kenya: United Nations Environment Programme.

Vale, B., & Vale, R. (1991). *Green architecture: Design for a sustainable future*. London: Thames and Hudson.

Violet Bramley, E. (2015). Can the Safecity app make Delhi safer for women? *The Guardian* Thursday 13th August 2015.

Whyte, W. H. (1980). *The social life of small urban spaces*. Washington, D.C: Conservation Foundation.

William McDonough & Partners (1992). *The Hannover Principles: Design for sustainability*. W. McDonough Architects.

Wong, F., Stevens, D., O'connor-Duffany, K., Siegel, K., & GAO, Y. (2011). Community health environment scan survey (CHESS): A novel tool that captures the impact of the built environment on lifestyle factors. *Global Health Action,* 4. 10.3402/gha.v4i0.5276

Zeisel, J. (2006). *Inquiry by design: Tools for environment-behaviour research*. Cambridge University Press.

Part II
Concepts and Perspective on Citizen-Centric Urban Governance

Chapter 4
Crowdsourcing Processes for Citizen-Driven Governance

Chiara Certomà and Francesco Rizzi

Abstract The chapter explores the current evolution of smart city paradigm characterized by worldwide-raising, spontaneous and bottom-up socio-technological networks that produce non-planned forms of citizen empowerment in urban governance, via crowdsourcing processes. It focuses on the role of citizen-centred data-richness for unlocking the full potential of people empowerment, which is currently less explored than top-down governance processes. Building upon the mounting critique toward the technocratic paradigm of smart city and the evidence of progressive diffusion of ICTs in public life, the following pages analyse how crowdsourcing can contribute to the creation of smart cities not as the outcomes of top-down, governmental programs or the business strategy of major technology companies, but rather as the consequence of self-empowering practices performed by social actors with the aim of improving the organisation and functioning of the city. Particularly, the chapter suggests that socio-technological networks can use crowdsourcing to spontaneously generate unpredictable positive effects, i.e. can deploy and operationalize the full potential of community-based initiatives, emerging from the interactions between heterogeneous social actors.

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4.1 Introduction

In recent time, the pervasiveness of the technocratic smart city rhetoric produced the paradoxical consequence that, while the term rapidly turned into a buzzword in both scientific and grey literature—encompassing a broad range of technology-driven initiatives (Shapiro 2006; Allwinkle and Cruickshank 2011; Batty et al. 2012), its meaning is still far from being fully understood or fully agreed. In a seminal report by Giffinger et al. (2007) titled "Smart cities. Ranking of European medium-sized cities", authors benchmarked seventy mid-size cities against six key aspects of urban smartness (economy, mobility, governance, environment, quality of life, social capital). Their analysis of smart initiatives shows that no commonly agreed definition exists nor generally adopted practice makes it possible to determine meaning of smart city. The label "smart city" is rather occasionally adopted by a city on the base of its capacity to well-perform in one or another aspects of urban life—or in a combination of them.

Despite urban smartness can be exercised in diverse domains and can be directed toward different goals, there are some common meta-characters that appear to emerge from the organisation and functioning of all the cities aspiring to name themselves as smart. These include:

(a) the construction of a progressist imaginary of cities itself as the incubator of multiple issues (including environmental, social, economic issues within a sustainable development plan);
(b) the assumption that in the practical realisation of such an efficient and accountable urban organisation, technologies play the key roles of facilitators and drivers of change;
(c) the belief that broadening technological access (both in term of availability of technology and literacy) will lead to citizens' empowerment;
(d) the tendency to welcome citizens' empowerment as an opportunity for developing new software and, thus, for making the most of the urban hardware.

These meta-characters allow us to better appreciate the critiques the dominant smart city paradigm recently attracted. Particularly we are interested in those critiques addressing the exclusive interest for technological innovations as potential solver of urban problems; the imaginary of smartness and its practical implementation via governance processes; and the effectiveness of citizens' participation and empowerment in smart city programs. These critiques provide useful climbing stairs for approaching our chapter's goal, i.e. to understand if and under what conditions crowdsourcing can equip citizens to take the lead in producing smart processes in the urban space for collective benefit.

4.2 Critical Perspectives of the Smart City Paradigm

The ambiguity and often the vacuity of many self-proclaimed smart city projects—ranging from the creation of brand-new cities characterised by the massive presence of technologies of control and organisation, up to single and often disconnected

initiatives in existing urban contexts—expose the concept of "smartness" to a broad variety of critiques (Holland 2008; Kitchin 2014a; March and Ribera-Fumaz 2014). These elaborate on the double role of smart city paradigm, which supports new ways of organising and managing data-richness (Townsend 2013) while impressing a new social order on the city itself (Gibbs and Krueger 2012; Vanolo 2013) through the adoption of technological tools (e.g. *iCity Rate*, http://www.icitylab.it/il-rapporto-icityrate/cose/; or *Cittalia*, www.cittalia.it/images/file/EfficienCITIES_Cittalia_Siemens.pdf).

The following sections discuss the key-points of the above-mentioned critiques, including the issue of technology, governance and participation, and empowerment.

4.2.1 Technology

The most recurrent set of critiques refers to the so-called "technological fetishism" (Kaika and Swyngedouw 2000; Batty et al. 2013) and unveils the high modernist planning approach of smart city discourse that conceptualises city as a machine that can be monitored in real time and thus controlled at a distance (Kitchin et al. 2015). Turning the city into an information and communication device produces the expectation of a smooth integration between real and virtual domains. As a matter of fact, this integration—whenever desirable—is far from being smooth; technological infrastructures need to be developed and implemented, citizens need to learn how to use them, policy makers need to decide what data can be relevant for their purposes, etc. All of these operations are affected by issues of ownership, privacy, access equality, security, hacking and system failure. Additionally, there are radical doubts about who can access the technological arena, what topics can be discussed and who has the power of deciding their public relevance.

Digging deep into the social construction of technology requires the smart city program to face the tricky issue of how data can be appropriated and manipulated by vested interests, most notably (still not exclusively) IT companies (Caprotti 2014). The experiments of creation and management of highly technological new cities run by private companies (Shwayri 2013) made clear how the smart city paradigm can be (and, often, is) a corporate storytelling (Söderström et al. 2014). Being the smart city idea itself a product of major IT companies like CISCO and IBM (Townsend 2013; Cocchia 2014), it is not surprising that in many circumstances these very companies, rather than the public administration, lead public-private partnerships in the race for innovative technology development and implementation. Moreover, it is not infrequent to find cases of smart processes promoted by city governments that are appropriated by private companies and turned into economic transaction practices (Agyemanm 2015).

Aside matters of technology ownership and control, the effectiveness of technology-based management of the city represents a further crucial issue. Urban studies scholars noticed that smart city program, far from being a mere blueprint for the city to come, are already real because "information processing technologies

and ubiquitous computing systems […] embedded in our urban landscapes" (Corsín Jiménez 2014, p. 347) are supporting the mushrooming of "sentient cities" (Shepard 2011), "ambient intelligences" (Crang and Graham 2007) and "expressive infrastructures" based on tiny microprocessors and wireless sensor networks (Thrift 2012). Despite the massive deployment of technologies, however, most pressing urban problems are far from being solved or even addressed. This is certainly related to the fact that smart city-enthusiastic perspective, as Vanolo points out, "boosts the idea that technological networks and governmental practices will automatically guarantee better cities, regardless, for example, of the development trajectories of local societies, the nature of technological developments, the difficulty to reduce the chaos and complexity of ecosystems to a handful of statistics and indicators which have to be fully monitored and controlled, or the need for debates, rules and forms of control in order to achieve virtuous coupling between technology and society" (Vanolo 2013, p. 896). Briefly, this perspective often disregards that technical improvement of city infrastructure and data-driven solutions, although important, are not endpoints in themselves (Graham and Martin 2001; Sennett 2012).

Moreover, when smart city project is understood as a mere matter of technology innovation and implementation, the commercial tension towards scalability and replicability discourages tackling with context-specific issues, in favour of one-size-fits-all solutions. As a consequence, under the appearance of broadening consumers' democracy through technological upgrading, a de-politicised view of smart city (Swyngedouw 2007) hampers critical reactions, resistances and spontaneous social innovation because entwined issues of democracy and political control have no place in the discussion.

The ensemble of the technological fetishism critiques converge towards the assumption that it is not the introduction of new technologies per se but a different regime of use and control of existing technologies that can make cities (and citizens) smarter.

4.2.2 Governance and Participation

Above considerations lead us to a further set of critique addressing the governance aspects (Halpern et al. 2013; Kitchin 2014b). Here urban governance is defined as the effect of the whole of informal and formal processes undertaken by governing bodies and administrations at different geographical scale (global, national, regional, municipal, local), market organisations, civil society, associations and individuals in order to influence the fate of a determined issue in the public space, by deploying multiple sets of tools (including laws, norms, behavioural patterns, communication structures, economic processes…) and various modes of social interaction (such as negotiation, conflict, dialogue).

Shelton et al. (2015) note that critical accounts often provided a simplistic description of the smart city governance as the interlocking of "neoliberal ideologies with technocratic governance and the dystopian potential for mass

surveillance" (Shelton et al. 2015, p. 1). However, Shelton et al. (2015) note that, despite pointing out relevant points in terms of governance power, this description relies on an understanding of smart city which is ironically coincident with the one provided by private companies (Greenfield 2013). In order to provide a truly alternative reading of smart city governance processes it should be acknowledged that in reality "the assemblage of actors, ideologies and technologies associated with smart city interventions bears little resemblance to the marketing rhetoric" (Shelton et al. 2015, p. 1). The specificities of local context, the actors involved and the socio-environmental implications of the debated issues deserve, in fact, more attention in the effort of interpreting actually existing smart governance practices.

On this regard, smart local government processes largely deployed participatory processes with the aim of taking public voice into account in traditional decision-making processes, through a large variety of dedicated method for sharing responsibility together with rights for decision-making (Ledwith and Springett 2010). Despite being not possible to sharply delineate smart local government processes and participatory practices, the latter originate from a top-down design. Nevertheless, participatory practices have been charged, in the last years, with not been so inclusive, sensitive, and plural as expected, because the increased sophistication of collecting data and information has not matched the need to develop a more collaborative decision making process. As a result, they had little positive impact on the social justice and cohesion enhancement (Martínez and Rosende 2011). Particularly these critiques confirm the distance existing between increased technological sophistication and shared democratic decision-making with a political and professional elite (Agyemanm 2015). This leads us wondering whether participatory processes are ways for consulting or engaging citizens in already existing projects and gaining their consensus in exchange of slightly modification to the original plans; or for a real opening to social innovation processes that can eventually lead to a radical change of the current mechanisms of decision-making themselves.

4.2.3 Empowerment

The last set of critical considerations we are interested in refers to the empowerment issue. Since the '70 s, the word "empowerment" entered the management literature by assuming different meaning from participation in a company's decision about the development of future products (Fuchs and Schreier 2011), to the workers' psychological perception of being in control of their work (Spreitzer 1995; Conger and Kanungo 1988; Zhang and Bartol 2010), or being capable of influencing organisation changes through affirmative actions (Maynard et al. 2012), up to the more recent reading of empowerment as capability endowment (Ansari et al. 2012a b). When later adopted in the political research domain, its meaning broadens so to include the possibility for social actors to influence the organisations that claim to represent them and to hold them accountable.

Citizens' empowerment is a key world in smart city projects, too. An increasing number of both public and private statements on smart city understand empowerment in terms of citizen-centeredness, i.e. in terms of posing citizens' needs at the core of smart city projects, by allowing people to obtain information and provide solutions to pre-defined problems (Siddal et al. 2013). It is, nevertheless, questionable whether deploying the informative potential of citizens, or allowing citizens to get informed about their (supposed) concerns, can be actually empowering. In these cases, citizens' empowerment is understood in terms of involvement in top-down projects, which, despite designed around alleged citizens' concerns, are actually selected amongst those problems that can be solved by available technologies—rather than amongst those most seriously affecting citizens' life. As a result, the entire process often merely lead to increase economic or political advantage of public or private actors committed in the project implementation, rather than benefitting the broad public.

Moreover, it is not rare to see how citizens' are considered active to the extent they take part in the achievement of smart city goals they did not contributed to define (Marinetto 2003), with no real possibility for citizens to significantly challenge the goals themselves. Such a power asymmetry both in problem definition, search for solution and implementation, which characterises top-down governance processes, makes it largely questionable the possibility for broad participation in public decision-making; and the empowerment potential of smart city paradigm. It unveils the distance from those who lead the smart process and those who are left behind, due to technological and informational gap, disparities of competencies, social and economic status, etc.

Moreover, should we also regard the smart city project to be actually empowering, we can remind that empowering means "give (someone) the authority or power to do something" (Oxford Dictionary 2015). In order to be empowered, thus, city dwellers need to receive power by somebody who is willing to delegate—generally a superior authority (being an administration empowering citizens in expressing their voice in political consultation, or a company empowering citizens in giving advice about its products, a law conferring citizens a veto power, etc.). There is a subtle but important distinction between (being) empowered and *taking* power—or self-empowering.

In our view, the emergence of citizens' technology-supported spontaneous agency can actually address this last but crucial point of smart city paradigm, ideally almost independently from the willingness of existing hierarchies to share power and decision-making. In recent years, urban studies scholars devoted an increasing attention to the emergence of bottom-up initiatives for planning urban space and some of its functional processes (Shatkin 2004; Roy 2005; Donovan 2008). A comparatively smaller number of contributes addressed the issue of governance initiatives that mobilise and activate spontaneous networks of citizens and technologies to answer their quest for innovation and generate smart solutions based on coordination and mutual support (Sennett 2012). Given that technologies alone cannot bring citizens' needs at the heart of the value propositions of smart cities program, citizen-driven smart transitions can more realistically originate

from innovations in the governance of technologies and in the use of technologies for governance.

Focussing on these considerations, particular attention is given to crowdsourcing as a potentially disruptive process for enabling smart transitions. The entwining of available technological products with bottom-up strategies based on self-empowerment processes which advance context-based life-quality are crucially important to redefine the very idea of smartness. We are specifically interested in the conditions allowing crowdsourcing processes to turn smartness initiatives from being *citizen-centred* into being *citizen-driven*. These last approaches rely on the potentiality of existing technological tools and privilege broader access rather than higher performance in order to address some of the key—but often forgotten—points of the smart city project (such as collective access, participation and community cohesion).

4.3 Crowdsourcing as a Web Based Innovative Model

The word crowdsourcing was defined in 2006 as a web-based innovative business model calling for voluntary open collaboration in the development of creative solutions (Howe 2006) through a distributed problem-solving process (Brabham 2008; Estellés-Arolas and González-Ladrón-De-Guevara 2012). In its wider definition, crowdsourcing is an act of outsourcing a task to a target population of potential contributors in the search of solutions to complex problems. Crowdsourcing is thus a valid option when the search is intrinsically constrained by the inadequateness of a single locus of knowledge, which can apply to both setting and answering exploratory questions (Felin and Hesterly 2007).

Most of the times, crowdsourcing envisages a subject (e.g. a company, a public body, an organisation or an individual) submits an online, open format call for solutions or ideas to a large number of users. Being originally understood as a cheaper alternative to traditional outsourcing processes (i.e. a way for externalising some programmes or content generating functions), crowdsourcing has been originally adopted by private companies, which produced open-access platforms for massive and rapid interaction with web-users. More recently, the idea of crowdsourcing entered academic discussions on urban governance (Brabham 2009) with referring to any open call format fostering far-flung genius in collective solution seeking by a large network of potential users (Brabham 2009; Certomà et al. 2015). In public governance it is intended for information gathering, large-scale data analysis, ideation problems (Brabham 2013), policy-making (Shirky 2008), and contribution in research-design (Seltzer and Mahmoudi 2013). A number of diverse processes can be regarded as crowdsourcing processes, as far as they rely on citizens' technological agency (Goodchild 2007) and are performed by using personal ICTs for collective peer-production (e.g. do-it-yourself technologies), for recording, measuring and reporting external environment (e.g. sensing technologies, citizen science initiatives), for sharing opinion, ideas and

experiences, for elaborating data (e.g. big-data analysis applications), and for creating open-innovation (e.g. open-source software, collaborative contents or multiple content aggregators) (Certoma' and Pimbert 2015).

Crowdsourcing is a tool that is attracting a great interest in environments open to collaborative innovation. Not surprisingly, practitioners and researchers are increasingly associating the search for solutions to complex problems to dynamics that are resonant with crowdsourcing when referring to multi-layered environments, such as cities. In urban environments, a multitude of actors ranging from public to private organizations, as well as informal aggregations of citizens, exert mutual influences by, e.g. sharing information, taking decisions, competing for resources, etc. This is because, making an ideal parallel with systems where facts are uncertain, values in dispute, stakes high and decisions urgent (i.e. the environment that has led to the rise of the so-called "post-normal" science (Funtowicz and Ravetz 1993), traditional problem-solving strategies often fail to adequately activate an extended peer community including all of those concerned with the issue. As a result, solutions often present a prevailing top-down influence and, consequently, often fail to answer large shares of citizen's needs. In contrast with top-down approaches, crowdsourcing is compliant with requirements for open and non-reductionist search, from the identification of the goal, up to the validation of results.

Among the most relevant issues that are currently debated in the crowdsourcing literature, we think a special attention should be devoted to explore the circumstances conductive to crowdsourcing and the possibility for crowdsourcing to systematically allow for citizen self-empowerment. Before focusing on these, it is worth to underlie some key assumptions on crowdsourcing. Despite the risk of placing too much reliance on the wisdom of the crowd (Lanier 2006), crowdsourcing has nevertheless an intrinsic potential for democracy. It already proved to be able to generate a new model for urban governance that gathers and mobilises around a common matter of concern heterogeneous social actors, working toward greener, innovation-orientated and inclusive urban space (Certomà et al. 2015). In so doing, it can help challenging the traditional smart city project generated by top-down government programs and the business strategy of major technology companies, where it might be furthermore more difficult to deal with large amount of crowd-sourced data (Söderström et al. 2014). Ultimately, it offers an alternative understanding of "actually existing smart cities" (Shelton et al. 2015) as an emerging effect of self-empowering practices.

As a matter of fact, a number of crowdsourcing projects that are not only citizen-centred but also citizen-driven already emerged, and showed the potential for citizens to take the lead not only from the side of the distant search to problems defined by traditional focal agents (e.g. public administrators or private organizations), but also from the side of participating to the problem definition itself. In consideration of the major critiques traditional account of the smart city paradigm attracted, we think that crowdsourcing is a technological process that can be easily adopted and managed by citizens; it can induce real participation based on actual interests of the involved crowd, by guaranteeing a degree of freedom and different

possibilities of commitment; and it can support self-empowerment while generating "spontaneous smartness". When referring to spontaneous practices we refers to the non-planned effect of bottom-up agency of heterogeneous actors networks endowed with distinctive interests, capabilities and qualities, which gather around a common matter of concern. Smartness refers to the ability to deploy the potential of crowdsourcing processes for circulating the issue they care about, in order to produce a higher order learning toward innovative socio-spatial configurations and organisational structures.

4.4 Citizen-Driven Crowdsourcing

In a recent seminal manuscript from Afuah and Tucci (2012), questions (1) and (2) have been addressed with reference to crowdsourcing as solution for distant search from a focal agent perspective, i.e. the perspective of an individual, group, or organization who defines the top-down problem to be solved. Answers lead to focus our attention to some enabling conditions for an effective use of crowdsourcing. These include the easiness to delineate and broadcast the problem, the presence of asymmetries that underlie the need of a distant search, the dimension and commitment of the target crowd, the possibility to assess solutions towards acceptance criteria and the absence of relevant transaction costs in different steps of the search. This contribution comes from framing crowdsourcing in a decision science perspective, which ensures the meaningfulness of findings for heterogeneous contexts—urban governance included.

The following sections ground on this contribution and aim at extending the rationale for the use of crowdsourcing to those more inclusive and bottom-up forms of citizen empowerment, which can potentially bring in urban governance a new deal distant search for human-centric solutions in data-rich cities.

4.4.1 The Trade off Between Directionality and Lock-Ins in the Distant Search for Solutions

A first consideration refers to the nature of distant search itself. A loose control on the solutions emerging from a search is often related to more causal ambiguity (King 2007) because the larger number of potential alternatives and their poorly understood consequences make it more difficult to tell what alternatives result, and at what degree of problem solving effectiveness. Thus, the opportunity to enlarge the bottom of the pyramid of decision processes (i.e. raising the number of potential alternatives to be considered) in the already complex urban environment can sometimes be questioned or, at least, subordinated to further investigation. This could lead to advocate the need for centripetal forces to preserve the supremacy of

focal agents at the top of the pyramid, as means for ensuring efficiency under the constraint of resource scarcity, especially the need to be addressed is of general interest (e.g. land protection, quality of the environment, etc.). Such forces could result in a top-down directionality in the selection of niche activities capable of advancing urban transitions—and this reduces the variety of potential niches to be explored. Being niches often considered as a protective space for path-breaking innovations (Smith and Raven 2012), such a selection has intrinsic impacts on the innovation dynamics. This event frequently occurs in public administrators-led crowdsourcing initiatives, where local governments often set the problem in order to avoid the atomization of initiatives and the consequent dilution of the critical masses of resource crucial to progress from exploration to exploitation phases. In other words, directionality is frequently assumed as a necessary condition for crowdsourcing to result in an efficient mechanism for problems solving in urban environments (e.g. when processing data about demographic or employment trends). But it is worth noting that coordination and directionality from the top are not free from drawbacks, as, where not properly exerted, they can easily result in lock-ins. In fact, they could sometimes collide with a pragmatic conception of innovation as the evolutionary result of trial-and-error processes that often present a trade-off between risk perception and the exploration of new technological or organizational pathways (see the concept of isomorphism with dominant institutions, Di Maggio and Powell 1983). The discriminant between the two opposing models (i.e. with or without top-down directionality) thus lays in the motivations and the way in which a problem is delineated and transmitted to the crowd.

As a consequence, apart from few exceptions (e.g. Dublin City Sounding Boards), in traditional urban governance, the prevalence of top-down agenda is a way to catalyse the use of resources towards a limited number of priority topics, and crowdsourcing is—at best—a tool to answer the "how" question. This perspective, which places the focal agent (as outlined by Afuah and Tucci) at the top of the pyramid, is effective in seeking solutions to problems that are explicitly acknowledged in the community and that can thus be, first, delineated with a limited subjectivity; and, second, modularized in the form of manageable challenges. In that, the concept of limited subjectivity applies to the "what" is the problem, but political subjectivity still plays a key role in the decision making process.

Moreover crowdsourcing can represent an effective solution also for the delineation of the problem in those cases where the problem is entrenched in the dimension of tacit knowledge. In other words, when explicit information and data are not suitable to represent the complexity of the urban environment and to support decision-making and goal setting, these tasks can be transferred at the bottom of the pyramid because of its ability to select meaningful challenges via the spontaneous structuration of viral topics. Such function is particularly relevant in the urban environment, where opportunities for citizen empowerment can refer to the identification of the focal agent itself. A citizen-led delineation of the problem represents a concrete opportunity to preserve and reinforce intra-group bonding social capital—i.e. structural, relational, and cognitive—so as to increase the diffusion and retention of new capabilities within the bottom of the pyramid community

(Ansari et al. 2012a, b). Additionally, increased possibilities to delineate viral topics directly impact on the actual freedom of choice (Sen 1988) and, thus, on the possibility to recognize the complexity of human-centric needs in contrast to the traditional welfare approaches that typically equate wellbeing with either opulence or utility. This is particularly evident in those cases where delineation of problems comes with the escalation of common concerns that are informally transmitted and processed within crowds via social media or informal channels. By extending the problem definition to the bottom of the pyramid, solutions can emerge from the self-organization of committed vehicles of resources and capabilities into units of contributors, i.e. groups of citizens that spontaneously share the same values and stakes, which goes to the heart of collaborative urbanism. These units are capable to accurately articulate a complex problem and to spontaneously bring implicit and explicit knowledge into action, with no guide from institutions traditionally devoted to such purposes.

Among notable examples, *Meu Rio* (www.meurio.org.br) is a crowdsourcing platform in Rio de Janeiro accessed by more than 150,000 citizens that not only allows the distant search for solutions to top-down generated problems, but also the emergence of problems from the crowd. These problems are usually different from the ones that are in the agenda of local public administrations, e.g. water waste management in view of the Olympics. Success stories of bottom-up citizen empowerment cover a wide range of issues, from the recovery of a near-to-be-demolished school to the start-up of social services (e.g. professional investigation on missing citizens), from smart public transportation to the proposal of amendments to local laws. All these initiatives present a double bottom-up engagement of the crowd, the first during the problem definition, the second during the ideation of the solution.

4.4.2 Modularization Issues in Crowdsourcing the Definition of a Problem

The identification of the focal agent through bottom-up dynamics opens to relevant implications also in terms of modularization of a problem. Modularization refers to the separation of complex problems into manageable and independent components, where independence can originate also from the segregation of duties and resources involved in the search. An adequate modularization of the problem is a key issue when a single focal agent leads crowdsourcing. Errors affect results, the efficiency of the process and, ultimately, the legitimation of the focal agent itself. This means that modularization of the problem (i.e. the delineation of the sole aspect that really requires a distant search within a more complex challenge) can be even more complex when the focal agent is a spontaneous organization of citizens from the bottom of the pyramid. But citizen empowerment offers also some opportunities to counterbalance this risk. In fact, duplication of outcomes, which is a typical diseconomy in difficult-to-coordinate systems, can

be acceptable in urban environments because of the prevailing importance of the evolutionary nature of trial and errors over the maximization of efficiency under the constraint of scarce resources—being scarcity a condition that stems only from the difficulties in organizing a diffused capital of fuzzy and intangible resources (Puerari et al. 2013). Since the dynamism of relation in the urban environment can help activating and organizing these resources, bottom-up attempts to modularize complex problems potentially result in the rising of clusters of citizens who commit underexploited resources, despite being externally entrenched in information asymmetries, because they internally share the same values, vision and interests. As a result, the spontaneous competition between these clusters is a basic, yet effective, process that stimulates engagement and commitment of citizens towards taking action. This is a major outcome when considering the huge amount of diffused, but under-utilized, resources that are available from the crowd. As already demonstrated in the field of collective experiences of ethical consumption (Papaoikonomou et al. 2012), the commitment to share resources depends on sense of effectiveness and control when compared to individual actions, which is a matter of fitness into a meaningful group. For instance, homeowners and neighbours associations have since decades been a collective voice of interest groups that has been formally created to give residents greater voice in civic affairs. These formalized organizations, when coupled with a critical mass of adhesions, gain voice in local governance. Thus, they represent specific groups of citizens, whose needs are effectively captured by means of interactions with a high degree of engagement and inclusiveness, leading to the possibility for citizens to actively contribute to solve problems of common interest, and represent a pioneering implementation of bottom-up crowdsourcing-kind processes.

Conceiving crowdsourcing as a two-levels process, i.e. one regarding the activation of agents and one regarding the interactions within clusters, also helps lowering the costs of interaction between the focal agent and potential solution providers that typically occur with focal agents placed at the top of the pyramid. The rational for that comes from an evolutionary perspective on social constructivism, which differs from the management of open source projects as in vogue in several industries in that the sharing the same culture within a group of committed problem solvers facilitate cognition and negotiation processes. From this perspective, negligible efforts are required to set up the modularization of citizen's needs (e.g. conceiving the problem of citizen empowerment in collective energy as a whole), because shared culture make easier for potential solvers to understand them.

4.4.3 Setting the Distance Between Problem and Solvers

A third characteristic that makes crowdsourcing a powerful tool to empower citizens is the effective distance between focal agents and the knowledge needed to solve the problem. In comparison with the adoption of crowdsourcing in

traditional organizations, where this distance refers to the outside-in dynamics and agent's absorptive capacity in the urban environment, distance refers to the ability of a leading group of citizens to aggregate a critical mass of committed contributors into a self-organizing group of potential solvers. The outside-in perspective, thus, turns into an integrative one, where the drivers of the spontaneous networking of citizens correspond to the three dimensions of proximity that are relevant in inter-organizational collaborations (Knoben and Oerlemans 2006). These are the geographical proximity, i.e. a facilitator of face-to-face relations that help building mutual knowledge; organizational proximity, i.e. being part of communities that share rules and routines of behaviour as well as a system of representations, or set of beliefs', based on the concept of socio-culturally entrenched "communities of practice" (Roberts 2006); technological proximity: i.e. the exchanging of compatible bodies of knowledge through the use of the same enabling platform. While these dimensions are relevant for relations at the intra-cluster level, only the geographical one is really important for integrative processes among clusters. In fact, synergies between clusters are mainly driven by results and by their mutual impact over the same target communities, no matter the flagship values and beliefs or the knowledge exchange dynamics throughout the work in progress.

4.4.4 Leveraging on Tacit Knowledge Through Citizen Empowerment

Crowdsourcing is a preferred tool to search for solutions that rest on tacit knowledge. This applies also in the case of crowdsourcing as a tool that favours citizen empowerment. In fact, it is increasingly acknowledged that the answers citizens need often require the activation of resources and capabilities that are already present from the users' side, more than traditionally organized ones (e.g. public funding, consultants' empirical competences, etc.) (Gloria 2015). The participation of citizens in both the problem definition and the distant search overcome causal ambiguity problems, which refer to the fact that the holder of tacit knowledge might not understand, or even be aware of, the link between tacit knowledge and solution (King 2007). In contrast with crowdsourcing in urban traditional approach crowdsourcing, where the focal agent aims at activating, required knowledge from the crowd, environments the attracts tacit within clusters of interest, which contributes to improve the performances of the focal agent itself. Differences are evident when thinking to experience like the platform *SeeClickFix* (http://en.seeclickfix.com/), originally set up in the city of New Haven, Connecticut. *SeeClickFix* clearly shows how making communications about civic complaints simple by means of smartphone applications encourage citizens to trust in the effectiveness of bottom-up reporting. This success highlights benefits for both public administrators, who directly receive useful information from citizens to manage the city at nearly-zero costs; and for citizens, who drastically reduce the effort spent

to increase public awareness about common issues. The *SeeClickFix* initiative addresses the issue of "how to be informed about citizens' complaints", despite citizens not taking action in the follow-up phase. In contrast, the quasi-internal sourcing described in *Meu Rio* entails no delegation of authority for the execution of solution from the solver to the focal agent (i.e. in this case, the competent public authority), which would limit the potential of citizen empowerment and, even more, the closeness of the focal agent to citizen needs.

The dual role that the tacit knowledge plays in both the problem definition and the search for solutions comes with a threat for the effectiveness of the applications of crowdsourcing as a tool for citizen empowerment. In fact, the spontaneous definition of clusters of interest, which is a necessary condition for preserving a real bottom-up nature of the search, can theoretically lead to the over-representation of dominant groups of activists and, to a strong homogeneity of members in each cluster. The resulting lack of diversity among the members of a cluster would result in a lack of solvers in every possible location in the landscape of alternative solutions (Afuah and Tucci 2012). This subsequently reduces the possibility to self-setting the distance and, the probability of success of the search for solutions. As such an inclination towards dialogue and open-mindedness are fundamental characteristics of a cluster of interest increasing the probability to impact more than the other clusters. The capability to attract a critical mass of distributed motivations basically depends on reliability of the cluster to solve viral and complex problems.

Successful clusters of interest should target widely acknowledged challenges. When single perspectives prevail, the pervasiveness of empowerment dynamics decreases so as for the probability to overcome bureaucratic barriers and the related limitedness of resources that usually emerge when traditional public or private actors manage the search. When targeted at scalable problems, crowd-based solutions can aim at overcoming bureaucracy by e.g. just fuelling viral ideas through crowdfunding. This is the case of *Spacehive* (https://www.spacehive.com), a recent crowdfunding platform set up in the United Kingdom. *Spacehive* encourages creative projects of public interest, by aggregating a large numbers of small contributions in terms of money or work. Not surprisingly, similar platforms already exist in several other world regions, e.g. *Citizinvestor* (http://www.citizinvestor.com/) in the U.S.

4.4.5 Selection of Solutions

Finally, one of the main advantages of the above mentioned two-layered approach to crowdsourcing in the urban environment, where shared platforms (no matter if

developed in top-down or bottom up initiatives) enable the engagement of citizens in both the problem definition and the search for solutions, is the embeddedness of evaluation criteria within the process. In fact, since the search for solutions relies on the empowerment of citizens who have the willingness and the capabilities to formulate problems of common concern and to contribute to the search, the evaluation of the competing solutions occurs at the citizen level among the crowd and results in the consensus achieved by each alternative. As a result, the more a solution is viral, the more it reflects a wide response to citizen needs and collects support from a crowd that goes beyond the boundaries of the original cluster of interest. In parallel, since there is a relation between the willingness to contribute and support a solution and its expected impact (O'Mahony and Ferraro 2007), this form of spontaneous and distributed evaluation practical outcomes over abstract ideals, values or prejudices.

The distinction between top-down and bottom-up crowdsourcing leads to substantial practical implications. Despite both requiring innovation platforms where citizens can interact directly with public authorities, to solve urban challenges and express their consensus for the preferred ones, differences can still exist from the objectives of the agent that holds the platform. The cases of *OpenIdeo* (https://openideo.com/) and *Mi Medellin* (http://www.mimedellin.org/) are exemplar. In fact, *Mi Medellin* explicitly leverages on the partnership with the local government, which aims at being promptly informed about more urgent issues to be handled in the framework of the public mandate to competent authorities; while *OpenIdeo* aims at opening local challenges to global networks of contributors and sponsors (see the "Human Rights Challenge" as an exemplar case), which is a way to also engage external solvers not only in the exploration but also in the execution phase. Like in the case of *Meu Rio*, where winning ideas fuel bottom-up processes that result in the activation of actors from the crowd, *OpenIdeo* thus stimulates new active citizenship and entrepreneurship, which brings substantial implications in terms of delegation of control over the actual results of the single initiatives. Besides that, the underlying logic of trial and errors makes the latter approach to crowdsourcing platforms also less vulnerable to the over-representation of small groups of activists, who can—on the contrary—introduce a sort of socio-cultural divide into lobbying for public support. In fact, the more the platform stimulate the self-selection of solutions within the crowd, the more lobbying for public resources can be replaced by the resources committed by the supporters themselves.

In summary, the Table 4.1 describes the authors' interpretations differences in the rationales that lay behind the adoption of crowdsourcing in corporate and citizen-driven environments:

Table 4.1 Comparative table of key crowdsourcing criteria of corporate and citizen-driven crowdsourcing

Crowdsourcing criteria (as by Afuah and Tucci)	Corporate crowdsourcing	Citizen-driven crowdsourcing
1. How the problem is delineated and transmitted	Crucial problems to answer internal needs are classified in those that can be solved via internal resources or standard commercial relations, and those that require the access to resources that are diffused among the crowd	Open access platforms can facilitate the creation of critical masses of shared needs whose priority is proportional to the extension and commitment of the related stakeholders
2. How it is modularisable/modularised	Problems are decomposed into easily manageable unit by a focal agent, which is thus the only responsible for the design of the way the cognition of a need is translated in an explicit problem	The dominant forms of cognition of a need spontaneously emerge from the crowd in terms of discourses and narratives, which help potential solvers identifying the hot landscapes for the search for solutions
3. How the effective distance of knowledge from focal agent, and the tacitness and complexity of solution knowledge are addressed	The focal agent controls internal sourcing opportunities through a systemic management of local search processes. A special attention is paid to avoid misinterpretations of local and distant searches	Single citizens have intrinsically limited knowledge, which is thus externally sourced through the creation of social networks to address complex need. The trade-off between the shared concern towards local issues and the limitedness of local resources can result in a two-tails cut of problems that are not relevant of citizen-led crowdsourcing
4. How the pervasiveness of problem-solving know-how in crowd is identified	The focal agent relies on formal and informal internal resources that refer to organized intelligence and intuition. In that, previous experiences and embeddedness in cross-disciplinary communities help scouting the problem solving potential of the crowd	The self-organization of groups of citizens that share the same concerns and visions vitalizes trial and error processes. The variety of ways problem-solving know-how is activated favours the recombination of underexploited resources and the spontaneous emergence of effective configurations of solvers

(continued)

Table 4.1 (continued)

Crowdsourcing criteria (as by Afuah and Tucci)	Corporate crowdsourcing	Citizen-driven crowdsourcing
5. How to win the motivations of potential solvers with solution knowledge	The focal agent builds its own legitimation among potential solvers by communicating professional trustworthiness and setting adequate value propositions, so as to facilitate the emergence and activation of tacit knowledge. Employment opportunities are often an asset of the focal agent	The motivations of potential solvers are basic determinant of the creation of critical masses of interest towards a specific issue. In case of lack of such motivations, discourses do not turn into action and the crowdsourcing process does not take place
6. How the evaluation of proposed solution is performed	Effective relations between the focal agent and the potential solvers rely on the possibility to avoid the dominant position of a single evaluator. Evaluation thus tends to be delegated to users	Solutions that not are capable to spontaneously answer citizens' needs and progressively loose support and, thus, are set apart. On the contrary, effective solutions tend to go viral

4.5 Conclusions

The crowdsourcing landscape is rapidly evolving in a variety of directions that reveal the increasing pervasiveness of social network dynamics in different societal functions. The different platforms enable the crowd to take part not only for search, but also to the definition of the problem, which unveils new opportunities for citizen empowerment. As such, citizen-driven crowdsourcing an interesting potential in complementing top-down urban governance. The related generation of bottom-up initiatives emerges as a preferred way to unlock the potential of spontaneous smartness.

The design of crowdsourcing platforms plays an important role in effectively disrupting conventional top-down approaches (Brabham 2009). In fact, the nature and the rules for accessing these platforms determine the extent to which the crowd is involved in sourcing both the formulation of the needs and the identification of the solutions. The design should usefully geared on the accessibility to a large share of citizens and on facilitating consensus-building processes for the crowd-based selection of the problems whose solutions will come from distant-searches. As shown in several lighthouse experiences, collaborations between promoters (i.e. founding groups of citizens) and expert ICT organizations is fundamental to set up an attractive and effective platform.

Compared to corporate approaches to crowdsourcing, a bottom-up-oriented platform brings implications for focal agents, which are asked to develop and share the platforms through open models, without introducing inflexible participation roles or, even worse, specific purposes and goals. The number of platforms that are currently capable to enable citizens not just to participate but to create a new model of Internet-equipped direct democracy is still limited, but some encouraging experiences are already ready for replication. In this chapter we have outlined the rationale for a systemic application of crowdsourcing processes to the situations where urban governance welcomes, or even needs, citizen empowerment. Future monitoring and assessment of these initiatives will help sharing best practices and lessons learnt among the community of scientists and practitioners who are increasingly showing interest towards the mobilization of social networks in urban governance.

References

Afuah, A., & Tucci, C. L. (2012). Crowdsourcing as a solution to distant search. *Academy of Management Review, 3*(3), 355–375.

Agyemanm, J. (2015). *Sharing cities: A case for truly smart and sustainable cities*. Cambridge, MA: MIT Press.

Allwinkle, S., & Cruickshank, P. (2011). Creating smart-er cities: An overview. *Journal of Urban Technology*, *18*(2), 1–16.

Ansari, S., Munir, K., & Gregg, T. (2012a). Impact at the "Bottom of the Pyramid": The role of social capital in capability development and community empowerment. *Journal of Management Studies, 49*(4), 813–842.

Ansari, S., Munir, K., & Gregg, T. (2012b). Impact at the 'Bottom of the Pyramid': The role of social capital in capability development and community empowerment. *Journal of Management Studies, 49*(4), 813–84230.

Arup. (2011). *Smart cities: Transforming the 21st city via the creative use of technology*. Arup: London.

Batty, M., Axhausen, K., Fosca, G., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., et al. (2012). Smart cities of the future. *European Physical Journal, 214*, 481–518.

Batty, M., Manley, E., Milton, R., & Reades, J. (2013). Smart London. In S. Bell & J. Paskins (Eds.), *Imagining the future city: London 2062*. London: Ubiquity Press.

Brabham, D. C. (2008). Crowdsourcing as a model for problem solving an introduction and cases. *Convergence, 14*(1), 75–90.

Brabham, D. C. (2009). Crowdsourcing the public participation process for planning projects. *Planning Theory, 8*, 242–262.

Brabham, D.C. (2013). The four urban governance problem types suitable for crowdsourcing citizen participation. In Brabham, D.C. (ed.), *Citizen E-participation in urban governance: Crowdsourcing and collaborative creativity*, IGI-Global, pp. 50–68.

Caprotti, F. (2014). Building the smart city: Moving beyond the critiques. UGEC Viewpoints, March 24.

Certomà, C., Corsini, F., & Rizzi, F. (2015). Crowdsourcing urban sustainability. Data, people and technologies in participatory governance. *Futures*, *74*, 93–106.

Certoma', C., Pimbert, M. (2015). Crowdsourcing and action research. Fostering people's participation in research through digital media. In H. Bradbury-Huang (ed.), *Handbook of action research*. Sage: London.

Cocchia, A. (2014). Smart and digital city: A systematic literature review. In R. P. Dameri & C. Rosenthal-Sabroux (Eds.), *Smart city*. Switzerland: Springer.

Conger, J. A., & Kanungo, R. N. (1988). The empowerment process: Integrating theory and practice. *Academy of Management Review, 13*, 471–482.

Corsín Jiménez, A. (2014). The right to infrastructure: A prototype for open source urbanism. *Environment and planning D: Society and space, 32*, 342–362.

Crang, M., & Graham, S. (2007). Sentient cities: Ambient intelligence and the politics of urban space. *Information, Communication and Society, 10*, 789–817.

Di Maggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review, 48*(2), 147–160.

Donovan, M. G. (2008). Informal cities and the contestation of public space: The case of Bogotá's street vendors, 1988–2003. *Urban Studies, 45*(1), 29–51.

Estellés-Arolas, E., & González-Ladrón-De-Guevara, F. (2012). Towards an integrated crowdsourcing definition. *Journal of Information Science, 38*, 189–200.

Felin, T., & Hesterly, W. S. (2007). The knowledge-based view, nested heterogeneity, and new value creation: Philosophical considerations on the locus of knowledge. *Academy of Management Review, 32*(1), 195–218.

Fuchs, C., & Schreier, M. (2011). Customer empowerment in new product development. *Journal of Product Innovation Management, 28*, 17–32.

Funtowicz, S. O., & Ravetz, J. R. (1993). Science for the post-normal age. *Futures, 25*(7), 739–755.

Gibbs, D., & Krueger, R. (2012). Fractures in Meta-Narratives of development: An interpretive institutionalist account of land use development in the boston City-Region. *International Journal of Urban and Regional Research*, *36*(2), 363–380.

Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N. and Meijers, E. (2007). Smart cities. Ranking of European medium-sized cities. http://www.smartcities.eu/download/smart_cities_final_report.pdf

Gloria, A. De. (2015). Games and learning alliance. In A. De Gloria (Ed.), *Games and learning alliance conference* (Vol. 9221). Cham: Springer.
Goodchild, N. F. (2007). Citizens as voluntary sensors: Spatial data infrastructure in the world of web 2.0. *International Journal of Spatial Data Infrastructures Research, 2*, 24–32.
Graham, S., & Martin, S. (2001). *Splintering urbanism: networked infrastructures*. Routledge, London: Technological Mobilities and the Urban Condition.
Greenfield, A. (2013). *Against the smart city*. New York: Do Projects.
Halpern, O., LeCavalier, J., Calvillo, N., & Pietsch, W. (2013). Test-bed urbanism. *Public Culture, 25*(2), 272–306.
Hollands, R. G. (2008). Will the real smart city please stand up? *City, 12*(3), 303–320.
Howe, J. (2006). The rise of crowdsourcing. *Wired*, *14*(6).
Kaika, M., & Swyngedouw, E. (2000). Fetishizing the modern city: The phantasmagoria of urban technological networks. *International Journal of Urban and Regional Research, 24*(1), 120–138.
King, A. W. (2007). Disentangling interfirm and intrafirm causal ambiguity: A conceptual model of causal ambiguity and sustainable competitive advantage. *Academy of Management Review, 32*(1), 156–178.
Kitchin, R. (2011). The programmable city. *Environment and Planning B, 38*, 945–951.
Kitchin, R. (2014a). The real-time city? *Big Data and Smart Urbanism. GeoJournal, 79*(1), 1–14.
Kitchin, R. (2014b). Making sense of smart cities: Addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society,*. doi:10.1093/cjres/rsu027
Kitchin, R., Lauriault, T. P., & McArdle, G. (2015). Knowing and governing cities through urban indicators, city benchmarking and real-time dashboards. *Regional Studies, Regional Science, 2*(1), 6–28.
Knoben, J., & Oerlemans, L. A. G. (2006). Proximity and inter-organizational collaboration: A literature review. *International Journal of Management Reviews, 8*(2), 71–89.
Lanier, J. (2006). Digital Maoism. *The Edge. org*.
Ledwith, M., & Springett, J. (2010). *Participatory practice: Community-based action for transformative change*. London: Policy Press.
March, H., Ribera-Fumaz, R. (2014). Smart contradictions: The politics of making Barcelona a self-sufficient city. *European Urban and Regional Studies*, *20*, doi:10.1177/0969776414554488
Marinetto, M. (2003). Who wants to be an active citizen? The politics and practice of community involvement. *Sociology, 37*(1), 103–120.
Martínez, M., & Rosende, S. (2011). Citizen participation in local agendas 21: Critical questions of urban governance. *Scripta Nova. Revista Electronica De Geografia Y Ciencias Sociales, 15*(3), 1–11.
O'Mahony, S., & Ferraro, F. (2007). The emergence of governance in an open source community. *Academy of Management Journal, 50*(5), 1079–1106.
Oxford Dictionary. (2015). *Empowerement*. http://www.oxforddictionaries.com/it/definizione/inglese/empower
Papaoikonomou, E., Valverde, M., & Ryan, G. (2012). Articulating the meanings of collective experiences of ethical consumption. *Journal of Business Ethics, 110*(1), 15–32.
Puerari, E., Concilio, G., Longo, A., Rizzo, F. (2013). Innovating public services in urban environments: A SOC inspired strategy proposal. In: *international forum on knowledge asset dynamics* (IFKAD), pp. 987–1007.
Roberts, J. (2006). Limits to communities of practice. *Journal of Management Studies, 43*(3), 623–639.
Roy, A. (2005). Urban informality: Toward an epistemology of planning. *Journal of the American Planning Association, 71*(2), 147–158.
Seltzer, E., & Mahmoudi, D. (2013). Citizen participation, open innovation, and crowdsourcing. Challenges and opportunities for planning. *Journal of Planning Literature, 28*(1), 3–18.

Sen, A. (1988). Freedom of choice. *European economic review, 32*(2-3), 269–294. doi:10.1016/0014-2921(88)90173-0

Sennett, R. (2012) No one likes a city that's too smart. *The Guardian*, December 4.

Shapiro, J. M. (2006). Smart cities: Quality of life, productivity, and the growth effects of human capital. *The Review of Economics and Statistics, 88*(2), 324–335.

Shatkin, G. (2004). Planning to forget: Informal settlements as 'forgotten places' in globalising metro Manila. *Urban Studies, 41*(12), 2469–2484.

Shelton, T., et al. (2015). The 'actually existing smart city'. *Cambridge Journal of Regions, Economy and Society, 8*(1), 13–25.

Shepard, M. (2011). *Sentient city: Ubiquitous computing, architecture, and the future of urban space*. Cambridge, MA: MIT Press.

Shirky, C. (2008). *Here comes everybody: The power of organizing without organizations*. London: Penguin Press.

Shwayri, S. (2013). A model Korean ubiquitous eco-city? The politics of making Songdo. *Journal of Urban Technology, 20*(1), 39–55.

Siddal, E., Grey, T., & Dyer, M. (2013). Indicators and stakeholders engagement: A Dublin case study. *Proceedings of the Institution of Civil Engineers, 166*(2), 85–97.

Smith, A., & Raven, R. (2012). What is protective space? Reconsidering niches in transitions to sustainability. *Research Policy, 41*(6), 1025–1036. doi:10.1016/j.respol.2011.12.012

Söderström, O., et al. (2014). Smart cities as corporate storytelling. *City, 18*(3), 307–320.

Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions, measurement, and validation. *Academy of Management Journal, 38*, 1442–1465.

Swyngedouw, E. (2007). "Impossible 'sustainability' and the postpolitical condition. In R. Krueger & D. Gibbs (Eds.), *The sustainable development paradox. Urban political economy in the United States and Europe*. New York: Gilford Press.

Thrift, N. (2012). The insubstantial pageant: Producing an untoward land. *Cultural Geographies, 19*, 141–168.

Townsend, A. M. (2013). *Smart cities. Big data, civic hackers, and the quest for a new utopia.* Norton & Company: New York.

Travis M. Maynard, L., Gilson, L., Mathieu, J.E. (2012). Empowerment–Fad or fab? A multilevel review of the past two decades of reserach. *Journal of Management*, *38*(4):1231–1281.

Vanolo, A. (2013). Smartmentality: The smart city as disciplinary strategy. *Urban Studies, 51*, 883–898.

Zhang, X., & Bartol, K. M. (2010). Linking empowering leadership and employee creativity: the influence of psychological empowerment, intrinsic motivation, and creative process engagement. *Academy of Management Journal, 53*(1), 107–128.

Chapter 5
Integral Approach to Urban Design in a Data-Rich City Context

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Abstract This chapter deals with spatial transformation of urban space in context of data-rich urban environments and networked society, focusing on human activities, experiences and behaviours. It starts from definition of urban design as the multi-disciplinary activity of shaping and managing urban environments where elements of urban design are physical environment, human activities and connections. At the same time, contemporary communication technologies have changed patterns of spatial use; the way people act and behave in public spaces. Thinking over presence of social networks, virtual social communities, myriad data in public open space, and usage of communication devices chapter addresses question about their reflection on city's social life, collective experiences and behaviour. The main issue examined is how urban design theory deals with social and spatial changes within network society. Looking at urban design through the lenses of integral theory will offer effective framework for encompassing both directions of socio-spatial relation. As such the chapter is a short critical analysis of theories with aim to recognize and identify urban design approaches based on changed human activities and social and spatial connections in data-rich city context. Overview of design approaches could be understood as contribution to methodological platform for designing people friendly cities.

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5.1 Introduction

If urban design is considered as a profession within wider sense of shaping the spatial or physical environment we have to take into account the professions involved. Related professions rang from civil engineers to horticultural specialist and other neighbouring branches of physical planning. To understand the scope of urban design we should focus on matters to which urban design brings distinctive perspective. In that sense urban design is the field that engages the human experience of the built environment. Further, urban design has focus on features of built environment that take place in the public realm (Sternberg 2000). In short terms we could rely on Jon Lang suggestion that public realm should be considered as a set of behaviour settings. Comprising behaviour pattern, pattern of built form and a time period (Lang 2005, 8).

Relation between spatial form and social relations is core theme of urban design. Urban design as a discipline has roots in two different and simultaneously developed ideas about the approach to design and transformation of urban space. These differences about socio-spatial relation can be traced in contemporary approaches to urban design favouring either socio or spatial direction of socio-spatial relation. Looking at it through the lenses of integral theory will offer effective framework for encompassing both directions of socio-spatial relation in urban design.

In discussion of contemporary urban design, and urban life, role of technology is also important. As architect and urban designer William J. Mitchell points out relationship between people and their social environments are changing with usage of wireless digital information and the city itself is becoming a sensitive organism capable of reflecting and responding to human needs. Presence of social networks, virtual social communities, myriad data in public open space, and usage of communicational devices reflects on city's social life, collective experience and behaviour. Of course, who and how use technology depends on demographics and socio-economic status of both individual and society. But, nevertheless, it is necessary to think (critically) about the new social formations associated with the technological innovations. Discovering the city and search for facilities that we need on a daily bases (e.g. restaurants, grocery stores, leisure places) is partly done by use of digital media, but exact use of those facilities is still in physical space. Even though city becomes like a patchwork of places of interest there is present necessity for connections between places. Urban fragmentation by digital media is similar to urban fragmentation by car and transport development. On the other hand security and control issues related to urban space, such as space appropriation, are also regulated by technology (Mitchell 1995, 2003). There is multiplicity of factors converging to shape new social configurations.

For a better understanding of urban design it is important to provide an overview of how sociability has been changing in the context of changes of a public sphere and public space at the beginning of 21st century.

5.2 Urban Life Between Public Sphere and Public Space

Urban public sphere was understood and theorized as spatial construct—a physical space for encounter and social interaction (Simmel 1971; Arendt 1958; Habermas 1991; Sennett 2002). According to sociologist Georg Simmel, space is a crucial and fundamental element in human experience because social activities and interactions are and must be spatially contextualized (Simmel 1971; Zieleniec 2007). In urban theory, since Simmel (loc cit), it is pointed out that basic characteristic of urban life is that individuals have to live together with strangers that have completely different view of life and way of living. According to Arendt (loc cit), public sphere is about individuals that act as collective, but not as uniform entity such as a class, a nation, or a mass. The public sphere is like parenthesis that brings together the differences between people (Arendt 1958). For Habermas public sphere is "a discursive space in which individuals and groups congregate to discuss matters of mutual interest and, where possible to reach a common judgment" (Hauser 1999). Arendt also states that it is important not because everybody agrees but because they disagree and anyhow need to come to common understanding. Such understanding of urban public sphere leads to conclusion that society needs a place where these differences are brought together. In spatial terms she advocates city centre and her measure of urban space is in terms of its density. For Habermas public realm is tied to economic interests and not necessarily related to city centre (Habermas 1991).

Unlike Arendt and Habermas, Richard Sennett's approach to public sphere is less political and more cultural with focus on how people express themselves to strangers. For Sennett public realm is composed of minutiae of behaviour, such as the street clothing, customs of greeting, when people feel free to talk to strangers and when they do not, the bodily gestures etc. Spatially he focused on centralised open space as strangers meeting place. According to him, public space is the space where strangers can be aware of each other (Sennett 2002).

A brief search through the histories of new technologies—printing, steam power, gas lighting, electrification, the motor car, the telephone, television, and computers—confirms that all innovations had influence on urban life and consequently co-shaped and/or changed the public sphere and urban environment. Since the early 1990s, sociologists and economists have been looking at contemporary cities as expressions of networks and fluxes of information (Castells 1989). Concepts like intelligent city, sustainable city, smart city, mediascape, informational landscape, data-rich city are essential in contemporary debates about cities. They are offering visions of places shaped and defined in the context where digital data coming from multiple sources (sensing technologies, ubiquitous computing, and user-generated content) play important role in shaping the urban experience. The term "ubiquitous computing" was introduced by Mark Weiser in 1991 to describe that computational processes are integrated into and are sensitive to the external environment and integrated with diverse objects (Weiser 1991, 1993). Role of technology in the future urban design context is very important.

New forms of publicness and exchange of ideas, information and goods are enabled by digital technologies and, consequently, they are indicating need for change in physical urban space. Urban life of public spaces is no longer based on bringing different people spatially together (as earlier in coffeehouses and town squares), but on organisation of publics around common issues of concern. In a public sphere citizens should be able to distance themselves from their private identities and focus on a common interest. Also the everyday use and movement through the city is no longer dominantly based on characteristics and information from urban environment but is also generated by information perceived through digital media technologies.

Together with the appearance and expanded usage of digital media technologies notion of public sphere has changed. Journalist and researcher Maritjn De Waal study the role of digital media technologies in the urban public sphere. The author starts with the assumption that new technologies, from mobile phone to urban sensor networks, co-shape urban life in the same way as physical infrastructure and spatial programming of urban planning have always done. Urban technologies developed since 90s and their dominant role was in creation of second reality (cyberspace, virtual reality, virtual community etc.). Today urban technologies are related to location sensing capacities and in that way they co-create (hybrid) cities (De Waal 2014). Digital media technologies are linked up with the role of public sphere in public space. Physical environment and non-direct features brought into those environments through various technologies are elements that co-create also citizens' experience of the city.

New perspectives of urban sphere within data-rich city context still have in their focus socio-spatial relations. Before we discuss those changes of public sphere and urban life in the context of urban design it is necessary to understand urban design origin and framework it operates within.

5.3 The Roots and Ideological Framework of Urban Design

Urban design as a distinctive field in relation to architectural design and urban planning emerged in 50s as a part of critical evaluation of post-war urban landscape by these disciplines. The names that are closely linked to the formation of the field belongs to the Spanish architect Josep Lluís Sert (1901–1983), member of CIAM (*Congrès Internationaux d'Architecture Moderne*) and to the Harvard University Graduate School of Design where Sert was dean and chairman of architecture department from 1953 to 1969. Sert was the co-founder of the GATEPAC (*Grupo de Artistas y Técnicos Españoles para el Progreso de l'Arquitectura Contemporánea*), the Spanish branch of the CIAM. Also, he was the president of CIAM from 1947 to 1956, the formative years of the urban design discipline and challenging years for CIAM.

Urban design fundamentals emerged from rethinking and reconceptualization of modernistic planning principles and techno-centred approach to spatial transformation of cities after World War II in both Europe and USA, by CIAM members them self. According to Eric Mumford research, seemingly divergent discourses on revision of modernistic approach coming from Sert and Harvard School on one side and auto critique of mostly European Team 10 members at the other are closely intervened and still relevant for the discipline today (Mumford 2009). Their intellectual confrontation and mutual stimulation produced the core ideas about what we call today the urban design.

In the 30s many significant CIAM members came to the United States due to the political situation in Europe. The publication by Sert and CIAM entitled *Can Our Cities Survive? An ABC of Urban Problems, Their Analyses, Their Solutions: Based on the Proposals Formulated by CIAM* was one of the first efforts to present CIAM ideology to American professional circles (Mumford 2000). Although designed according to the most famous CIAM postulates defined on the fourth CIAM congress in 1933, the book was published in dramatically changed social circumstances in 1942.

Ten years later CIAM published another important publication as a result of the eight CIAM congress debate held in Hoddesdon (England) in 1951 with the unexpected title *The Heart of the City: Towards the humanization of Urban Life*. According to research of Constanze Sylva Dormhardt this period of ten years was a very significant for the development of the relation between American urban discourse and CIAM. The exchange of ideas between European CIAM members with American colleagues, as well as their personal experience of American cities and suburbs, had an impact on CIAM urbanism. Two concepts had a key role in the formation of CIAM post-war considerations and that was the concept of comprehensive planning and the concept of neighbourhood unit (Dormhardt 2011). At the same time, both spatial concepts were rooted in architects' social visions of community and civic society. In this period of ten years a different Sert's approach to urbanism began to emerge. Although still rooted in CIAM large scale planning, but probably influenced by American urban conditions, as Dormhardt noticed, Sert developed "a new concern with pedestrian places of social and political assembly" (cited in Mumford 2009, 16).

The Heart of the City publication is considering the city as an integral entity based on relationships of the individual domain and the collective sphere, centre and periphery, city and region. Therefore, the restructuring of the city at all spatial levels is the new task of architectural and planning practice. Contrary to separation of functional areas of the city, the goal is their incorporation in a comprehensive and continuous urban space related to natural and rural context—a civic landscape. Jaqueline Tyrwhitt, a member of MARS group (Modern Architectural Research Group) and first author of the publication played an important role as a mediator in European-American communications. Tyrwhitt and Sert specifically dealt with the argument of theoretical observation of the city in different spatial scales and their relation with social life. In 1955 Jaqueline Tyrwhitt

along with Sert was working on preparations for the First Harvard Urban Design Conference held in 1956 (Mumford 2009).

Eric Mumford finds that the eighth CIAM congress was the most significant post-war congress because it is the earliest professional debate on the problem of urban public space in modern architecture in the changed post-war circumstances. Mumford sees the eighth CIAM congress as the first reference point for new forms of public urban space that will appear during the fifties in the context of rapid decentralization of cities and discourse of shopping malls, as well as the revitalization of urban cores and theme parks. At the same time, this congress shows CIAM members efforts to find a new socio-political basis for the "architecture of social collectivity" in a spirit of broader post-war socio-political context (Mumford 2000, 215).

Sert had an opening address at the eight CIAM congress and he noticed that decentralisation of the city influenced the way people live and behave. So he proposed the return to civic and urban terms of organisation and design of cities where "real advantage of living in a city" is "to get man together with man, and to get people to exchange ideas and be able to discuss them freely (cited in Mumford 2009, 22)." As Mumford suggests, it is important to notice that Sert began to advocate the political and cultural importance of pedestrian life in cities at the moment of massive and politically supported suburbanisation of Americans. Blending the CIAM ideas of designing the city as whole with the new ideas about the city core and the pedestrian life Sert developed the fundamentals of urban design. This comprehensive view on city life would require the integration of urban planning, architecture design and landscape architecture.

The concept of human dimension in planning that appears in the post-war work of CIAM and gets a very tangible theoretical outlines at the eighth congress, moves to a new level after 1951. CIAM debate in the next decade represents an early version of the urban discourse based on the perspective of the urban space user and his experience, later associated to work of Team 10 and Alison and Peter Smithson.

At the ninth CIAM congress in 1953 in Aix-en-Provence (France) younger generation of CIAM members criticized technocratic urbanism CIAM propagated. During this congress, Smithsons presented their famous work "Urban Reidentification". They criticized modernist dogma of the rational city with its separate functions. By analysing daily life in working class neighbourhood they were searching for a new, architectural equivalent to the intuitive spatial connections they saw in the way children played. They underscored the importance of public spaces and aimed to explain how people identify with their environment. The Smithsons advocated structuring the city that will provide mix of different facilities characteristic for street life and will produce space with which residents can emotionally connect. A sense of connection with different levels of spatial patterns enables the creation and development of community identity. Such understanding of the built environment through the notion of urban experience and meaning of space directed further work of the congress till its end.

Emergence of more human oriented approach in designing cities promotes architecture and urbanism sensitive for the needs of urban space users. This human approach considers a city as spatial frame that provides multiple choices in everyday life with focus on people, patterns of space use and their relations with spatial configuration. Within the contemporary context of data-rich environments human approach is still fundamental for urban design, but technology is an integral part of it. Technology is changing the patterns of everyday life and spatial use, but also is offering various new tools for finding out what are users' needs related to urban spaces and everyday life in cities today.

5.4 Urban Design Approach: Two-Way Direction of Socio-spatial Relation

Urban design brought the new perspective to city envisioning. In urban design socio-spatial relation, which was always important for modernist city planning, was defined at the different spatial scale of everyday practice and human experience. City core and its public space as the environment of pedestrian interaction and communication became the key subjects of urban (re)design.

Josep Lluís Sert and Team 10 were both part of post-war CIAM. They were seemingly on the opposite sides of ideological discussion since Sert was the president of CIAM and Team 10 represented the new CIAM generation, but in their rhetorical differences they produced the core ideas of urban design. Eric Mumford indicated that the beginnings of urban design at Harvard and the Team 10 challenge to CIAM are not separate phenomena. But, from the theoretical point of view we could also notice that Sert and Team 10 represented two different perspectives to socio-spatial relation. Everyday use of urban space means two-way relation between people and the spatial context. Urban space with its form and organization directs human activities and influences their intensity, including the interaction and communication, as Sert was pointing out. On the other hand people change spatial context and appropriate it to their needs and interests, in physical and imaginative way, as Smithsons were arguing. The use of space includes simultaneous flow of both ways of socio-spatial relation, whereby people and space are both continuously changed trough use. Architect and theorist Nikolaas J. Habraken call this dynamic relationship the "live configurations" (Habraken 2000).

Elusive difference between the use of space and production of space has a central place in the unitary theory of Henri Lefebvre too. Production of space, according to Lefebvre, is not limited to the domain of administration and experts, but also includes the domain of residents and users. Everyday life considered by the concept of practice as human activity of personal self-realization, for Lefebvre is a centre of social life formation (Lefebvre 1991). To inhabit for Lefebvre means to appropriate—to modify, reshape and adapt space on different scales, from flat to urban territories.

So, we could use these different perspectives to socio-spatial relation as criteria to recognise two different approaches to urban design. The one oriented towards the question how physical features of urban space mediate the use of space and human behaviour, we call configurational approach. It could be related to level of socio-spatial relation Lefebvre called "spatial practice" or "perceived space" (*espace perçu*) in his unitary theory of space production. The other oriented toward examination of how is physical dimension subjected to reinterpretation and adaptation of meanings, we call the representational approach. The related level of Lefebvre's theory is called "spaces of representation" or "lived space" (*espace vécu*).

The most appropriate example of configurational approach is the Space Syntax theory.[1] According to this theory the relationship between the physical parts and the way they are linked into a whole, are much more important than any individual part from a sociological point of view. The urban space with its form divides, brings together and groups different people, especially inhabitants and foreigners, for what many theorists believe it is urbanity blueprint—a collective project of coexistence with foreigners (Hillier and Hanson 1984).

The representational approach of urban design is concerned with meanings and imaginative reinterpretation of urban space. In Margaret Crawford description of design approach called Everyday Urbanism we can hear an echo of Smithsons: "It is an approach to urbanism that finds it's meanings in everyday life, but in an everyday life that always turns out to be far more than just the ordinary and banal routines that we all experience…We want to reconnect these human and social meanings with urban design and planning, something that hasn't been attempted for quite a while (Crawford 2008, 18)." Everyday urbanism approach is conceptualizing the physical domain of everyday public activity that exist between realms of home, the institution and the workplace using the knowledge about the symbolism and meaning of space.

Configurational approach to urban design, such as Space Syntax, is analytical and evidence based in method. It relies on technologically advanced tools for measuring the social performativity of urban form. In context of this approach, patterns of space use changed by use of urban technologies are not of importance since they do not change the basic condition for sociability—spatially mediated co-presence of people. But, as De Waal points out the everyday use and movement through the city is no longer dominantly based on spatial characteristics of urban environment but is also generated by information perceived through digital media technologies.

The representational approach of urban design is much more dependent on the use of "urban media technologies" in everyday city life. This kind of approach is trying to produce a new kind of public space by enhancing the urban experience

[1]The Space Syntax is the name for a group of theories and techniques developed at the beginning of the eighties in the Bartlett University College London—UCL. The theory has grown into a global scientific research program and a wide application in architectural and urban design.

that is already there. It is small-scale approach accumulating small spatial transformations. Methodologically it is based on careful observation of spatial activities and gaining knowledge about spatial meanings. As Crawford points out, it is radically empirical. Within this approach urban design foster also citizens' participation as a method for gaining knowledge about spatial meaning and users' needs.

After discussing what are core themes of urban design and the framework it operates within it is important to understand what happened to urban space in data-rich city context.

5.5 Informational Territory of Urban Space

City and urbanity should be understood within smart city framework of real time monitoring of movement and flow for both people and information. The impact of media technologies is on mobility and on the way we produce and consume information. Quintessential question for (21st century) urban designers would be "How should virtual and physical spaces relate to one another (Mitchell 1995)?" Sociologist Ander Lemon offers the answer to this question coined in the term informational territory. This new type of territory is formed by digital information flow in physical space. Defined like that informational territory is not cyberspace but moving, hybrid space formed by the relationship between electronic and physical space. As Lemon states within informational territory places, as a result of intersection of urban space and cyberspace, become more complex. Such place is dependent on the physical and electronic spaces that it is linked to. These informational territories could be studied empirically by researching the use of public space now equipped with the new infrastructure of wireless networks and devices. Also one could study urban space from socio-cultural point of view by examining and showing the relationship between users and space before and after formation of informational territories (Lemos 2010, 2011).

According to the ways new media technologies are used, De Waal divides them in two groups. First group is about usage of technologies in writing tools or experience markers. This includes bottom up approaches such as describing places, notifications about location of individuals and what are they doing in specific moment (e.g. status on social networks). In first group there are also institutional and governmental mapping and recording of who, where and what is doing. De Waal distinguish second group of media technologies as territorial tools. Those are tools that co-shape human experience of certain physical space. In this group there are also bottom up approaches from the users perspective, e.g. when users while being in park play with their mobile devices and access the Internet over Wi-Fi network. Specific applications, combining writing and territorial tools, are used to help us to choose where to go and why. Territorial tools could also be used by institutions, companies and governments in same way (De Waal 2014).

What De Waal calls territorial tools others call locative media and define it as a set of technologies and info-communicational processes whose informational

content is related to a specific place. Word locative is a grammatical category that expresses place, as “in” or “next to”, indicating the location or the final moment of an action. Locative media encompass various actions from finding information about restaurant with a mobile phone, being guided by GPS in the car, having accurate picture with geographical information system (GIS) and geo-tags and, as mentioned, playing with mobile devices in public spaces among others (Lemos 2010).

5.6 Integral Theory in Rethinking Urban Design: People-Centred Approach in a Digital World

How would urban design take in consideration this hybrid space formed by the relationship between electronic and physical space? How should changed patterns of use be analysed? What are the relations of configurational and representational approaches in this overall changed context of urban design and data-rich city? Integral theory (in general) is concerned with integrating all expanding knowledge now available yet fragmented between specialisms. It is developed by philosopher and transpersonal psychologist Ken Wilber. In the context of urban design role of integral theory is to bring into relationship subjective and objective as well as individual and collective in both—spatial form and social relations. According to the architect, town-planner and critic, Peter Buchanan those core themes of integral theory are explained through Wilbers integrative matrix named AQAL (All Quadrant, All Level) diagram (Buchanan 2012).

The AQAL diagram is defined by two crossed axes. The realm of individual is marked in the upper part of the vertical axis and the collective is in the lower part. On the other side, left side of the diagram marks realm of the subjective and the right part realm of objective. Further, diagram includes and brings into relationship realms of all four quadrants. Upper left Quadrant (UL) is about individual subjective experience and aesthetic pleasure. To Lower Left quadrant (LL) belongs to communal and cultural dimensions of subjective experience, such as meaning, symbolism and shared values. Upper Right (UR) is about function and ergonomics, form and construction. More precisely parts of UR are the objective realms of observed behaviour (function) and the physical characteristics of form and functioning (form, material, construction etc.). In lower right (LR) part of the AQAL diagram there are many systems in which those objective functions and forms operate—economic, ecological, technical, sociological etc. (Buchanan 2012, 2013).

Thinking further about AQAL matrix in the urban design context, we could associate configurational approach to urban design with the realm of Right Quadrants of AQAL diagram. This objective perspective of design covers both physical (UR) and systemic (LR) elements of urban design. In contrast to emphasis on objective in configurational approach, representational approach as more

socio and user oriented belongs to the realm of Left quadrants. Representational approach encompasses subjective perspective of translating cultural elements through design (LL) and individual experience and perceiving of space (UL). All left quadrants subjective perspectives foster greater citizens' participation to shape the city. Of course, informational territory of urban space brings additional elements to AQAL diagram. De Waal's writing and territorial tools are related with both right and left quadrants, but their greater relevance is in left quadrants subjective point of view. In people-centred digital world of today various "instruments" enabled by new media technologies are making the citizens participation more convenient, useful, and playful.

From integral point of view all four perspectives (quadrants of AQAL diagram) are necessary for better understanding of urban design in data-rich cities. Eric Mumford has shown that different ideas about socio-spatial relation were not separate phenomenon and that these differences together produced the core principles of what we today call urban design. In the same manner we could say that urban design today needs integration of existing approaches which will enable reflection on technologically changed patterns of space use and take in consideration the both ways of socio-spatial relation. Even though human activities and social and spatial connections are changed in data-rich city context, human dimension and citizens are in the centre of any design action.

Integral theory offers (effective) framework for understanding variations in points of view that we encounter in urban design. Such integral approach to urban design is the one that unites both subjective and objective perspectives and decision-making in designing and creating people friendly cities of today.

References

Arendt, H. (1958). *The human condition*. Chicago: University of Chicago Press.

Buchanan, P. (2012). The big rethink part 3: Integral theory. The architectural review. http://www.architectural-review.com/rethink/viewpoints/the-big-rethink-part-3-integral-theory/8626996.fullarticle. Accessed 17 October 2015.

Buchanan, P. (2013). The big rethink part 11: Urban design. The architectural review. http://www.architectural-review.com/essays/the-big-rethink-part-11-urban-design/8643367.article. Accessed 15 October 2015.

Castells, M. (1989). *The informational city: Information technology, economic restructuring, and the urban regional process*. Oxford, UK; Cambridge, MA: Blackwell.

Crawford, M. (2008). Everyday urbanism. In J. L. Chase, et al. (Eds.), *Everyday urbanism* (pp. 22–35). New York: The Monacelli Press.

De Waal, M. (2014). *The city as interface: How new media are changing the city*. Rotterdam: NAI Publishers.

Dormhardt, K. S. (2011). From the 'Functional City' to the 'Heart of the City': Green space and public space in the CIAM Debates of 1942–1952. In D. Brantz & S. Dümpelmann (Eds.), *Greening the city. Urban landscapes in the twentieth century* (pp. 133–156). US: University of Virginia Press.

Habermas, J. (1991). *The structural transformation of the public sphere. An inquiry into a category of Bourgeois society*. Cambridge, MA: MIT Press.

Habraken, N. J. (2000). *The structure of the ordinary: Form and control in the built environment*. Cambridge, Massachusetts, London: The MIT Press.

Hauser, G. A. (1999). *Vernacular voices: The rethoric of publics and public spheres* (p. 61). Columbia: University of South Carolina Press.

Hillier, B., & Hanson J. (1984). *The social logic of space*. Cambridge: University Press.

Lang, J. (2005). *Urban design: A typology of procedures and products*. Oxford: Architectural Press.

Lefebvre, H. (1991). *The production of space*. [1974] Translated by Donald Nicholson-Smith. New Jersey: Blackwell Publishing.

Lemos, A. (2010). Post—mass media functions, locative media, and informational territories: New ways of thinking about territory, place, and mobility in contemporary society. *Space and Culture, 13*, 403. doi:10.1177/1206331210374144

Lemos, A. (2011). Locative media and surveillance at the boundaries of informational territories. In R. J. Firmino, et al. (Eds.), *ICTs for mobile and ubiquitous urban infrastructures: Surveillance, locative media and global networks* (pp. 129–149). Hershey: Informational Science Reference.

Mitchell, W. J. (1995). *The city of bits: Space, place and the infobahn*. Cambridge, London: MIT Press.

Mitchell, W. J. (2003). *Me++: The cyborg self and the networked city*. Cambridge, London: MIT Press.

Mumford, E. (2000). *The CIAM discourse on urbanism, 1928–1960*. Cambridge, London: MIT Press.

Mumford, E. (2009). The emergence of urban design in the breakup of CIAM. In A. Krieger & W. S. Saunders (Eds.), *Urban Design* (pp. 15–37). Minneapolis, London: University of Minnesota Press.

Sennett, R. (2002). *The fall of a public man*. London: Penguin books.

Simmel, G. (1971). Metropolis and mental life. In D. Levine (Ed.), *Georg Simmel: On individuality and social forms* (p. 324). Chicago: University of Chicago Press.

Sternberg, E. (2000). An integrative theory of urban design. *Journal of the American Planning Association, 66*(3), 265–278. doi:10.1080/01944360008976106

Weiser, M. (1991). The computer for the 21st century. *Scientific American, 265*(3), 94–104.

Weiser, M. (1993). Some computer science issues in ubiquitous computing. *Communications of the ACM, 36*(7), 75–84.

Zieleniec, A. (2007). *Space and social theory*. London: SAGE Publications Ltd.

Chapter 6
Collaborative Planning Through Visualization: Learning from Urban Living Labs

Giulia Melis

Abstract During recent years, the fast development of Information Technologies (IT) has introduced new opportunities for a sustainable growth of cities. This integration of IT in urban areas has generated the concept of "smart city", promoting a technology driven vision: this quantitative approach however contrasts with the social and qualitative origins of urban co-living. As a result, citizens are long away benefitting from smart technologies within urban areas. This chapter reviews how new digital tools, Planning Support Systems (PSS) and visualization tools in particular, can promote dialogue between planning practitioners, citizens and decision makers, in order to start a collaborative process. The review is illustrate by recent experiences from the city of Amsterdam and other examples.

6.1 Introduction

The fast development of Information Technologies (IT) has introduced new opportunities for a sustainable growth of cities. A deeper knowledge of ongoing phenomena is enabled by big data and city sensing. Urban planning handles problems of the built, natural, and social environment, where a wide range of features have to be balanced against each other to reach solutions (Rittel and Webber 1973).

The integration of IT in urban areas has generated the concept of "smart city", promoting a technology driven vision: this quantitative approach however contrasts with the social and qualitative origins of urban co-living. As a result, citizens are long away from benefitting of smart technologies within urban areas. Nowadays the debate is finally shifting towards a more human dimension, introducing the concepts of people friendliness and human-to-human approach.

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The role of inhabitants as key players in urban planning is progressively gaining importance, recognizing the added value they can bring to planning processes. Inhabitants know the reality and the problems around them better than anyone else. Citizens' knowledge provides a rich source of updated information that helps to improve the quality of the analysis, leading to different solutions than when using traditional forms of data.

Nevertheless, involving members of society in planning decisions affecting their lives is a recent trend, principally influenced by legislation. For instance, the United Nations Local Agenda 21 (UN 1992) program enshrines the practice in its principles; and the Aarhus Convention (UNECE 1998) established that sustainable development can only be achieved by involving stakeholders.

However, public participation for urban planning decisions is not a straightforward process. It deals with problems that coevolve, with an infinite number of solutions (Rittel and Webber 1973; Tang et al. 2005). Besides, the complexity and interdisciplinary characteristics of all studies needed to produce an urban analysis demand up-to-date tools and methods to represent space and its inherent relations. As most urban studies data are found in map forms, visualization capacity, employing mapping services, found in Web 2.0 tools, and the capacity to model multiple outcomes of GIS, are critical (Elwood 2006).

This chapter explores how new digital tools, Planning Support Systems (PSS) and visualization tools in particular, can be helpful in fostering the dialogue between planning practitioners, citizens and decision makers, in order to start a collaborative process. The analysis of some lighthouse experiences from the city of Amsterdam, will help me disentangling how IT tools, and particularly PPGIS and PSS, are used in participatory urban planning, which are the bottlenecks and some lessons learnt so far.

6.2 Context

An assessment of spatial planning practice at the end of the 20th century suggested that the adoption and use of geoinformation tools (geographic information and spatial modelling systems) are far from widespread and far from being effectively integrated into the planning process (Stillwell et al. 1999).

Whilst many tools are being produced and tested, with an increasing trend especially in the last 15 years, by software companies, research groups from the university, private research centres, their use in current planning activities is still not so common.

It may be observed that many planners nowadays have access to the geodata and meta-geoinformation facilities of their organizations, and many are proficient in using their geoinformation tools to perform spatial queries and to generate thematic maps. Progress towards the use of these tools beyond these basic activities to help solve key planning problems through more sophisticated analysis, however, remains very limited (Stillwell et al. 1999). Geoinformation tools appear

to be seldom used for those tasks that are unique to planning, such as visioning, storytelling, forecasting, analysis, sketching, and evaluation (Couclelis 2003; Klosterman 1997).

Studies trying to analyse the reasons from such a shortfall in the adoption of geoinformation tools suggest not only reasons of a technical nature, but also human, organizational, and institutional factors. Most common explanations are that the majority of current tools are far too generic, complex, and inflexible, incompatible with most planning tasks, oriented towards technology rather than problems, and too focused on strict rationality (Batty 2003; Bishop 1998; Couclelis 1989; Geertman and Stillwell 2004; Harris and Batty 1993; Innes and Simpson 1993; Landis 1988; Nedovic-Budic 1998; Scholten and Stillwell 1990; Sheppard et al. 1999; Sieber 2000; Uran and Janssen 2003).

Quite recently, a new generation of geoinformation tools has entered the scene focusing directly on support of spatial planning tasks: they are known as planning support systems (PSS). Harris, in the early 1989, defined PSS as appropriate models for combining a range of computer-based methods and models into an integrated system that can support the spatial planning function. PSS bring together the functionalities of geographic information systems (GIS), models, and visualization, to gather, structure, analyze and communicate information in planning. In other words, PSS can be considered a subset of geoinformation-based instruments that incorporate a suite of components (theories, data, information, knowledge, methods, tools, etc.) that collectively support all of, or some part of, a unique planning task (Geertman and Stillwell 2003). In this way, PSS take the form of 'information frameworks' that integrate the full range of information technologies useful for supporting the specific planning context for which they are designed (Vonk et al. 2005; Klosterman 1997).

Information technology offers new potentials of citizen participation in urban planning. The essential tasks to be achieved with the use of new media can be summarized in providing a communication platform which suppresses a barrier of non-professionalism, allowing for distant contacts and enabling participatory process management (Hanzl 2007).

6.3 Visualization, Perception, Participation

As Patsy Healey already expressed in her book on collaborative planning, contemporary planning theory evolves towards planning through communication and debate (Healey 1997). The creation of a coherent vision proceeds changes in real urban environment: therefore, the city representation in the citizens' minds plays an essential role in reshaping real space. This image is shaped on real city appearance and on information coming from different sources, but it is also influenced by visions of designed transformation published in media.

As Lynch (1960, p. 120) says: "In the development of an image, education will be quite as important as the reshaping of what is seen. […] A highly developed art

of urban design is linked to the creation of a critical and attentive audience. If art and audience grow together, then our cities will be a source of daily enjoyment to millions of their inhabitants."

The production of spatial images is a common practice in different disciplines and activities, especially in scientific research fields, whose aim includes objectivity and transparency as a fundamental principle for conveying knowledge and information. Nevertheless, images include a projective element due to the fact that they concisely represent an object filtered by a subject, on the basis of his/her own vision or intention (De Rossi and Durbiano 2006), which is a peculiarity contrasting with the scientific aim of neutral communication. Thus, how the subject influences both the building and the reading of images is constantly an open question, in which new Information Technologies have a deep influence on the changing of paradigms. The image of a territory is not just the translation of spatial data into a visual platform, but a structured project which must be designed and oriented to a specific task to be achieved, and addressed to a specific target of public (Masala 2014). The perception process is shown in Fig. 6.1.

In a spatial planning process, the exploring subjects are composed by several actors who embody different intentions and knowledge (van den Brink 2007; MacEachren et al. 2004). The heterogeneity of interests, as well as the different viewpoints of many stakeholders, will produce several final objects, one for each actor, which reflects just small parts of reality. This fragmentation in knowing reality can result in misunderstandings and conflicts among the parties. Therefore, one of the duties of participatory spatial planning processes is to manage these differences.

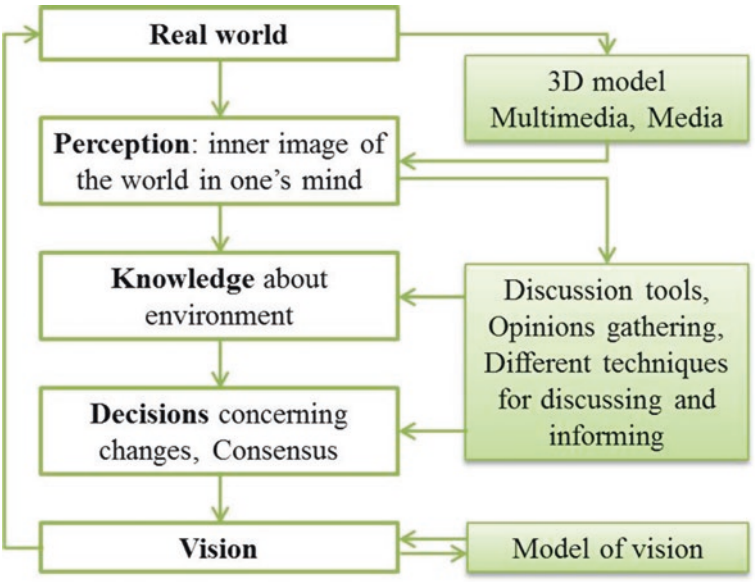

Fig. 6.1 The role of vision and city models in perception process (adapted from Hanzl 2007)

Furthermore previously, maps and territorial representations were always used to support decision-making processes. In fact, images can be easily shared among people with different skills and expertise, so as to create common mental models, intended as the archaeology of our knowledge (Foucault 1969). When somebody observes an image, he receives a visual input, which activates some specific thinking and reasoning, which leads to the creation of a personal knowledge of the object.

Mental models are essential for localising and ordering objects, without which knowledge will not happen. Moreover, without a shared mental model, processes involving many subjects cannot obtain a common basis for pursuing a goal. Therefore, the creation of mental models is a useful tool not only to make people agree, but, in particular, to create a common understanding of planning issues. Thus, to have effective spatial planning processes, the sharing of common mental models is a requisite, which could improve communication among different actors (Masala 2014).

6.4 Recognition of Available Tools

Mapping instruments such as GIS, CAD drawings, parametric models or virtual globes are just few examples of the new technologies widely available to both expert and non-expert users. In particular, many opportunities for next future developments come from the recent progress in the real time processing of large databases, which can be visualised in interactive environments as well as on web platforms, allowing a wide accessibility to spatial data analysis, which implies involvement and collaboration of large numbers of people.

As a consequence, scientific literature commonly recognises the possibilities offered by IT as a new frontier for increasing knowledge sharing within spatial planning processes. A review from Hanzl (2007) has given a quite comprehensive overview of the tools that are being produced and experimented for public participation in urban planning. I'll present here the main categories of those tools, to get an idea of their new potentials and variety.

City models: they are built in order to understand and to represent the processes which take place in the city. 3D models are easy to read, and they can assist non-professional in understanding complex planning issues. Some examples of modelling languages include: 3D models using Virtual Reality Modelling Language (VRML), eXtensible Markup Language (XML), for data exchange on the WWW, the use of multimedia commercial software.

GIS tools, which can be divided in two main families: Participatory Planning GIS (PPGIS), which serve data with spatial reference to wide audience via the Internet, and some of them enable users to express comments. And Planning Support Systems (PSS), which allow for simulation of future state of a site after introducing parameters describing current state and planning conditions. Normally those tools are used for supporting discussion: after introducing desired

developments, the system generates feedback information concerning characteristics of future population, habitats and social structure, etc., which will be used as a basis for informed confrontation among stakeholders. Scenarios can be tested and strategy collectively set.

In addition games can be included in this list as having great educational potential, enable object manipulation within a scene, and show the most advanced branch of computer graphics as to generate 3D graphics in real time. Most common formats are interactive games with a kind of Internet forum with rich interaction possibilities, which develop their potential as communication medium. Simulation games imitate real decision process in conflict situation, thus allowing for taking into consideration behaviours of design participants (Wrona 1981). Starting from the beginning of the 1980s, human participation got on importance and Role Playing Games (RPG) became standard technique for conflict solving, and they are currently used as sociological technique supporting mediations, stressing also the importance of real contacts during the process (see D'Aquino et al. 2003).

With collaborative software, new paradigm of social participation in planning assumes collaboration of all interested parties (Innes and Booher 2000; Sanoff 2000). Both citizens and planners become providers and recipients of information. Such collaboration takes place in design groups and in Internet systems where users are actively engaged in design process. A rapid development of new ways of use of network has been observed in last few years, through groupware, social software, etc. The strength and innovation resides in the fact that those forms use electronic media to improve the mutual understanding of users; according to research on collective intelligence, groups work is not a sum of effects of work of single participants, but provides new values, as an effect of collective work (Hanzl 2007).

6.5 Tools-in-Use for Urban Living Labs

Based on experiences assessing development of Urban Living Labs in the city of Amsterdam (de Waal and Melis 2015): it can be seen that visualization of the problem is a first step before public engagement. In this initial phase, the problem is made visible, and a communication strategy is started by those who are directly concerned by the problem (the initiators of the ULL). It is a phase of clarification and focusing, by re-shaping the issue and visualizing it in an abstract or physical dimension, which sets the stage for public involvement. Yet as described in chapter crowdsourcing, the problem definition and solution search can benefit both a top down and bottom process.

In this study 3 main methods were considered based on previous work of Hanzl (2007), but characterized by the merging of online and offline solutions. The methods are as follows

Fig. 6.2 Public art exhibition for public engagement for the Regional Strategic Plan—promoted by Amsterdam City Planning Department (*Source* 'Free State of Amsterdam', Weblog of Zef Hemel on urban planning, http://www.zefhemel.nl/)

- Graphical Images: The approach uses graphical images to express a concept in a clear, captivating and easy way. For example a spider-graph can be used for rating and giving priorities, as well as many other possibilities related to the infographic domain.
- Physical Models: Models can help people to express their emotions and their feelings by using toy or scale models (Fig. 6.2) such as collage, lego/duplo, *maquette*, or to develop a real prototype, more technologically complex. The choice depends on the time and budget available and on the skills and interests of people involved.
- Public Art Installation: This third approach involves building physical installations to stimulate interest and dialogue between people. The physical presence of such public art make them tangible and different to ignore thus reinforcing sense of community.

Beside those methods, a very effective path for communicating a problem and making it visible, is making municipal data available to all in an understandable and accessible manner. An interesting example in Amsterdam (and surrounding municipalities) is the Energy Atlas, which is showing energy consumption and non-stored waste, thus making transparent to everybody who uses how much energy and when. Making it visible, creating knowledge about how the streams go in the area, underlined consumptions and then opportunities in sharing energy in the real context of the area. This tool was useful for engaging new parties, as starting new sustainable projects in the area.

In addition to the three methods mentioned already a fourth powerful method is storytelling. In Amsterdam, the art of storytelling was used to collect thoughts and problems about one of the study areas in the north of the city. The stories were collected initially at workshops, and then it went online. A satisfying amount of feedbacks were collected when asking people to write stories about what they dream for their neighbourhood. The organizers, in this case, found that the topics were very broad, so people came up with problems they weren't able to solve.

Furthermore Amsterdam Smart City initiative launched a approach that highlighted to participating in the communication phase through serious gaming programmes. Amsterdam Smart City adapted the image of a tree to highlight concerns where apples grow in size as the perceived problem is felt by more people. It was presented initially as an online platform, but then it was later installed in the public space, allowing people to interact physically with the model. The tree visualize the perceived problems in the neighbourhood, with the aim of connecting local inhabitants and works with city organizations willing to respond to the specific issue.

Of course social media networks, were helpful too: almost every case study showed Facebook, Twitter, newsletters/email groups were employed to communicate with local citizens. However the most powerful mode of communication was by word of mouthing particular by, neighbourhood leaders who could collect and communciate the concerns of local residents.

6.6 Considerations for PPGIS

New information technology offers citizens new possibilities of participation in the planning process. New media provide important tools such as communication platforms, which have a fundamental role in suppressing barriers of non-professionalism, allowing for distant contacts, and helping to manage and facilitate a participatory planning process.

In this context data manipulation is a powerful method to get user's engagement (Geertman 2001; Han and Peng 2003). Within PPGIS, as well as other innovative tools, the user is able to examine data and makes decisions about the presentation of data using tools built into the software interface. In this context users are able to select parameters and hence display chosen layers of data representing different visions of sustainable development. Subsequently the different data sets can be combined to generate general indicators, which then may be used to compare different centres according to the level of their sustainability (Hudson-Smith et al. 2002), or to support decision making (Pensa et al. 2012).

An evaluation of pros and cons related to a list of techniques and computer tools available to use in physical planning is contained in Fig. 6.3, elaborated from Bugs et al. (2010).

The Web 2.0 PPGIS makes available urban planning information available to citizens at any time in a useful way, differing from traditional meetings, where there is minimal chance of interchange and information understanding. It

Tool	Pro	Con
Geovisualization	Makes Spatial data available	Does not support opinion sharing
E-mail feedback	Allows opinion sharing	E-mail can be ambiguous and does not enable exchange of spatial data
E-mail plus map with sketches	Transfer spatial content	Does not support transparent exchange of comments: other users do not see
Georeferenced comments	Clear comment geographical location	Comments are not organized or related to one another. No idea on the evolution
Online forum + georeferenced comments	Transparent exchange of comments	Map as user interface to the comments, when is not organizing it
Collaborative Software	Allows user input and two-way flow of information	Data trust and accuracy

Fig. 6.3 Application's tools comparison (adapted from Steinmann et al. 2004; Tang et al. 2005; Bugs et al. 2010)

promotes communication among users, and most importantly, vertically—with decision makers—in a more interactive and straightforward way.

Nevertheless, most of the examples of PPGIS described in literature are still experimental, and have not been tested in real situations. Most of the researches verify available technical possibilities and do not match real actions connected with social participation in planning.

In most of the cases, introduction of PPGIS is constrained by lack of funds, politics of authorities and technical factors: data transfer restrictions or lack of network. In most cases, the main function of system is the informative one. The restriction of use of 3D graphics is an effect of costs and time consuming (Hanzl 2007). Most of examples show how computer tools may be used for visualising the new development and not for constructive process of continuous public participation.

On the other side, great potential lies in the use of collaborative software and groupware. The applications of this kind may be used in the citizens' activity independently from the official authorities actions, reinforcing bottom-up approaches, which are showing up in growing applications in the last years.

Beside this, inhabitants are able to add an enriching insight on urban planning topics. They refer to city problems that would not be visible from traditional forms of data, and give voice to particular opinions that could not be considered in the decision making, simply because there is no opportunity, or lack of knowledge on the everyday functioning of an urban area from the planners side.

Relying on those considerations, the combination of traditional methods with novel Web 2.0 participatory tools can strengthen participatory urban planning and eventually empower the role of citizens.

However not all the tools, have the same participatory potential. Different attempts have been made to interpret different forms of online participation using the ladder of citizens' participation proposed by Arnstein (1969). The lowest step of the ladder describes an utterly passive behaviour and concerns public right to know, while the full interactivity occurs at the top of the ladder as the participation

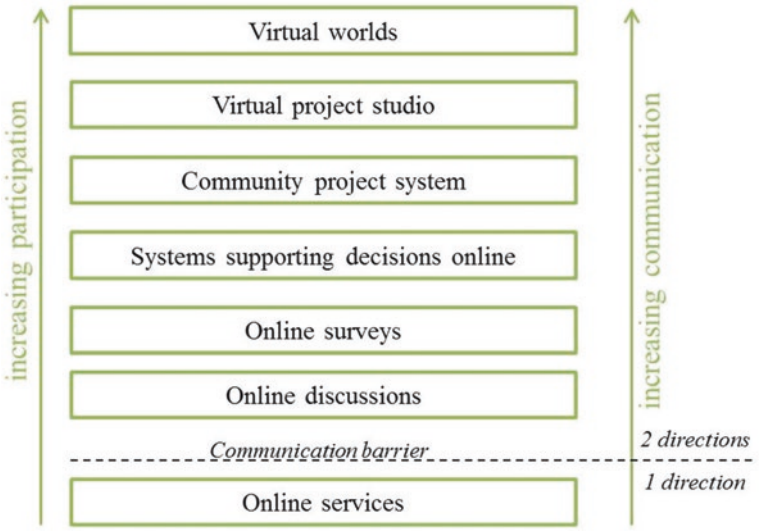

Fig. 6.4 Ladder of e-participation (adapted from Hudson-Smith et al. 2002)

in making decisions. The tools used will therefore undermine the level of engagement that can be reached: an accurate choice has to be considered in advance, before starting the process.

Elaborating on a schema devised by the scientists from Leeds (Jankowski and Nyerges 2001; Kingston 2002), a group of scientists from CASA, London, proposed a new schema, which is presented above as an attempt to refer online geographical participatory tools to the expected citizen involvement (Fig. 6.4): in the lowest step passive supporting of information is represented, while the highest one are systems supporting decisions working via the Internet, adding also the design by local society and virtual worlds. It is believed that such actions may engage more participants as actors of virtual scenes than in systems supporting decisions (Hudson-Smith et al. 2002).

6.7 Developing a Playable City Model

PPGIS and online tools in some cases can be perceived as a technological evolution of more traditional participation methods enabling more interactive engagement: they could be able to overcome weaknesses pointed out by some critics as for example the limited ability to sufficiently engage the public, to provide useful data, and to promote an exchange of ideas (van den Brink 2007).

Web 2.0, as defined by O'Reilly (2005), is contributing to turn the Web into a participatory platform, in which people not only consume content (via downloading) but also contribute and produce new content (via uploading). By creating new and useful links between users and data-providers, Web 2.0 is breaking the barriers among them (Hudson-Smith and Crooks 2008) by means of new techniques (tagging, social networks, blogs, wikis, mashups).

Although those technologies are enabling innovative, collaborative, and easy-to-use services and applications, embedding participatory practices into existing institutional organizations still needs plenty of effort. As van den Brink (2007) have stated, high resistance, lack of qualifications and variable interest by participants are acting together as entry barriers.

Anyway, an interesting attitude emerged, based on the ability to connect official and informal information: users are more proactive in creating Web 2.0 spatial content themselves. Neogeography (Turner 2006) and Voluntary GIS (Goodchild 2007) show the successful user-created-content map applications (Haklay and Weber 2008). Therefore, paying attention to Web 2.0 techniques is essential to collaborative decision-making.

The concept of 'playable city', which has recently been explored by Michiel de Lange for so called "Cyberparks" (de Lange 2015), creates coherence between numerous pervasive media projects that take place in the urban domain and that involve people's active participation. This insight enriches the considerations presented so far, giving new input for an effective participatory planning practice.

The term connects three parallel developments.

Firstly, the playable city refers to the interactive qualities, affordances and cultures of various digital media technologies: allow for more interactive ways of storytelling and staging, and playfulness describes a way of tinkering and hacking with an open and inquisitive attitude.

Secondly, it refers to civic participation. Many people want to become more actively involved in shaping the world around them as "professional amateurs" and "hackers". Citizen engagement oftentimes occurs through playful artistic urban interventions, towards a co-creation process.

Thirdly, and underexplored theory, the playable city sets a specific type of political frame around urban life and planning in terms of "urban commons" as shared public resource.

Being involved in a game such as cyber parks allows people to have new experiences of their city, which remain even long after the play or game is over. De Lange reports some comments of people who had this experience: "Now I can't go to these places anymore without thinking about the game. You remap your image of the city. This gives you a sense of ownership", or "I had seen a different side of the place, a secret. The game unveiled a secret about my own relationship to that place and instilled new memories". A very powerful new feeling of ownership can arise from playing somewhere: "having a playful experience makes people feel it's their city, not the city of the designers" (de Lange 2015).

6.8 Conclusions

Drawing on the commentary recently written by Metzger (2014), collaborative planning captures the ambition of citizen engagement for a more responsible urban planning and highlights the ethical responsibility for the role of planners, as well as inhabitants, in the city as a shared living space. In a similar vein Healey (2010) developes democratic and inclusionary planning methods for generating collective caring for place as a more-than-human entity. The "planning project" or "place governance with a planning inclination", thus crucially appears as a "matter of care" combining a thoughtfulness about an issue, as well as sense of belonging of those 'affected' by it, with a "strong sense of attachment and commitment" (de la Bellacasa 2011; Metzger 2014). The crux of the matter of Healey's argument is that this type of sensibility does not come about by itself. It requires active cultivation through skills, tools, and technologies. Care and technical tinkering, broadly conceived, go hand in hand in process of spatial planning. But Mol (2008) also cautions: "Technologies always have unexpected effects: they generate forms of pain and pleasure that nobody predicted. […] Do not just pay attention to what technologies are supposed to do, but also to what they happen to do, even if this is unexpected" (Mol 2008, p. 56). If we really want to develop spatial planning "as a technology aiming towards actively enacting a more-than-human caring for place we have to develop a whole new methodological toolbox so as to avoid just reproducing existing dominant, ecologically socially and economically highly destructive, patterns of action" (Metzger 2014, p. 1009).

References

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners, 35*(4), 216–224.

Batty, M. (2003). Planning support systems: Techniques that are driving planning. *Planning Support Systems in Practice*, 8.

Bishop, I. D. (1998). Planning support: Hardware and software in search of a system. *Computers, Environment and Urban Systems, 22*(3), 189–202.

Bugs, G., Granell, C., Fonts, O., Huerta, J., & Painho, M. (2010). An assessment of Public Participation GIS and Web 2.0 technologies in urban planning practice in Canela, Brazil. *Cities, 27*(3), 172–181.

Couclelis, H. (1989). Geographically informed planning: Requirements for planning relevant GIS. In *36th North American Meeting of Regional Science Association*.

Couclelis, H. (2003). The certainty of uncertainty: GIS and the limits of geographic knowledge. *Transactions in GIS, 7*(2), 165–175.

D'Aquino, P., Le Page, C., Bousquet, F., & Bah, A. (2003). Using self-designed role-playing games and a multi-agent system to empower a local decision-making process for land use management: The SelfCormas experiment in Senegal. *Journal of Artificial Societies and Social Simulation*, *6*(3).

de la Bellacasa, M. P. (2011). Matters of care in technoscience: Assembling neglected things. *Social Studies of Science, 41*(1), 85–106.

de Lange, M. (2015). The Playful City: play and games for citizen participation in the smart city. Report of the STSM may 2015, COSTb Action TU1306 Cyberparks. http://cyberparks-project.eu/sites/default/files/stsm/150518_Michiel_de_Lange-STSM_report_Bristol.pdf. Consulted on 15 December 2015.

De Rossi, A., & Durbiano, G. (2006). *Torino 1980–2011. La trasformazione e le sue immagini* (pp. 1–120). Umberto Allemandi & C.

de Waal, M., & Melis, G. (2015). Urban living labs & citymaking: Open innovation and urban design. In B. Cohen, & E. Almirall, (Eds.), *Open Innovation as a driver for Smart Cities*. Netherlands: Springer.

Elwood, S. (2006). Critical issues in participatory GIS: Deconstructions, reconstructions, and new research directions. *Transactions in GIS, 10*(5), 693–708.

Foucault, M. (1969). AM (1972) The archeology of knowledge and the discourse on language. Trans. AM Sheridan Smith. New York: Pantheon Books.

Geertman, S. (2001). Planning support by PSS: an inventory. In CUPUM-2001 conference, Honolulu.

Geertman, S., & Stillwell, J. (2003). *Planning support systems in practice*. Berlin/Heidelberg: Springer.

Geertman, S., & Stillwell, J. (2004). Planning support systems: An inventory of current practice. *Computers, Environment and Urban Systems, 28*(4), 291–310.

Goodchild, M. F. (2007). Citizens as sensors: The world of volunteered geography. *GeoJournal, 69*(4), 211–221.

Haklay, M., & Weber, P. (2008). Openstreetmap: User-generated street maps. *Pervasive Computing, IEEE, 7*(4), 12–18.

Han, S. S., & Peng, Z. (2003). Public participation GIS (PPGIS) for town council management in Singapore. *Environment and Planning B, 30*(1), 89–112.

Hanzl, M. (2007). Information technology as a tool for public participation in urban planning: A review of experiments and potentials. *Design Studies, 28*(3), 289–307.

Harris, B. (1989). Beyond geographic information systems. *Journal of the American Planning Association, 55*(1), 85–90.

Harris, B., & Batty, M. (1993). Locational models, geographic information and planning support systems. *Journal of Planning Education and Research, 12*(3), 184–198.

Healey, P. (1997). *Collaborative planning: Shaping places in fragmented societies*. UBC Press.

Healey, P. (2010). *Making better places: The planning project in the twenty-first century*. Palgrave Macmillan.

Hudson-Smith, A., & Crooks, A. (2008). The renaissance of geographic information: Neogeography, gaming and second life.

Hudson-Smith, A., Evans, S., Batty, M., & Batty, S. (2002). *Online participation: The Woodberry Down experiment*. CASA London.

Innes, J. E., & Simpson, D. M. (1993). Implementing GIS for planning lessons from the history of technological innovation. *Journal of the American Planning Association, 59*(2), 230–236.

Innes, J., & Booher, D. E. (2000). Indicators for sustainable communities: A strategy building on complexity theory and distributed intelligence. *Planning Theory and Practice, 1*(2), 173–186.

Jankowski, P., & Nyerges, T. (2001). *GIS for group decision making*. CRC Press.

Kingston, R. (2002, July). The role of e-government and public participation in the planning process. In *XVI Aesop Congress Volos, available at:* http://www.ccg.leeds.ac.uk/democracy/presentations/AESOP_kingston.pdf

Klosterman, R. E. (1997). Planning support systems: A new perspective on computer-aided planning. *Journal of Planning Education and Research, 17*(1), 45–54.

Landis, J. D. (1988). Microcomputers in US planning: Past present and future. *Environment and Planning B: Planning and Design, 15*, 355–367.

Lynch, K. (1960). *The image of the city*, vol. 11. MIT press.

MacEachren, A. M., Gahegan, M., Pike, W., Brewer, I., Cai, G., Lengerich, E., et al. (2004). Geovisualization for knowledge construction and decision support. *Computer Graphics and Applications, IEEE, 24*(1), 13–17.

Masala, E. (2014). Visualisation as a support to spatial decision processes: Some considerations on the concepts behind the construction of a strategy image. In: *Interactive Visualization Tool for Brownfield Redevelopment-A European experience* (pp. 81–94). Torino: Celid.

Metzger, J. (2014). Spatial planning and/as caring for more-than-human place. *Environment and planning A, 46*(5), 1001–1011.

Mol, A. (2008). *The logic of care: Health and the problem of patient choice*. Routledge.

Nedovic-Budic, Z. (1998). The impact of GIS technology. *Environment and Planning B, 25*, 681–692.

O'Reilly, T. (2005). Web 2.0: compact definition. *Message posted to* http://radaroreilly.com/archives/2005/10/web_20_compact_definition.html

Pensa, S., Masala, E., Marietta, C., & Tabasso, M. (2012). InViTo: An interactive visualization tool for supporting planning processes.

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences, 4*(2), 155–169.

Sanoff, H. (2000). *Community participation methods in design and planning*. London: Wiley.

Scholten, H. J., & Stillwell, J. C. (1990). Geographical information systems: The emerging requirements. In *Geographical Information Systems for Urban and Regional Planning* (pp. 3–14). Netherlands: Springer.

Sheppard, E., Couclelis, H., Graham, S., Harrington, J. W., & Onsrud, H. (1999). Geographies of the information society. *International Journal of Geographical Information Science, 13*(8), 797–823.

Sieber, R. E. (2000). GIS implementation in the grassroots. *URISA Journal, 12*(1), 15–29.

Steinmann, R., Krek, A., & Blaschke, T. (2004). Analysis of online public participatory GIS applications with respect to the differences between the US and Europe. In *Proceedings of the Urban Data Management Symposium'04*.

Stillwell, J., Geertman, S., & Openshaw, S. (1999). Developments in geographical information and planning. In *Geographical information and planning* (pp. 3–22). Berlin/Heidelberg: Springer.

Tang, T., Zhao, J., & Coleman, D. J. (2005, August). Design of a GIS-enabled online discussion forum for participatory planning. In *Proceedings of the 4th Annual Public Participation GIS Conference*, Cleveland State University, Cleveland, Ohio, USA.

Turner, A. (2006). *Introduction to neogeography*. O'Reilly Media, Inc.

United Nations (UN), Agenda 21. https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf. Consulted on 15 December 2015.

United Nations Economic Commission for Europe (UNECE), Aarhus Convention, http://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf. Consulted on 15 December 2015.

Uran, O., & Janssen, R. (2003). Why are spatial decision support systems not used? Some experiences from the Netherlands. *Computers, Environment and Urban Systems, 27*(5), 511–526.

van den Brink, A. (Ed.). (2007). *Imaging the future: Geo-visualisation for participatory spatial planning in Europe,* Vol. 3. Wageningen Academic Publisher.

Vonk, G., Geertman, S., & Schot, P. P. (2005). Bottlenecks blocking widespread usage of planning support systems. *Environment and planning A, 37*(5), 909–924.

Wrona, S. K. (1981). *Participation in architectural design and urban planning*. Wydaw-a Politechniki Warszawskiej.

Chapter 7
A Social Work Perspective on Socio-technological Innovations in Urban Planning and Development

Tanja Klöti, Matthias Drilling and Carlo Fabian

Abstract In the field of sustainable urban development ModularCity as a socio-technological innovation, which combines methods and approaches from computer-assisted planning, geography and social work. It allows planning representatives to analyse the socio-spatial context of future development projects by editing, collecting and visualizing geo-referenced, objective as well as subjective, data in one planning tool. This article explores ModularCity's impact for participative and socially sensitive urban planning and reflects the options and limits of data-driven analysis and socio-spatial visualization. The focus is on the translation between stakeholder's different planning concepts, goals and languages and it will be discussed how ModularCity's strategies of integration, visualisation and responsiveness serve to the translational demand in sustainable urban planning.

7.1 Introduction

In the last few decades, the planning and management of cities has increasingly become a field for inter- and multidisciplinary cooperation (Evans 2012). The participation of stakeholders from different professional and scientific backgrounds has been brought forward by the communicative turn taking place in planning theory since the seventies (Healey 1992). While this so-called horizontal participation calls for a collaboration between experts of different fields (e.g. planners

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and social workers), a vertically oriented participation targets to involve citizens in planning processes by means of informal processes (e.g. agenda setting, planning workshops, etc.). Today, collaborative planning "starts with the question: "How can we 'make sense' of what is happening and plan for the future within a dynamic and increasingly complex society?" (Allmendinger 2009: 127). To analyse urban processes an integral and holistic perspective on physical and social structures as well as human actions in social spaces is required in particular a specific focus on people and their daily living conditions. Therefore, the expertise of social work is becoming increasingly integrated in urban planning practices due to the growing awareness of the role of social factors in urban transformation processes (see Drilling 2013).

7.2 Social Work in Urban Planning

7.2.1 The Concept of Planning-Oriented Social Work in Urban Planning

Social work originates back to the 19th century and has from its outset been strongly dedicated to supporting an urban development which fosters liveable and inclusive urban environments for all citizens. In Chicago Jane Addams, one of social work's pioneers, supported social reforms for the poor by conducting urban research and proposing community oriented services in city districts (Kolko Phillips and Straussner 2002). In its ensuing history the field of urban social work followed different conceptual strands and practices, aiming for more participation of citizens in urban development processes. While the tradition of community organizing demanded for more civic power in political processes of urban planning (during the 1920s–1960s), newer approaches such as neighbourhood development or neighbourhood management focus on activating local communities to engage in their daily communal life (Oehler and Drilling 2013, pp. 17–28).

Planning-oriented social work is characterized by a stronger but still critical collaboration of social workers with planning authorities, either to represent the residents' interests in planning processes or to create possibilities for direct participation of citizens. One of its main tasks is to mediate between different planning actors and their relative concepts, goals, and professional languages. It aims for having a real impact on planning practices by integrating social work standards in urban planning processes on different spatial levels. This may concern the design and use of public spaces, the development of neighbourhoods, the planning of a whole new settlement area or infrastructural development in a city as well. Among others social work professionals need to develop so-called *urban planning capabilities* to effectively collaborate in processes of urban planning and development to convincingly represent the professional principles of *social justice*, *democracy* and *the right for supportive living environments for all urbanites* (Oehler and Drilling 2013, p. 33). The concept of planning-oriented social work is therefore

strongly committed to the idea of sustainable urban development which in the area of urban planning functions as a bridging concept between social work standards and urban planning tasks.

7.2.2 Social Sustainability in Urban Planning

Applying a social work perspective and its professional standards to urban planning processes puts the focus on *urban social problems*. These problems are treated as structural conditions as well as output of urban planning practices in an ongoing process of urban transformation on the global, national and local levels (e.g. global and regional economic crises, international and internal migration, social polarisation between regions, cities and neighbourhoods, etc.). Transformations are shaped by negotiation processes between various interests (politics, business, civil society, planning and administration, associations, etc.) producing unequal access to urban goods as housing, infrastructure or social support. To handle these problems the concept of planning-oriented social work aims to influence urban planning processes to enhance a more inclusive and socially just urban environment, which may be also called a socially sustainable urban development (Drilling 2013).

The two main *principles* of a socially sustainable urban development are (1) the consequent and ongoing participation of affected and marginalized social groups and (2) the enhancement of access to relevant social goods and equal opportunities for all citizens:

1. Participation as inherent principle of socially sustainable urban development aims to redistribute resources and influence in urban planning processes by empowering less powerful groups in the negotiation process. Meaningful instruments are the establishment of intermediate institutions as well as binding communicative processes that enable citizens to take part not only in planning projects but also in overall planning institutions and procedures. Planning-oriented social work also tries to support communities, social networks and movements to have a voice in urban planning processes.
2. Socially just urban planning focuses on the fostering of equal urban living conditions by providing resources for affected or marginalized citizens. These resources may be material like housing, access to open spaces or barrier-free mobility, as well as immaterial like social networks, social support or collective identity. Urban planning should therefore be socio-spatially sensitive which means taking into account the life worlds of current or future residents by analysing social inequalities and integrating citizens needs and resources such as for an ageing society (Drilling and Oehler 2013).

The past experiences of social workers engaged in socially sustainable urban development have shown many challenges in integrating a social perspective in urban planning processes (Klöti et al. 2014; Selle 2013). On the one hand, numerous so called participative planning processes often neglect the needs and interests

of non-affluent groups, either because they are underrepresented or not included at all. But also more inclusive settings are still restricted in their participative capacity because participation in Switzerland is mostly arranged top down and does therefore rather reproduce than transform existing political and professional hierarchies. On the other hand, the integration of informative data about socio-spatial processes is costly, needs expert knowledge and is therefore rarely conducted. In addition the consideration of qualitative data is especially complex because of their multidimensional and often subjective character (Stark et al. 2013). It is therefore not surprising that in today's conventional planning practices technical affordances and economic parameters are often of primary importance while social factors are treated as subordinated.

7.2.3 Socio-technological Innovations in Urban Planning

Related to their professionalization, social workers are interested in collecting data on socio-spatial contexts (by professionals or by the citizens themselves) as well as in activating and involving citizens in urban transformation processes. Professionals working in this field use a variety of quantitative and qualitative methods to support participative involvement of citizen's needs and interests in development projects on different spatial levels. While classical methods (e.g. citizen panels, planning for real or activating surveys) are designed in such a way that mostly people with strong intellectual, time and language capacities participate, the so-called "new procedures of cooperative planning" enable new forms of participation using internet and social medias to reach out to more and different people regardless of their location. Due to their visual vocabulary and virtual interactivity these tools may engage also lay people to participate in planning processes, especially those who are not familiar with expert knowledge and language (Neuhaus et al. 2015). In this sense socio-technological innovations have the potential to support social sustainability in urban planning as described above.

7.3 The Demand for Translation in Sustainable Urban Planning

One of the main challenges for sustainable urban planning lies in the bridging of unlike positions, values and knowledge of all involved actors: The claim for participation as well as the integration of the resident's needs and living conditions in urban planning demand for translation on different dimensions, for example:

1. between the resident's life worlds and the professional perspectives of experts;
2. between disciplines involved in the planning process (e.g. social work, urban planning, construction, regional economy, etc.);
3. between real world situations and planning instruments such as plans or models.

The disruptions between the involved actors may occur on three different levels following a deriving succession: Firstly the *mental representations* of the city may differentiate distinctively between different professions and viewpoints (e.g. city as a functional space vs. city as a social space). The way "the city" is mentally represented determines which questions and urban challenges are focused on. Therefore secondly in planning settings various *values and goals* about future urban development can come into conflict (e.g. economic growth vs. social stability), even though shared democractic values should be the touch stone for all decision making. These goals are not always explicit but structure decisively the negotiation processes between all stakeholders. Thirdly they are expressed by different *means and modes of communication* such as specific terms, participative procedures, routines or visualisation techniques. These communicative practices may vary between the involved actors and may impede or support the co-production of urban planning.

The demand for translation in sustainable urban planning goes along with the request to break with established concepts, popular goals and the conventional means to pursue and legitimate them. This reorientation may be guided by Habermas' theory of communicative rationality (Habermas 1981) which seeks to realise objective decisions not based on formal rationality but on agreement between individuals reached through free and open discourse. Planning is therefore defined as interactive and communicative process (Healey 1992) in which different stakeholders negotiate about their visions, values and goals. It must be performed through open debate achieving mutual understanding and, if possible, result in consensus (Innes 1996). Equally of importance is the requirement to give room to possible conflicts between different concepts, goals and values of planning actors. Referring to Chantal Mouffe's theory of a conflictive democracy (Mouffe 2007), conflicts in planning processes should not be obscured but carried out. The demand for translation in sustainable urban planning likewise needs the articulation of opposite positions to broach the issues about social inequalities between different social groups.

The following paragraphs discuss the challenges of communication in sustainable urban planning by developing a tool for area development called ModularCity. It focuses on the processes of integrating different concepts of city and goals of urban development in one communicative instrument and discusses how such a socio-technological innovation answers to the demand for translation in sustainable urban planning.

7.4 Socio-spatial Analysis with ModularCity

ModularCity is a socio-technological innovation which was developed by a collaboration of research institutes, private enterprises and the city administration of Langenthal. The project aimed to develop a planning software to edit, analyse and visualise objective as well as subjective data about a specific area under

development. It was conducted from 2011 to 2014 and completed by testing a software prototype in Langenthal, Switzerland.[1]

The project aimed to develop a planning software which allows to collect, edit, visualize and analyse socio-spatial aspects of a development area. Above all the visualisation of the socio-spatial context of an area shall offer an expanded basis for discussion in interdisciplinary working groups and enhance a systematic consideration of all relevant factors.

The projects demand was primarily to combine methods from computer-assisted planning (Urban ROI[2] Designer © by TSquare) and geography (geo-information system GIS) with approaches from social work (participation and socio-spatial analysis) in one software tool aiming to integrate socially relevant factors in the planning process. To select the interesting variables the project team was assisted by the methodology of socio-spatial analysis used in professional fields such as social planning or urban and district development (Riege 2012). The basic assumption behind this approach is that urban qualities (for example of public spaces) are not only shaped by physical conditions (like the design of the place) but also constructed through processes of appropriation by the users. ModularCity therefore tried to integrate socially relevant data about a development area in one planning tool, namely the social structure of the residents surrounding the development area (objective data) as well as the urbanites' subjective perception, daily use, and personal evaluation of the area (subjective data). Table 7.1 shows the main steps of the socio-spatial analysis to develop the ModularCity planning software.

7.4.1 Subjective Analysis with an Online Survey in Langenthal

One of the software's components is a survey-tool for collecting and visualizing data about the perception, use and evaluation of a defined area by the neighbourhood residents. Referring to the concept of sustainable urban development this tool aims to take into account the subjective perceptions and needs of urban residents in planning processes in the city. The survey comprises 5 closed questions and one open one about the following topics: subjective definition of the depicted area, means and routes of transport as well as activities on the area, positively and negatively perceived places on the area, qualities and atmosphere as well as problems and potentials of the area.

To test the tool a development zone in Langenthal was selected and all in the area registered 834 households (1582 persons) as well as 524 local businesses and

[1]For more information see www.modularcity.ch.

[2]ROI stands for Return of Investment.

Table 7.1 Main steps of the socio-spatial analysis by ModularCity

Phase	Steps	Example	Techniques used
Objective socio-spatial analysis	Definition of socio-spatial dimensions with relevance to a socially sustainable urban development	Social structure in the area	
	Operationalising the dimensions into objective variables	Age distribution among the residents in the area	
	Data collection using existing communal data bases	Individual ages out of the communal population register	
	Geographic referencing of the data and integration in the planning software	Aggregation of the individual ages and allocation to apartment blocks	GIS
	Visualization of the variables in a virtual 3D-model		Visualization techniques
Subjective socio-spatial analysis	Definition of socio-spatial dimensions with relevance to a socially sustainable urban development	Quality of use of an area	
	Operationalising the dimensions into subjective variables	Resident's activities on the area	
	Data collection using an online survey	Mapping activities on a map of the area	Map-based online survey
	Geographic referencing of the data	Aggregation of the individual answers and generation of density maps	GIS

institutions have been invited to participate in the study which lasted from 18th June to 16th July 2013. The novelty about this application is its map-based concept which makes possible to geo-reference the relevant information. Designed as an online survey the tool allows the respondents to answer the questions online by drawing lines or placing icons on a map (see example in Fig. 7.1).

Therefore it is possible to analyse the data by editing it on maps showing the location and density of the resident's answers (see example in Figs. 7.2 and 7.3).

The comparison of the positively and negatively marked places in the online survey allows to identify those places on the area whose should either be conserved or optimized. In this way the planning authorities gain insight in the area's hotspots of conflict and potentiality; these places could be treated with high priority in the planning process.

Fig. 7.1 Question in online survey: "Mark on the map places you like with the green pin and places you don't like with the red pin."—© GoogleMaps 2014.

Fig. 7.2 Density map of positively marked places in the online survey—(Fabian et al. 2013)

Another question of the online survey treats the means and routes of transport through the area. The participants are asked to choose the relevant transport mean and draw on the map the route by which they transverse the area (see Fig. 7.4).

The generated density maps (see Fig. 7.5) show that the site is modestly accessible from the inner city in the north but lacks sufficient access routes from and to the surrounding districts.

Fig. 7.3 Density map of negatively marked places in the online survey—(Fabian et al. 2013)

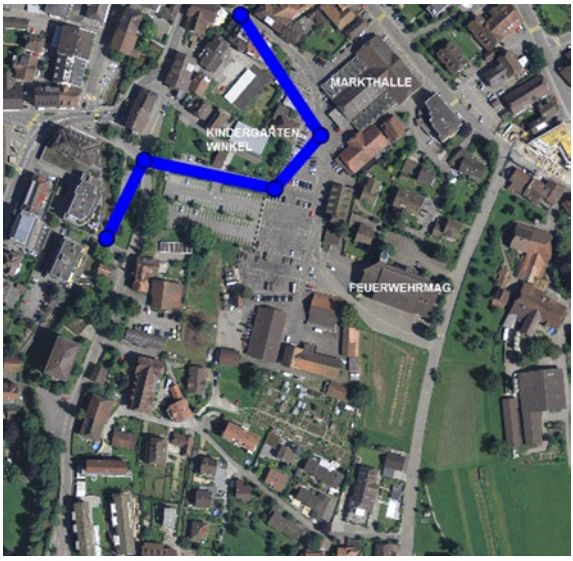

Fig. 7.4 Question in online survey: "Draw on the map by which means and on which routes you traverse the area." © Google Maps 2014

These results can be complemented by other findings of the survey concerning the subjective definition of the area borders. The respondents are asked to indicate on the map how they would personally define the respective area (see Fig. 7.6). By clicking on the map they can set the corner points that are automatically connected to one territory.

Fig. 7.5 Density map of all means and aggregated routes of transport in the online survey (Fabian et al. 2013)

Fig. 7.6 Question in the online survey: "Plot on the map the area in demand by clicking on the corner points of its territory." © Google Maps 2014

Every single area defined can be aggregated to one density map; in this case study the subjectively marked neighbourhood boundaries were differentiated for three different age groups (see Figs. 7.7, 7.8 and 7.9). The resulting maps show that the definition of the area varies according to the respondent's age, but the majority of all participants perceive the area's border in the north-eastern direction as quiet clearly defined by two main roads.

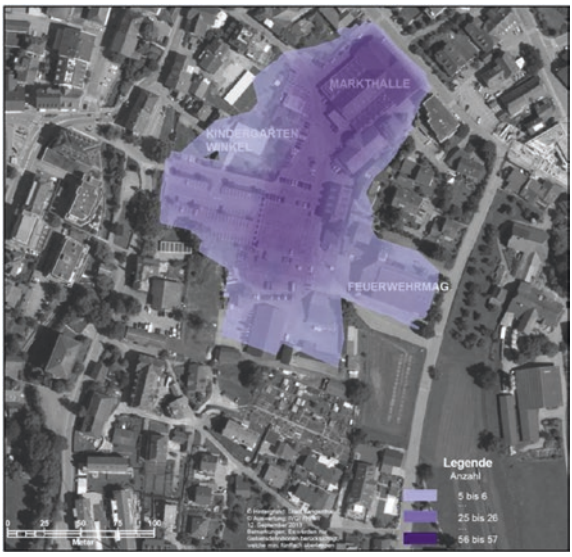

Fig. 7.7 Density map of the subjective area definition of respondents under 31 (Fabian et al. 2013)

Fig. 7.8 Density map of the subjective area definition of respondents between 31 and 50 (Fabian et al. 2013)

The findings of both questions illustrate that the main access routes to the respective area come from the inner city north-western of the area. The access from north-eastern direction is less open because of two main streets. The accessibility from the south may be judged as potential but not yet fully developed. Planning priorities may therefore lay focus on fostering the linkage between the

Fig. 7.9 Density map of the subjective area definition of respondents above 50 (Fabian et al. 2013)

area and its surrounding living districts in the south assuming that the better the respective area will be embedded in its context the more people will have access to the area and use its facilities.

By assessing socio-spatial resources and processes through ModularCity various issues concerning the urban living conditions can be raised: Although access to the area is provided sufficiently the actual usability of the space is limited. One of the main reasons for this is the lack of adequate infrastructure and spatial qualities (marked respectively mentioned by the participants of the online survey) impeding the use of the site as a place for social encounter and leisure activities. Another issue refers to the insufficient provision of green open spaces, a problem also related to the stated unpleasant atmosphere on the site. Following the approach of socio-spatial analysis this data can be compared to the structural context of the site that was provided by already existing communal databases of Langenthal. This comparison of subjective and objective information reveals gaps in the existing infrastructure as well as potentials for the future development of the area pointing for a more multifunctional use of the different places on the site.

7.5 Discussion

The initial results obtained for ModularCity's online survey tool speak for themselves as providing a valuable contribution to urban planning processes. As such, it highlights the need for the inclusion of different perspectives and viewpoints in the planning process to result in a socially sustainable urban planning solution.

When reviewing the lessons learnt from the study exercise, one of the main characteristics of the study was its interdisciplinary approach, concerning both the involved disciplines (geo-informatics, social work, urban development and software-engineering) and the cooperation between communal administration, residents, universities and private enterprises. This consortium partially mirrors the different working arrangements taking place in actual planning and development projects and affords a constant bridging of unlike concepts, values and goals of all involved actors.

The capacity of ModularCity to accommodate conflicting perspectives as well as to enable the establishment of a mutual understanding can be grouped into three translational strategies: (1) integration, (2) responsiveness, and (3) visualisation.

7.5.1 Integration

As described in Sect. 7.4, ModularCity tries to integrate different variables in one planning tool: The combination of objective as well as subjective socio-spatial analysis allows comparing the structural components of a development area with the subjective perceptions, uses and evaluations of the residents. Furthermore ModularCity attempts to relate physical aspects of an area with questions of access to resources provided by the area. In this respect ModularCity contributes significantly to the concept of sustainable urban development by bridging between different *mental representations of the city* as follows:

1. the social work's perspective on the given area captures several social processes and characteristics by integrating data about social structure and subjective perception. As a result it was possible to sensitize the planning authorities and decision-makers for the social work profession's questions, such as the distribution of and access to relevant social goods in the city (e.g. access to public space);
2. visualising a surrounding neighbourhood through the daily living perception of residents captures important intricate knowledge about qualities of urban spaces, which can be used further in the planning process;
3. supporting the politicians' responsibility to be aware of the legitimate concerns about communal questions, ModularCity offers a more sophisticated knowledge base for political decision-making;
4. for planners the functionality of urban spaces is one criterion for quality in urban spaces. Considering that besides the physical design also social processes are of relevance for the functionality of a space ModularCity makes those "soft" factors more tangible for planning experts.

Even though ModularCity proved to be a valuable tool, it was difficult to integrate the generated density maps (see figures in Sect. 7.4) in the already existing planning software Urban ROI Designer. These problems are discussed in the next paragraph.

7.5.2 Visualisation

The ModularCity platform made visible information that is not normally so readily available and as such the software tool provides a more sophisticated understanding of the concept of socially sustainable urban development. In comparison with other available software ModularCity allows the mapping of access to and use of the area's resources (e.g. leisure facilities, places for social encounter, green spaces, etc.). Hence it enables planning experts to better understand the social consequences of future development projects. Therefore ModularCity tries to facilitate the translation between different languages of planning experts and citizens.

However, linking the real and the virtual world is challenging. As every aggregative procedure in research leads to a reduction of complexity ModularCity also standardizes those social processes that it attempts to record. While the real life experience of the city is rather subjective and very dynamic their visual representations in ModularCity appear quite static and objectified. Due to the intention to facilitate the communication between different languages these visualisations may lead to an oversimplification of rather complex processes. If not interpreted correctly and with professional caution the visualisations of ModularCity may be misunderstood or even misused as visible proofs of doubtful facts.

Additionally a combined visualisation of both data from subjective and objective socio-spatial analysis could not have been developed sufficiently because of technical hindrances in the planning software. Only the objective data about social structure as well as some of the survey results got visualised in 3D (see Fig. 7.10).

In these cases the collected data is visualised as integrated in the building landscape and therefore gives the impression that the very individual behaviour of people is rather dependent of its physical environment than vice versa. Following the approach of socio-spatial analysis the appropriative processes are hence not sufficiently depicted.

7.5.3 Responsive Planning

The case study in Langenthal was designed as online survey to reach as many residents as possible. Based on 372 participants the calculation of the response rate shows that 37 % of all addressed households and 26 % of all addressed businesses and institutions have answered at least parts of the questionnaire. However concerning the total of people addressed ($n = 2106$) the response rate decreases to 18 % suggesting that only one person per household participated the survey. A closer look at the personal data reveals that the majority of all respondents were Swiss, male and employed while foreigners, unemployed people, women, pensioners and people in education are underrepresented; children under 22 didn't

Fig. 7.10 Visualisation of subjective perception of atmospheric qualities of the area (green words represent positive qualities, red words represent negative qualities) © ModularCity 2014

participate at all (Fabian et al. 2013). This distribution corresponds with other experiences of participative processes, problematized in the literature as selective participation (see Cornwall 2008; Werner 2012).

Another interesting indicator for ModularCity's responsive capacity is the drop-out rate. From all 372 people who started the questionnaire 167 of them also finished the survey. Most of the participants dropped out after the entrance page (108 drop-outs) and after the first question (57 drop-outs) suggesting that the interest to participate significantly declined when seeing the first or second question. Reasons for this may originate either from the insufficient user friendliness and attractiveness of the interface or from content-related barriers. Regarding the design of the survey (see Fig.7.11) the functionality of the interface was tested repeatedly and judged as adequate but no professional efforts had been taken to enhance the visual attractiveness of the websites. This may also explain why no young people were interested to participate in the survey.

Concerning content-related barriers one must consider that the selected area can be judged as highly political: As a former marketplace the site has a historic value for the community and although currently poorly used the area is well known and contributes to the resident's identity. This may explain why all the former efforts to develop the site didn't succeed (Stadtbauamt Langenthal 2010) although especially the economic interests in establishing new housing and business spaces have always been strong. Regarding this political background it can be assumed that the most important concerns for the residents of Langenthal are related to the future development and uses rather than their actual activities on the area. One can speculate that questions about the resident's needs, visions and prerequisites for the area development may have caught much more attention than

Fig. 7.11 Example of the design of the online survey. © ModularCity 2014

the tasks set in the online survey (see Sect. 7.4). This assumption is supported by the fact that the response rate increased significantly with the last question which treated current problems and future potentials of the area.

ModularCity's efforts for responsive planning may be judged as one important step for sustainable urban development: Workshops with planning experts as well as discussions with administrative and political personal showed that the addressed decision makers got sensitized for the resident's needs and expressed their interest for more participative planning. This position can mainly be explained by the motivation to help the project's popular acceptance and the state action's legitimacy to be strengthened. In this sense ModularCity mediates between subjective living practices and the interests of planning authorities and hence fosters a better understanding of resident's needs and interests. However considering the sensitivity of the political business ModularCity rather avoids the confrontation of conflicting opinions by involving citizens only as data suppliers (online survey) and planning condition (data of social structure) but not as active negation partners. Seeking for a consequent translation between different maybe conflicting *urban development goals* more fundamental negotiations are needed. This involves not only the collection of the citizen's opinion but an interactive exchange of all stakeholders' goals, interests and values. Concerning ModularCity this would have included at least informing the participants about the survey's results, and feed backing as well as discussing the study's implications for planning with residents for example in planning workshops or in planning working groups.

7.6 Conclusion

With ModularCity some interesting insights have been obtained regarding sustainable planning in the data-rich city: Combining methods and approaches from computer-assisted planning, geography and social work subjective as well as objective data can be collected, edited, and visualized related to each other. The case study in Langenthal shows that the findings serve as more sophisticated basis for many stakeholders involved in urban planning processes. The evaluation of ModularCity's translational capacities against the standards of social sustainability in urban planning identified potentials as well as challenges of socio-technological innovations in sustainable urban planning. Above all the demand to integrate a social work perspective in urban planning has proved to be fruitful also for other involved disciplines.

However there are some open questions to be addressed: The first challenge lies in the search for a more differentiated correspondence between real and virtual worlds. The key question in this regard is how best to visualise objective and subjective information (e.g. values or subjective meanings) since it raises the question of power through specific visualisations that have the capacity to reinforce existing dominate concepts of the city. To avoid oversimplification and standardization new visualisation techniques must be developed which allow capturing socio-spatial processes in a more fluid and differentiated way. Ideas may be torn from ethnographic research (e.g. mental maps) or visual communication to create more interactive images of the city. Secondly, to allow stronger participation of residents in urban planning it is of fundamental importance to discuss how and by whom participation in socio-technological innovations is defined and in which way bottom up efforts can be integrated in the rather expert-driven tools. Active and effective involvement of citizens may be supported through strategies of community work and participatory action research (e.g. raising political awareness through civic education and capacity building) as a complementary approach to socio-technological tools.

References

Allmendinger, P. (2009). *Planning theory* (2nd edn). Planning-environment-cities). Basingstoke: Palgrave.

Cornwall, A. (2008). *Democratising engagement: What the UK can learn from international experience*. London: Demos.

Drilling, M. (2013). Planning sustainable cities: Why environmental policy needs social policy. In I. Wallimann (Ed.), *Environmental policy is social policy—Social policy is environmental policy: Toward sustainability policy* (pp. 103–119). New York: Springer.

Drilling, M., & Oehler, P. (2013). Soziale Arbeit und Stadtentwicklung aus einer planungsbezogenen Perspektive. In M. Drilling & P. Oehler (Eds.), *Soziale Arbeit und Stadtentwicklung: Forschungsperspektiven, Handlungsfelder, Herausforderungen* (pp. 87–109). Wiesbaden: Springer VS.

Evans, P. (2012). Political strategies for more liveable cities: Lessons from six cases of development and political transition. In S. Fainstein & S. Campbell (Eds.), *Readings in planning theory* (pp. 499–517). New York: Wiley.

Fabian, C., Klöti, T., & Stark, H.-J. (2013). *Online-Befragung zur Nutzung und Bewertung des Markthallenareals in Langenthal*. Langenthal: Bericht zu den Befragungsergebnissen zu Handen des Gemeinderates.

Habermas, J. (1981). *Theorie des kommunikativen Handelns*. Frankfurt am Main: Suhrkamp Verlag.

Healey, P. (1992). Planning through Debate. The communicative turn in planning theory. *The Town Planning Review, 63*(2), 143–162.

Innes, J. E. (1996). Planning through consensus building: A new view of the comprehensive planning ideal. *Journal of the American Planning Association, 62*(4), 460–472.

Klöti, T., Drilling, M., & rhim kommunikation. (2014). "Warum eigentlich Partizipation?" Sozialwissenschaftliche Analyse aktueller Partizipationsverständnisse in der Planung, Gestaltung und Nutzung öffentlicher Räume.

Kolko Phillips, N., & Straussner, S. L. (2002). *Urban social work: An introduction to policy and practice in the cities*. Boston: Allyn and Bacon.

Mouffe, C. (2007). *Über das Politische: Wider die kosmopolitische Illusion* (Edition Suhrkamp, Vol. 2483). Frankfurt: Suhrkamp.

Neuhaus, F., Stark, H.-J., & Drilling, M. (2015). *Atlas ePartizipation: Demokratische Stadtentwicklung*. Brugg: FHNW.

Oehler, P., & Drilling, M. (2013). Soziale Arbeit, Gemeinwesenarbeit und Stadtentwicklung. Eine theoriegeschichtliche Spurensuche. In M. Drilling, & P. Oehler (Eds.), *Soziale Arbeit und Stadtentwicklung: Forschungsperspektiven, Handlungsfelder, Herausforderungen* (pp. 13–41). Wiesbaden: Springer VS.

Riege, M. (2012). *Sozialraumanalyse: Grundlagen-Methoden-Praxis* (3., neu bearb. und erg. Aufl. ed., [SRM-Reihe], Vol. Bd 8). Köln: Verlag Sozial Raum Management.

Selle, K. (2013). *Über Bürgerbeteiligung hinaus: Stadtentwicklung als Gemeinschaftsaufgabe? Analysen und Konzepte (Edition Stadt-Entwicklung)*. Detmold: Rohn.

Stadtbauamt Langenthal. (2010). *Grundlagen für die Erarbeitung eines Entwicklungs- und Nutzungskonzeptes für das Markthallenareal*. Langenthal: Stadt Langenthal.

Stark, H.-J., Klöti, T., Hollenstein, D., Bleisch, S., & Fabian, C. (2013). *Including a social perspective into urban planning using visualisations based on self-organising maps*. Genf: Paper presented at the Geospatial World Forum.

Werner, S. (2012). *Steuerung von Kooperationen in der integrierten und sozialen Stadtentwicklung: Machtverhältnisse und Beteiligung im Prozessraum*. Diss Univ Passau, 2012, Wiesbaden: Springer VS.

Part III
Tools and Case Studies Promoting Citizens' Perspective on Urban Futures

Chapter 8
Time Quality—Measure for Quality of Place

Damjan Marušić and Barbara Goličnik Marušić

Abstract The chapter discusses time quality assessment (TQA), a time-people-place oriented approach for evaluation the quality of living environments. The challenge is to shift understanding of city analysis and valuations from two-dimensional land use perspective to dynamic and comprehensive perspective taking into account relationships among users, activities they are engaged with and environments these activities are taking place, analysing there key parameters: time balance, economic balance and time quality balance. It shows that quality of time spent for certain activity in certain place indicates quality of living environments, that it depends on that what a person can afford, and provides evaluation of quality of living environments with a measure of good/bad time. Thus the chapter suggests time as the universal expression and measure of quality of living and challenges planners, decision-makers as well as ordinary people to shape their future having such concept in mind.

8.1 Introduction

The chapter discusses an innovative theoretical approach towards assessing the quality of living environments in terms of the needs of real people, real economic frames as well as spatial qualities and characteristics. The method introduces a time quality assessment approach (TQA) that analyses the quality of space for certain use (activity) and certain users via analysis of quality of time spent for that activity in a particular place or sequences of places. Quality of time spent for an

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activity is a complex function going beyond quantity of time spent for certain activity in a certain place; but combines basic economic ability of a profile, assessment of conduciveness of physical environment and pleasantness of activity taking place there. In relation to development and current state of the art in the field of approaches towards assessing or measuring quality of living, there is a variety of comprehensive concepts of quality of life, usually referring to quantitative social, spatial and economic aspects (e.g. Allen and Gibson 1987; Norris 2001; Oort 2005; Baker and Palmer 2006). Literature review shows that although quality of life is recognised as a general concern, there is little consensus of a definition of quality of life or the factors/predictors of an individual's quality of life (e.g. Blomquist 2006; Lora and Powell 2011). In last decade quality of life concept is focussing also on well-being, health and standard of living addressed via softer indicators such as happiness, life satisfaction and the like (OECD 2013). However, there is still a lack in focus on detailed actual, local level aspects, despite of the fact that many strategic documents (e.g. Territorial Agenda 2020 2011; Leipzig Charter 2007) as fundamental objectives for smart, sustainable and inclusive growth put the importance of local development towards quality of place and well-being of people. In relation to this, Marušić and Goličnik Marušić (2014) argue, that actual implementation of such objectives into real life situations (in scale 1:1) is often vaguely realised. Furthermore these approaches do not suggest a universal measure that can be equally applicable wherever.

The TQA theoretical methodology depends on calibration regarding quality of activity follows, target groups questionnaires, interviews, or appropriate ways of crowd sourcing (e.g. web public participation, social networks), depending on the environment where the approach is applied. Similarly, quality parameters and weights used initially follow a combination of expert knowledge (e.g. sociological studies of everyday life, studies addressing place-making and place attachment—a combination of expert knowledge from the fields of environmental psychology, urban planning and design) and data collected from relevant target groups. The chapter discusses a new approach and illustrates its applicability and value mostly on examples that simulate possible real situations. Comments are based on selected cases, theoretically set up and occasionally proven for some territories, knowing their socio-economic characteristics (source SURS, GURS), place characteristics (e.g. spatial site analysis, behaviour mapping analysis, GURS) and commuting possibilities for the theoretical target profile, using via Michelin or similar portals. To keep the discussion manageable, simplification of parameters or situations is used.

8.2 Time Quality Assesment (TQA)

Hence TQA has been introduced as an alternative approach for assessing effectiveness of human environments for living (Marušić and Goličnik Marušić 2014). In city planning and design, processes the time quality assessment of living environments represents a potential universal baseline.

To implement TQA as a universal evaluation tool for quality of place in relation to its usage, behaviour mapping is seen as a key part of the process, especially where behaviour maps extract behavioural evidence into layers of spatial information to give a better understanding of the individual and collective patterns of use that emerge in a place. Thus, such behaviour maps can be used to capture the knowledge that brings indirect insights of usage-spatial relationships and visualise abstract notions and essentially non-spatial characteristics of physical environments. In relation to TQA, one of the key information offered is time-related characteristics. A behaviour map can show two significant temporal dimensions. Firstly, for how long certain activity is going on in a certain place and secondly, in which day or any other time-unit sequence the activity has been taking place. The chapter explores and introduces a time-place-people-centred approach, supporting low-tech (Goličnik Marušić and Marušić 2012) as well as high-tech (Bahillo et al. 2015) data collection techniques.

Behaviour mapping as a method and tool for analysing user-spatial-temporal relationships provides a conceptual and practical framework that aims to address liveability of places quite directly and describes it with simple everyday measures which are shaping our daily routines and which reflect on actual living situations as much as possible. Based on spatial characteristics, taking into account the character of the activity and economic situation of the subject involved in the activity, TQA approach classifies time spent regarding the activity as such as well as the environment in which the activity is taking place as well or badly spent time; and elucidates backgrounds of user's expectations, affordances and experiences in places (via daily routines). Bottom up approach, human dimensions, real place and time, and 1:1 scale are crucial aspects.

To be able to simulate behaviour of population, behaviour of individuals needs to be known. In TQA approach behaviour is usually defined by daily routine but allows consideration of other situations e.g. weekly routine and extraordinary routine. Those routines are described in relation to individual's needs, obligations and desires. In a personal level (e.g. home) control over the relationships between realised desires, needs and offer is manageable and liveable places in relations to wishes and expectations are often achieved. In bigger scales and more complex environments, where to achieve liveable environments, needs and expectations of many individuals are in question. City making, no matter smart or traditional, is a social process, which in all aspects, from demographic to cultural, economic, structural, ecological and climate, is time and scale sensitive. At the same time city development is an economic activity thus in the process of place creation the classic aspects of economic characteristics, offer, demand and price/value, come into play (see Fig. 8.1). Seeing them in relation to place quality they should assure suitability and affordability reflecting attractiveness of places to users, reasonable facilities for reasonable price and economic accessibility to users; i.e. TQA approach takes into account spatial characteristics and values, socio-economic structure of users and their affordances for place occupancy or consumption (see e.g. Sect. 8.2.2 Economic balance).

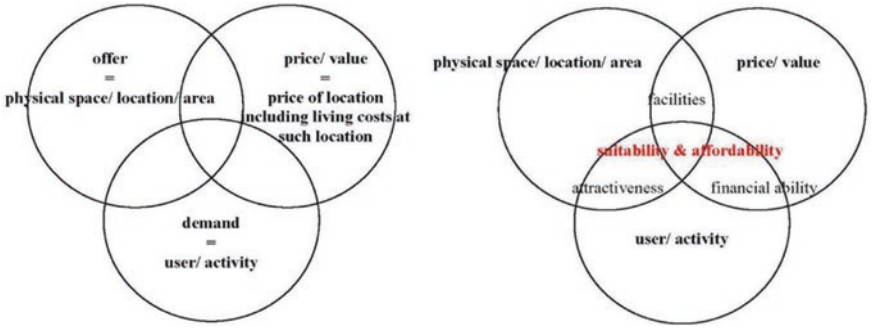

Fig. 8.1 Schematic representation of the background relations relevant for the discussion and development of TQA approach

This reasoning reflects the notion that it is crucial to achieve well-being especially via optimisation of consumption of time, optimisation of services and reduction of costs. In this respect quality of time spent for certain activity in certain place has to do with characteristics of space, characteristics of use in this space reflecting on activity and the person involved with it in the place or sequences of places as well as the money the person has at hand to maintain his/her activities in the place. Thus quality of time spent indicating quality of living environments, depends on that what a person can afford, and provides evaluation of quality of living environments with a measure of good/bad time. TQA approach is based on two time-quality components: activity component and space component. The activity component evaluates potential or most probable satisfaction with the activity within a given time interval, e.g. desired recreation or relaxation would be assigned +100 %, driving a car ±0 %, while compulsory hard labour −100 %. The space component evaluates potential or most probable satisfaction with the place where activity is taking place for given activity within a given time interval, e.g. very suitable and stimulative place for certain activity would be assigned +100 %, a very inappropriate and destimulative place −100 %.

8.2.1 Behaviour Mapping

Activity and space represent a key core examination focus of usage-spatial relationship, an immanent characteristic of behaviour mapping. As a method, tool or source of empirical knowledge behaviour mapping can influence improvements of places for current users or users of similar socio-spatial circumstances of those being observed. However, in combination with TQA approach, offering consideration for socio-economic structure of users and their affordances for place occupancies or consumption, behaviour mapping can help to evaluate quality of living environments. In this respect people friendly and socially inclusive places are places with minimum time waste for their users. They represent places where

residents and other users are able to qualitatively spend their time. Furthermore, such places must enable as broad spectrum of users as possible (e.g. considering peoples' age, socio-economic situations, ethnic groups, impaired people, etc.) to fully fulfil their needs and expectations.

In summary the challenge of this concept is to shift understanding and focus about data sets for city analysis towards people and places. Assisted with behaviour mapping, this alternative approach would provide a time-based perspective on the activities and engagement of *people*.

8.2.2 Place

There are two basic types of properties of places: programmes in places and communications between them. In classic spatial planning language programmes would refer to land uses, communications to infrastructure. However, nowadays such perspective is often too narrow especially taking into account dynamic character of cities and manifestations of various activities in same places at different times. In such context land use approach promoting single-view and sectorial dealing with spatial reality omits multi-functionality of territories (e.g. a park may be well used for recreation as well as for cultural events at different or even the same time). Therefore uses and offers of places are referred to as programmes. Necessary programmes are, for example, dwelling, working, attending to the basic services. Other activities within a daily routine are classified as optional or desired, such as leisure, recreation (e.g. sport, culture) and other services (e.g. hairdressing). Each such spatial component—programmes based in the building or in an open space and the communication between them—has its basic purpose. Places are evaluated against their prime purpose as well as to any other potential activity they might stimulate. Thus two components of the place are taken into consideration:

- what a person is doing in a place (activity component, AC);
- in what kind of environment the activity is taking place (space component, SC).

Both components are assessed with quality of time spent. Final suitability of the location for one or more activities is calculated as the parameter *quality of activity component of time* (F_{QAC}), i.e. quality of time involved in action as such, and *quality of spatial component of time* (F_{QSC}), i.e. quality of time spent in a certain environment.

To illustrate the concept, the example below shows calculated F_{QAC} and F_{QSC} for a simple daily routine of commuting for a person P (or representative profile of users). The person P is shown to have four possibilities for going about daily business: by car, by bus, by bicycle, by foot. Each routine regarding the means of transport is different; each involves different places and results in various times of satisfaction, which in this context finally leads towards quality of living environments. The resulting calculations are presented in Table 8.1 for commuting

Table 8.1 Time spent (T_{Sp}) and quality of activity (F_{QAC}, %) and spatial (F_{QSC}, %) components of time in commuting section of a daily routine of a selected profile (P)

		By car (incl. walking and parking time)					Sum	By bicycle (incl. walking and parking time)					Sum
Activity		Going to nursery	Going to work	Going from work, to pick up children	Going from work and shopping	Going home		Going to nursery	Going to work	Going from work, to pick up children	Going from work and shopping	Going home	
P	T_{Sp}	15	15	15	10	15	70	10	15	15	10	10	60
	F_{QAC}	0	0	0	0	0		50	50	50	50	50	
	F_{QSC}	−50	−10	−10	−50	−50		−20	−10	−10	−20	−20	

activities by car or traveling by bicycle. For example it shows that in this scenario the person completes his/her journey faster by bicycle than by car. Furthermore it shows that cycling, as an activity, is more enjoyable even though comparative experiences do not differ much. However the cyclist has the opportunity to choose slightly friendlier route. This is a preliminary analysis with no time quality related qualifications yet.

8.2.3 User Perspective

A key focus of TQA approach is that quality of time spent indicates quality of living environments. At this stage the model introduces an economic component, which finally relates to costs of time spent and expresses the quality of activity user is involved with in temporal dimension.

The following example addresses user's valuation of optional activity in his daily routine, in the case of recreational swimming. It shows that there are two different valuations of the same time by two different recreational swimmers (S1, S2), of which each earn 12 EUR/h. Each of them pre pays timetabled hour of swim (6 EUR). They are both running late by 5 min. S1 does not want to lose any minute of swimming and takes a taxi to the swimming pool. He arrives on time. S2 walks to the swimming pool along the nice neighbourhood and arrives 10 min late. As they both have to finish swimming at fixed time, S1 has been swimming for 60 min, S2 for 50 min. However, S2 considered his walk as valuable as swimming; so, S2 does not feel he lost 10 min of recreation. Moreover, S2 might even feel he gained 5 min of recreation. S2 did not spend any extra money. S1 completed his 60 min of recreation and spent some extra money for a taxi. S1 paid 6 EUR for swimming pool and 6 EUR for a taxi to enjoy 60 min of swimming. The price was 12 EUR for 60 min of recreation. S2 spent money only for swimming pool. The price was 6 EUR for 65 min of recreation (50 min of swimming +15 min for walking). They both spent 65 min for both activities commuting to the pool and swimming in the pool, but they were willing to pay different price for the same activity (swimming). S1 paid 12 EUR for 60 min of swimming (20 cents/1 min of swimming); S2 paid 6 EUR for 50 min of swimming (12 cents/1 min of swimming). Time spent in the swimming pool as well as time spent for commuting to the pool were valuated differently (Table 8.2).

When addressing quality of living, quality of time spent for recreation matters. As shown above, S1 had 60 min of good time (recreation), S2 had 65 min of good time (recreation). Speaking in time-dimensions, for these 60 min of good time, S1 consumed one working hour and 5 min of taxi driving, i.e. 65 min of bad time (time spent for working is considered as a bad time). S2 spent 65 min of good time and consumed for that only half working hour, i.e. 30 min of bad time. The value of and the price for time spent differ very much. S2 gets higher value for lower price.

Table 8.2 Quality of engagement with activity in relation to valuation of time spent for that in the case of two recreational swimmers, S1 and S2

Person	Recreation entrance (EUR)	Circumstances	Solution	Swimming time (min)	Value of time spent	Costs of time spent (EUR)	Time-costs of time spent*
S1	6	5 min late	Taxi on time	60	60 min of good time	12	65 min of bad time
S2	6	5 min late	Walking 15 min late	50	65 min of good time	6	30 min of bad time

*The simplification is used to illustrate the first step of TQA analysis (quality of activity, F_{QAC}): time invested in recreation is considered as a good time; time invested in working ours to earn money to be able to afford payable recreation is considered as a bad time

Table 8.3 Affordance—economic impact on carrying out optional activity such as recreational swimming for two persons of different incomes (P1, P2), who go to recreation by foot

Person	Earnings (EUR/h)	Activity (good time) [min]	Costs (EUR)	Commuting 1* (bad time) [min]	Working (bad time) [min]	Total good time (min)	Total bad time (min)
P1	72	60	6	10	5	60	15
P2	12	60	6	10	30	60	40

*To keep the discussion simple, the example here assumes that walking takes a short cut, passing unpleasant environments, therefore it is considered as bad time

8.2.4 Economic Perspective

So far the discussion addressing the TQA approach characteristics shows comments on activities in relation to the means of transport and sequences of places on the way (subchapter 8.2.2), and valuation of consumed time for an activity (subchapter 8.2.3). At this point discussion is upgraded with the economic frame of a person (profile) and shows its impacts on affordability of activity in places for a chosen profile. For example, there are two persons (P1, P2) with different incomes who go for 60 min of swimming. As already shown in the discussion so far in TQA approach, in a simplified case, there are three time corpuses which matters: time for activity in focus, time for going there, and time of work in which a person earns enough to be able to do the activity and go to the activity. P1 earns 72 EUR/h, P2 earns 12 EUR/h (P1 earns 6xP2). Swimming hour costs 6 EUR. If P2 is walking to the swimming pool for 10 min and swimming for 60 min he/she must work for that commodity for 30 min, as the only cost is the entrance to the swimming pool (6 EUR). So, for 60 min of swimming (good time) P2 has to invest in total 40 min of commuting* and working (bad time) (Table 8.3). If P2 takes a taxi to the swimming pool it costs 6 EUR and takes 5 min. In such case P2's time balance is as follows: for 60 min of swimming (good time), P2 invests 5 min of commuting and 60 min of work (30 min to pay a swimming pool and

Table 8.4 Affordance—economic impact on carrying out optional activity such as recreational swimming for two persons of different incomes (P1, P2), who go to recreation by a taxi

Person	Earnings (EUR/h)	Activity (good time) [min]	Costs (EUR)	Commuting 2 (bad time) [min]	Working (bad time) [min]	Total good time (min)	Total bad time (min)
P1	72	60	12	5	10	60	15
P2	12	60	12	5	60	60	65

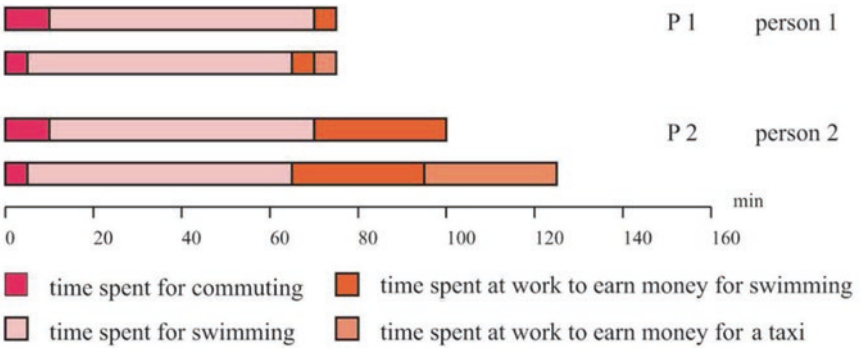

Fig. 8.2 Comparative illustration of time investment of P1 and P2 to afford recreational swimming

30 min to pay a taxi) (Table 8.4). In total, for P2 the bad time (65 min) prevails the good time (60 min). So, to keep living good in the area P2 cannot afford to take a taxi to the swimming pool (Tables 8.3 and 8.4).

On the contrary, for 60 min of swimming and going there by foot, in time measures P1 spent 10 min for walking and 5 min of working hour for the entrance. So, for 60 min of a good time (swimming) P1 invests 15 min of bad time (Table 8.3). In case that P1 takes a taxi (Table 8.4), situation in terms of time quality balance is the same: for 60 min of swimming P1 invests 5 min of commuting by a taxi and 10 min of work (5 min for paying a taxi, 6 EUR; 5 min for paying the swimming pool, 6 EUR). In the case of the person who earns more money (P1) the price in bad time for the unit of good time is the same in both arrangements. For such a profile it is irrelevant which way of transport to the swimming pool the person chose, while the other person makes his quality of living much worse. If chose to go by taxi the total balance is 5 min of bad time and 0 min of good time (Fig. 8.2).

8.2.5 Time Perspective

TQA approach divides the time spent for any activity into the good or the bad portion. The remaining time is considered as neutral portion of time. As shown in subchapter 8.2.2, initial analysis is related to time spent for the activities and

to basic qualities of activities and places. Further evaluation with time as the universal measure for quality of environments by weighting using the parameters (F_{WAC}, F_{WSC}). The weight of each quality component describes how much each component contributes to potential quality of time, e.g. potential satisfaction with the time spent in the given place (see Tables 8.5 and 8.6). These two parameters finally shape the activity-place relationship in a daily routine, and are for comparative purpose finally transferred into coefficient of time quality and quality time balance (K_{TQ} and T_Q).

In all the examples referring to implementation of TQA approach, the following parameters are assessed and/or calculated:

T_{Sp}	time spent (hours, minutes)
F_{QAC}	quality of activity component of time (%)
F_{QSC}	quality of spatial component of time (%)
F_{WAC}	weighting of activity component of time (%)
F_{WSC}	weighting of spatial component of time (%)
K_{TQ}	coefficient of time quality
T_Q	quality time (hours, minutes)

Relations among the measures of activity-place relations in a daily routine (see Tables 8.5 and 8.6) show for example, that for the selected chosen profile daily shopping represents 20 min. Activity of basic goods shopping is compulsory therefore it is assessed as indifferent ($F_{QAC} = 0$ %) and as such does not represent high influence ($F_{WAC} = 20$ %) in comparison to the space as such (shop) and its location. In this case spatial components of time have bigger influence on time quality experience that the activity ($F_{QSC} = 20$ %, $F_{WSC} = 80$ %). Time quality balance shows that in such situation for 20 min of shopping 3 min represent a quality time. Having a look on optional activity, e.g. gym for which the profile spent 2 h, it is classified as desirable and enjoyable activity ($F_{QAC} = 100$ %), also the place where the activity is taking place is recognised as comfortable, well facilitated, well located, designed and maintained, and as such represents important influence on the entire satisfaction ($F_{QSC} = 80$ %, $F_{WSC} = 40$ %), although influence of the activity plays bigger role ($F_{WAC} = 60$ %). Final assessment of quality of usage-spatial satisfaction shows that in 2 h the person gains 1 h and 50 min of quality time which ranks the gym with its surrounding as high quality place.

8.3 Time Quality

TQA approach examines relationships between users (characteristic socio-economic profiles acting in certain environments), their activities and the relevant environments in terms of three key parameters: time balance, financial balance and time quality balance. Time balance shows how comfortable the time is spent by the user in his/her (living) environments. Economic balance is a category, which represents subject's incomes and expenses for essential and optional activities, and

Table 8.5 Activity-place relations and quality time balance (T_Q) for total daily routine for profiles Pa (live close to work) and Pb (live far from work) regarding commuting by car. Theoretical simulation by authors, Ljubljana, spring, 2013

Place		Home	Home	Street	Nursery	Street	Work	Street	Nursery	Street	Shop	Street	Street	Gym	Street	Home	Home	
Activity		Sleeping	Getting up and breakfast	Going to nursery	Dropping of children	Going to work	Working	Going to nursery	Picking up children	Going to do shopping	Daily shopping	Going home	Going to recreation	Recreation	Coming from recreation	Dinner	Home with a family	
Pa	T_{Sp}	8 h 0′	30′	15′	5′	15′	8 h 0′	15′	5′	10′	20′	15′	10′	2 h 0′	10′	30′	3 h 0′	24 h 0′
	F_{QAC}	100	0	0	0	0	-20	0	0	0	0	0	0	100	0	100	100	
	F_{QSC}	80	80	−50	−10	−10	0	−10	−10	−50	20	−50	−50	80	−50	80	80	
	F_{WAC}	50	40	60	40	60	50	60	40	60	20	60	60	60	60	50	50	
	F_{WSC}	50	60	40	60	40	50	40	60	40	80	40	40	40	40	50	50	
	K_{TQ}	0.90	0.48	−0.20	−0.06	−0.04	−0.10	−0.04	−0.06	−0.20	0.16	−0.20	−0.20	0.92	−0.20	0.90	0.90	0.48
	T_Q	7 h 12′	14′	−3′	0′	−1′	−48′	−1′	0′	−2′	3′	−3′	−2′	1 h 50′	−2′	27′	2 h 42′	11 h 27′
Pb	T_{Sp}	8 h 0′	30′	15′	5′	20′	8 h 0′	20′	5′	10′	20′	15′	10′	2 h 0′	10′	30′	2 h 50′	24 h 0′
	F_{QAC}	100	0	0	0	0	−20	0	0	0	0	0	0	100	0	100	100	
	F_{QSC}	80	80	−50	−10	−10	0	−10	−10	−50	20	−50	−50	80	−50	80	80	
	F_{WAC}	50	40	60	40	60	50	60	40	60	20	60	60	60	60	50	50	
	F_{WSC}	50	60	40	60	40	50	40	60	40	80	40	40	40	40	50	50	
	K_{TQ}	0.90	0.48	−0.20	−0.06	−0.04	−0.10	−0.04	−0.06	−0.20	0.16	−0.20	−0.20	0.92	−0.20	0.90	0.90	0.47
	T_Q	7 h 12′	14′	−3′	0′	−1′	−48′	−1′	0′	−2′	3′	−3′	−2′	1 h 50′	−2′	27′	2 h 33′	11 h 18′

Table 8.6 Activity-place relations and quality time balance (T_Q) for total daily routine for profiles from the same neighbourhood; Pa (live close to work), Pb (live far from work) and Pc (living place characteristic with bad spatial characteristics)

Place		Home	Home	Street	Nursery	Street	Work	Street	Nursery	Street	Shop	Street	Street	Gym	Street	Home	Home	
Activity		Sleeping	Getting up and breakfast	Going to nursery	Dropping of children	Going to work	Working	Going to nursery	Picking up children	Going to do shopping	Daily shopping	Going home	Going to recreation	Recreation	Coming from recreation	Dinner	Home with a family	
Pa	T_{Sp}	8 h 0′	30′	10′	5′	15′	8 h 0′	15′	5′	10′	20′	10′	10′	2 h 0′	10′	30′	3 h 10′	24 h 0′
	F_{QAC}	100	0	50	0	50	−20	50	0	50	0	50	50	100	50	100	100	
	F_{QSC}	80	80	−20	−10	−10	0	−10	−10	−20	20	−20	20	80	20	80	80	
	F_{WAC}	50	40	40	40	40	50	40	40	40	20	40	40	60	40	50	50	
	F_{WSC}	50	60	60	60	60	50	60	60	60	80	60	60	40	60	50	50	
	K_{TQ}	0.90	0.48	0.08	−0.06	0.14	−0.10	0.14	−0.06	0.08	0.16	0.08	0.32	0.92	0.32	0.90	0.90	0.50
	T_Q	7 h 12′	14′	1′	0′	2′	−48′	2′	0′	1′	3′	1′	3′	1 h 50′	3′	27′	2 h 51′	12 h 2′
Pb	T_{Sp}	8 h 0′	30′	10′	5′	25′	8 h 0′	25′	5′	10′	20′	10′	10′	2 h 0′	10′	30′	2 h 50′	24 h 0′
	F_{QAC}	100	0	50	0	50	−20	50	0	50	0	50	50	100	50	100	100	
	F_{QSC}	80	80	−20	−10	−10	0	−10	−10	−20	20	−20	20	80	20	80	80	
	F_{WAC}	50	40	60	40	60	50	60	40	60	20	60	40	60	40	50	50	
	F_{WSC}	50	60	40	60	40	50	40	60	40	80	40	60	40	60	50	50	
	K_{TQ}	0.90	0.48	0.22	−0.06	0.26	−0.10	0.26	−0.06	0.22	0.16	0.22	0.32	0.92	0.32	0.90	0.90	0.50
	T_Q	7 h 12′	14′	2′	0′	7′	−48′	7′	0′	2′	3′	2′	3′	1 h 50′	3′	27′	2 h 33′	11 h 57′
Pc	T_{Sp}	8 h 0′	30′	10′	5′	15′	8 h 0′	15′	5′	10′	20′	10′	10′	2 h 0′	10′	30′	3 h 10′	24 h 0′
	F_{QAC}	100	0	50	0	50	−20	50	0	50	0	50	50	100	50	100	100	
	F_{QSC}	20	70	−20	−10	−10	0	−10	−10	−20	20	−20	20	80	20	70	70	
	F_{WAC}	50	40	40	40	40	50	40	40	40	20	40	40	60	40	50	50	
	F_{WSC}	50	60	60	60	60	50	60	60	60	80	60	60	40	60	50	50	
	K_{TQ}	0.60	0.42	0.08	−0.06	0.14	−0.10	0.14	−0.06	0.08	0.16	0.08	0.32	0.92	0.32	0.85	0.85	0.39
	T_Q	4 h 48′	13′	1′	0′	2′	−48′	2′	0′	1′	3′	1′	3′	1 h 50′	3′	26′	2 h 42′	9 h 26′

a financial frame within which the subject is flexible to perform relevant activities in a certain environment. Whilst lastly time quality balance calculates time spent in terms of both activity and environment.

8.3.1 Time Balance

Time spent for each action should be shorter or equal to available time for that action:

$$T_{Rqi} \leq T_{Avi}.$$

where

T_{Rqi} time required for action i
T_{Avi} time available for action i

Sometimes one does not manage an activity within the available time, so the person is late. However, the minimum required condition, yet not always sufficient, is to perform everything that is required in the whole available time (e.g. to do all daily routines in 24 h):

$$\sum_i T_{Rqi} \leq \sum_i T_{Avi} \rightarrow T_{Rq} \leq T_{Av}$$

Time balance analysis shows balance of essential and optional activities. In the situation of assessing suitability of neighbourhood for certain profile, a first checking criterion at the level of time balance is profile's ability to fulfil activities. If the profile is not able to fulfil necessary activities the neighbourhood is not suitable for it, if the profile is not able to fulfil optional activities, optional activities must be re-organised against a new priority list.

8.3.2 Economic Balance

The basic information addressed is household's incomes and expenses for necessary activities and optional activities. Expenses of a household should not exceed the incomes:

$$\sum_i M_{Rqi} \leq \sum_j M_{Avj} \rightarrow M_{Rq} \leq M_{Av}$$

where

M_{Rqi} money required for expense i
M_{Avi} money available from the source j

Incomes are classified as regular (e.g. salary earned in working time every working day); other regular (e.g. pension, rent); and irregular (e.g. property

selling). Expenses are classified as: residential expenses; basic basket expenses (e.g. food, clothes); other necessary expenses (e.g. nursery, school); other optional expenses and; travel expenses for commuting at daily routine.

8.3.3 Time Quality Balance

Time quality balance shows when financial situation allows the activities to happen, how well the time required is spent; how much of the entire time taken for all the activities per day is considered as being good quality and how much of bad quality. This balance shows final quality of time spent within a routine and reflects on quality of living environment one lives in. Thus with this final parameter the TQA approach shows whether a segment of population can live in certain area and how comfortable.

$$K_{TQ} = \frac{T_Q}{T_{Sp}} = \frac{\sum_i T_{Qi}}{\sum_i T_{Spi}} = \frac{\sum_{ij} T_{Spi} \times F_{Qij} \times F_{Wij}}{\sum_i T_{Spi}}$$

where $\sum_j F_{Wij} = 1$ and $-1 \leq F_{Qij} \leq 1$

where

K_{TQ} time-quality coefficient
T_Q evaluated portion of time (+ signed: good time; − signed: bad time)
T_{Qi} evaluated portion of time within the time interval i
T_{Sp} time spent
T_{Spi} time spent within the time interval i
F_{Qij} quality of the quality component j within the time interval i
F_{Wij} influence (weight) of the quality component j within the time interval i

In the examples presented at least two time-quality components are proposed:

AC activity component
SC space component

Therefore:

$$j \in \{AS, SC\} \Rightarrow F_{Wi,SC} = 1 - F_{Wi,AC}$$

The following comparative simulation shows that in the case when daily routine is performed by bicycle, no matter job location (Pa job is closer than in case Pb), a person gains more quality time per day than when he is driving a car to get all the daily activities done.

Simulating quality time balance for the same profile, with exactly the same daily routine, living in the same neighbourhood, but at the other side, close to the heavy traffic road and railway line, would show that quality time balance would decrease, especially as quality of spatial component of time for sleeping, which

in the previous case represents a great portion of good quality time (8 h), is considered as bad. In such case instead of having 12 h 2′ of a good quality of time per day the person has 9 h 26′ of a good quality of time per day (K_{TQ} is 0.39) (see Table 8.6).

8.4 Practical Relevance

Implementing TQA approach, it has to be born in mind that time balance and economic balance are absolute objective measures, whilst time quality balance is always subjective. Hence it shows how one place may be better (e.g. provides higher benefit/comfort for the user) than the other and always needs to be commented regarding the context. In this respect although economic balance represents an absolute value, it is linked to location. When applying TQA approach it is necessary to define some characteristic individual profiles, which can help to describe the population in the studied area. Such profiles are set up from available statistical data or any other relevant source (e.g. questionnaire) regarding demographic and social parameters such as: age, gender, family status, education, occupation, income, and the like.

Based on crucial boundary characteristics all possible variations of individual profiles, which are assumed to be realistic, are defined. Realistic profiles are designed by logical filters or on the basis of known data about the population of the area of interest. Having defined possible real boundary profiles of the population, the assumption is, if those boundary profiles are satisfied, all profiles within the studied segment of population is covered. On the basis of individuals' profiles it is possible to define limits of population of the studied area and edge conditions of/for such population within the area.

For the purpose of making elderly people living easier, a pilot testing assessment of quality of living environments via quality of time was modelled for a local district in the northern part of the city of Ljubljana (Goličnik Marušić and Marušić 2013). The profile was defined based on socio-economic statistical data. Data on time and activity was collected on the basis of combination of approaches: field work related to spatial analysis, including facilities and services (e.g. open/green space, recreation, culture, public transport), and accessibility; pilot behaviour observation of selected areas to get an idea of behaviour patterns of elderly in the area, including duration of activities in the environment (e.g. how much time they spent to come from A to B, how much time do they spent in local park or library). An interview with the active member of local community, an elderly person living in high raised flats area, was conducted including questions of daily routine there, environmental, social and economic commodity of living there and the like. Parameters calibration was done on combination of discipline tacit knowledge, expert knowledge and target groups involvement; space component as a combination of field work, cartographic materials, expert knowledge and target groups involvement (indirectly with behaviour mapping, directly via interview); activity

		home	home	public space O	cafe	home	shop	public space O	home	home	home	public space O	public space O	public space O	bus	public space O	public space I	public space O	bus	public space O	home	home	sum
		sleeping	breakfast preparation + breakfast	walking to the cafe	socialising	walking to the shop	shopping	walking back home	cooking	having lunch	resting at home	walking in the neighbourhood	walking in the park	walking to the bus station	travelling by bus	walking to the library	in the library	walking from the library	travelling by bus	walking home	dinner preparation + dinner	easy evening at home	
P1a	T_{Sp}	8h 0'	2h 0'	10'	1h 30'	10'	30'	20'	1h 30'	1h 0'	2h 0'	10'	2h 0'	5'	20'	5'	1h 0'	5'	20'	10'	1h 0'	1h 35'	24h 0'
	F_{QAC}	100	80	40	65	40	25	40	60	80	85	75	75	40	-10	40	100	40	-10	40	80	100	
	F_{QSC}	-40	60	-10	80	-10	0	-10	80	60	-50	-30	80	-10	40	50	50	50	40	-10	60	0	
	F_{WAC}	50	50	50	60	60	60	60	50	50	40	40	40	60	70	60	40	60	70	60	50	40	
	F_{WSC}	50	50	50	40	40	40	40	50	50	60	60	60	40	30	40	60	40	30	40	50	60	
	K_{TQ}	0.30	0.70	0.15	0.71	0.20	0.15	0.20	0.70	0.70	0.04	0.12	0.78	0.20	0.05	0.44	0.70	0.44	0.05	0.20	0.70	0.40	**0.44**
	T_Q	2h 24'	1h 24'	2'	1h 4'	2'	5'	4'	1h 3'	42'	5'	1'	1h 34'	1'	1'	2'	42'	2'	1'	2'	42'	38'	**10h 40'**
P1b	T_{Sp}	8h 0'	2h 0'	5'	1h 30'	10'	30'	15'	1h30'	1h 0'	2h 0'	5'	2h 0'	5'	20'	5'	1h 0'	5'	20'	5'	1h 0'	1h 55'	24h 0'
	F_{QAC}	100	80	40	65	40	25	40	60	80	85	75	75	40	-10	40	100	40	-10	40	80	100	
	F_{QSC}	40	100	20	80	20	0	20	100	100	40	20	80	20	40	50	50	50	40	20	100	80	
	F_{WAC}	50	50	50	60	60	60	60	50	50	40	40	40	60	70	60	40	60	70	60	50	40	
	F_{WSC}	50	50	50	40	40	40	40	50	50	60	60	60	40	30	40	60	40	30	40	50	60	
	K_{TQ}	0.70	0.90	0.30	0.71	0.32	0.15	0.32	0.80	0.90	0.58	0.42	0.78	0.32	0.05	0.44	0.70	0.44	0.05	0.32	0.90	0.88	**0.71**
	T_Q	5h 36'	1h 48'	2'	1h 4'	3'	5'	5'	1h 12'	54'	1h 10'	2'	1h 34'	2'	1'	2'	42'	2'	1'	2'	54'	1h 41'	**17h 0'**
P1c	T_{Sp}	8h 0'	2h 0'	5'	1h 30'	10'	30'	15'	1h 30'	1h 0'	2h 0'	0'	2h 0'	5'	15'	5'	1h 0'	5'	15'	10'	1h 0'	2h 5'	24h 0'
	F_{QAC}	100	80	40	65	40	25	40	60	80	85	75	75	40	-10	40	100	40	-10	40	80	100	
	F_{QSC}	20	100	-10	80	-10	0	-10	100	100	20	-10	100	-10	10	50	50	50	10	-10	100	20	
	F_{WAC}	50	50	50	60	60	60	60	50	50	40	40	40	60	70	60	40	60	70	60	50	40	
	F_{WSC}	50	50	50	40	40	40	40	50	50	60	60	60	40	30	40	60	40	30	40	50	60	
	K_{TQ}	0.60	0.90	0.15	0.71	0.20	0.15	0.20	0.80	0.90	0.46	0.24	0.90	0.20	-0.04	0.44	0.70	0.44	-0.04	0.20	0.90	0.52	**0.64**
	T_Q	4h 48'	1h 48'	1'	1h 4'	2'	5'	3'	1h 12'	54'	55'	0'	1h 48'	1'	-1'	2'	42'	2'	-1'	2'	54'	1h 5'	**15h 27'**

Fig. 8.3 TQA assessment results showing the best quality of living for the representative profile are areas of individual houses. The area including public elderly home accommodation resulted as the less qualitative (Goličnik Marušić and Marušić 2013)

component target groups involvement (indirectly with behaviour mapping, directly via interview). Time and economic balance of the profile was assessed as positive. Time quality assessment for a daily routine of a profile living in three different types of locations (high rise flats area including elderly people accommodation, 1a; area of individual houses, 1b; area of compact rural settlement, 1c) within the area was simulated using TQA approach (see Fig. 8.3).

8.5 Conclusion

The TQA approach proposes time as the universal expression and measure of quality of living, using time balance, economic balance and time quality balance as the key indicators to calculate possibility and comfort of living in the given environment. Data as results of such approach are linked to locations and user

profiles and are therefore useful for comparison of profiles within different location of the area, and judgement about suitability of certain location in the area for varies profiles. Capability of contemporary ICT tools, which serves as an interface between place and people, can play a significant role to automate data. Especially, monitoring tools consisting of a smart phone application, a set of web services, and the cloud can give very informative and rich information about parameters relevant for TQA approach. Bahillo et al. (2015), for example, upgraded and used such tool for behaviour mapping in public spaces and collect detailed spatial-temporal information about people's engagement in places, agreed profile's descriptive information (e.g. gender, age group, occupation), positions, answers on contextual questions as well as augmented reality suggestions. Such technology enables insights into real bottom-up understanding of daily routines and circumstances people are involved with and is worth linking it with TQA in further development of the approach and its implementation.

Information offered by TQA approach is useful for any kind of place user, from individuals to check locations e.g. where to live or work, to decision-makers at various governance levels. Distribution of such information is possible through upgrade of existing available information systems. Such information is under constant refinement process referring to two main sources: available geoinformatics and spatial data, and direct and indirect participatory data. TQA as a monitoring or development control approach is applicable for authorities and individuals for setting new developments in a place, searching for measures of improvements, comparison of different locations for one particular use, and comparison for various measures in a certain location.

References

Allen, L. R., & Gibson, R. (1987). Perceptions of community life and services: A comparison between leaders and community residents. *Journal of the Community Development Society, 18*(1), 89–103.

Bahillo, A., Golicnik Marusic, B., & Perallos, A. (2015). A mobile application as an unobtrusive tool for behavioural mapping in public spaces. In Garcia Chamizo, J. M. (ed.). *Ubiquitous computing and ambient intelligence: sensing, processing, and using environmental information* (pp. 13–25). Berlin: Springer.

Baker, D. A., & Palmer, R. J. (2006). Examining the effects of perceptions of community and recreation participation on quality of life. *Social Indicators Research, 75*, 396–418.

Blomquist, G. C. (2006). Measuring quality of life. In R. J. Arnott & D. P. McMillen (Eds.), *A companion of urban economics* (pp. 483–501). London: Blackwell Publishing.

Goličnik Marušić, B., & Marušić, D. (2012). Behavioural maps and GIS in place evaluation and design. In B. M. Alam (Ed.), *Application of geographic information systems* (pp. 113–139). Intech: Rijeka.

Goličnik Marušić, B., & Marušić, D. (2013), In.FLOW.ence model for territorial governance—Model for valuation and simulation of quality of living environments. http://www.inflowence.eu/Data/Sites/1/inflowencemodelofterritorialgovernance.pdf. Accessed 26 Feb 2016.

GURS Geodetska uprava Republike Slovenije; Surveying and mapping authority of the Republic of Slovenia.

Lora, E., & Powell, A. (2011). *A new way of monitoring the quality of urban life.* UNU-WIDER Working Paper, Vol. 12, pp. 1–24.

Leipzig Charter. (2007). *Leipzig charter on sustainable European cities*. http://ec.europa.eu/regional_policy/archive/themes/urban/leipzig_charter.pdf

Marušić, D., & Goličnik Marušić, B. (2014). Model for valuation and simulation of quality of living environments. *International journal of innovation and regional development, 5*(4/5), 405–428.

Norris, T. (2001). America's community movement: Investing in the civic landscape. *American Journal of Community Psychology, 29*(2), 301–307.

OECD. (2013). OECD Guidelines on measuring subjective well-being. *OEDC Publishing,*. doi:10.1787/9789264191655-en

Oort, F. (2005). Using structural equation modelling to detect response shifts and true change. *Quality of Life Research, 14*(3), 587–598.

SURS Statistični urad Republike Slovenije; Statistical office of the Republic of Slovenia.

Territorial Agenda 2020. (2011). *Territorial agenda of European Union 2020—Towards an inclusive, smart and sustainable Europe of diverse regions*. http://ec.europa.eu/regional_policy/sources/policy/what/territorial-cohesion/territorial_agenda_2020.pdf

Chapter 9
Designing a Social Urban Networks to Promote Smart Participation in Matera (Italy)

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Abstract A Smart and Liveable City is a place in which innovative technologies and ICT-based solutions ideally coexist with active citizen participation in order to tackle effectively major challenges in urban development. This chapter aims at contributing to the discussion on how the use of technologies can foster an active engagement of citizens, discussing the example of a Social Urban Network developed for the town of Matera (SUN4Matera) that has been awarded European Capital of Culture 2019.

The SUN4Matera has been developed within the "Smart Basilicata" R&I Project, on the basis of a prototype designed for L'Aquila town (Annunziato and Pede 2012), aimed at producing integrated information for the valorization of community knowledge assets and facilitating the sharing of new ideas.

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The proposed approach is based on an in-depth analysis of the local community, considering citizen feedback since the design phase. To this end, an innovative methodology based on an argumentative and participative approach was adopted supported by structured interviews with citizens, stakeholders and tourists (in January 2014) by a multidisciplinary staff to identify a core set of priorities and sustainable behaviours. These informal interviews overcome the limits of traditional research and socio-anthropology reportages, experimenting a multitasking approach to collect deep needs, wishes, creative ideas and enhancing individual freedom and capacities.

Based on the priorities identified by the survey, the SUN4Matera will contribute to people empowerment by facilitating the exchange of tangible/intangible assets and services, fostering initiatives to support socially vulnerable groups, and implementing multilayer interactive areas and interactive tools for tourists and citizens.

9.1 Introduction

Among the European Industrial Initiatives (EIIs) introduced by the EC Strategic Energy Technology Plan (SET-Plan) (COM/2007/0723 final 2007), the Smart Cities and Communities Initiative, launched in 2011, has the objective to create the conditions "to trigger the mass market take-up of energy efficiency technologies" in order "to secure CO_2 reductions". The focus is on cities that have committed themselves to create a more sustainable future, for instance adhering to the Covenant of Mayors (CoM initiative 2015), and that are willing to demonstrate transition concepts and strategies towards a low carbon economy transforming their buildings, energy networks and transport systems.

Recognizing that "smart urban technologies can provide a major contribution to tackling many urban challenges" (European Commission 2012), in 2012 the European Innovation Partnership on Smart Cities and Communities (EIP-SCC 2015) launched the attempt to form an alliance among cities, industry and citizens for improving urban life through more sustainable integrated solutions.

The multifaceted definitions of smart city reflect different meanings and specific aspects of a city. The disparity of words used in defining a smart city is fairly evident as underlined by a recent literature review (Mozannenzadeh and Vettorato 2014), which points out also an evident difference of viewpoints among the three fundamental domains in which the concept of smart city has been developed (Academic, Industrial, and Governmental). The various definitions of smart cities suggest the necessity of deploying coordinated set of interventions aimed at converting bustling cities in more sustainable places in which the development of social participation as well as quality citizen lifestyles are the drivers for "smart communities" (Annunziato 2013).

In order to meet the challenges faced by the smart citizens growth, the ENEA has proposed a model of Social Urban Network (SUN) (Annunziato and Pede 2012) for L'Aquila with the aim to encourage public participation in decision-making process

and enhance the social-cultural capital town of Abruzzo region through ICT tools and Living Labs. The proposed model of Social Urban Network can be understood as a coordinated set of actions that both through web devices (social networks, portal, app) and the urban scene (interactive, social events) promote cohesion and development of human capital.

The SUN can develop several thematic pathways (cultural, welfare, health and wellness, education, production activities, citizen-to-Public Authorities) aimed at supporting a sustainable development of local communities, enhancing their territorial and cultural potential as well as promoting informed choices and active participation of the whole urban community. This innovative planning and information tool, which facilitates the spread of knowledge and the share of good practices, can help to overcome the existing barriers on cooperation among Public Authorities, citizens and businesses in planning and managing development processes as well as to implement technical solutions characterized by financial and cultural feasibility.

Taking advantage of the experience gained in the implementation of the SUN for the town of L'Aquila (Annunziato and Pede 2012), a customized Social Urban Network (SUN) for the town of Matera (SUN4Matera), awarded European Capital of Culture 2019, has been carried out by ENEA in the framework of the "Smart Basilicata" project, funded by the Basilicata Regional Authority under the call "Smart Cities and Communities and Social Innovation" (2012) of the Italian Ministry of Education, University and Research—MIUR.

The Smart Basilicata project (2012–2017) was designed by a composite work team including local government, small and medium enterprises, academia and research centres mainly located in the regional territory. The project is structured around five main integrated operating objectives (Smart Environment, Smart Energy, Smart Mobility, Smart Culture and Tourism, Smart Participation) with the aim of experimenting with innovative solutions in different sectors, in which the improvement of social participation and the use of smart services specifically designed for Public Administrations and citizens represent key elements of innovation.

The ultimate aim pursued through the full implementation of SUN4Matera was to foster the involvement of the whole community through a new approach on smart participation, with the willingness to produce integrated information that valorize all knowledge assets and allow to share easily new ideas arising from the local community. In an ordinary governance process, the design process of an ICT tool starts with the selection of a set of standard topics that are validated and tested by citizens during the implementation phase. Within this approach, citizen priorities are not preliminarily and explicitly taken into account whereas their feedbacks are considered only in the subsequent phases for revisions and uptake. This could lead to the development of tools not fully respondent to citizens' needs and cause significant delays in the finalization phase. To overcome these difficulties, the design of the SUN for the Matera town was based on direct interviews with citizens, stakeholders and tourists carried out in order to identify active facilitators, empowering their role and disseminating positive ideas. At the same time, pessimists could improve their reliance on their owns capacities expressed and emerged from their opinions.

Taking into account the priorities emerged by the survey, the SUN4Matera represents both an aggregator of experience and incubator of all the cultural processes that take place in the town. The purpose is to strengthen social cohesion through the investigation of community identity (e.g. history and memory emersion, cultural heritage and intangibles goods valorization) as well as the improvement of creative capacity, self-criticism, and boosting the local economy through a sustainable development of businesses and tourism. In such a way the SUN will effectively support the empowerment of community starting from an original contributions of citizens that are involved since the beginning thanks to a creative approach aimed at enhancing real community expectations for a smart growth.

After outlining the ENEA model for SUN, this chapter focuses on the argumentative and participative survey adopted in Smart Basilicata Project to set up SUN4Matera and describes in details objectives, activities as well as the main results obtained through direct interviews to citizens, stakeholders and tourists.

9.2 The Case Study and Research Framework

In the following sections the social and territorial context in which the research is carried out is presented with a focus on a previous experience of Social Urban Network development.

9.2.1 The Basilicata Region and Matera

Basilicata is a small region of Southern Italy (Fig. 9.1) with about 578,000 inhabitants (ISTAT 2011) representing 1 % of Italian population, and a very low population density (about 59 inhabitants/km^2 whereas the national average is about 202 inhabitants/km^2). The local economy is based prevalently on agriculture, with few

Fig. 9.1 The Basilicata Region and Matera town (European capital of culture 2019)

small-medium size industrial areas except for the FCA Melfi plant of the FIAT group (http://fcamelfiplant.fiat.it). Tourism, mainly developed on coastal areas, is increasing, although its share is still under the national average.

Matera (59,796 inhabitants) (ISTAT 2011), one of the two provinces of the Basilicata Region, is located in the eastern part, at about 400 meters above sea level. Its historical heritage dates back to the late Paleolithic era. The town centre includes the renowned "Sassi" district, constituted by stone houses that represent a unique settlement "perfectly adapted to its terrain and ecosystem" (UNESCO 2015) and an outstanding example of peculiar use of natural resources, which was acknowledged as a World Heritage Site by the UNESCO in 1993.

The primary nucleus of the Sassi district was inhabited uninterruptedly from the Prehistoric era until the modern age. In late forties, due to the poor sanitary conditions, the Italian government ordered its evacuation and the about 15,000 inhabitants had to leave their cave-style houses to move to new built residential areas.

However subsequently the high historical, cultural and landscape value of the Sassi district was recognized and since 1986, ad hoc legislative provisions have financed the restoration of the "Sassi" triggering a revaluation of its touristic and historical potential. This process led to an increased social identity awareness that supported the vision of Matera as a popular tourist destination, contributing noticeably to development of tourism. In 2014 Matera was appointed European Capital of Culture 2019 representing an important acknowledgment of its cultural value. Despite the remarkable progresses, many social problems still exist as well as political and infrastructural barriers that hamper a full development of tourism and the recognition of Matera as a worldwide cultural tourist destination. Therefore in view of the Matera 2019 appointment additional efforts are required to improve the tourist offer, and the organisational infrastructures including the design of customised web-based services.

9.2.2 A Model for Smart Participation: The Enea-Sun Model

The ENEA model for a Social Urban Network (ENEA-SUN model) arises from the experience of the City 2.0 research project for the town of L'Aquila (Annunziato and Pede 2012), damaged by a dreadful earthquake in 2009. The City 2.0 project consists of different actions integrating several urban networks and services with a synergetic and integrated approach.

The SUN model has been developed in this framework since 2012 to promote the creation of a Smart Ring around the Old Town aimed at triggering a process of sustainable reconstruction for the destroyed city. This sustainable reconstruction concept was applied not only to the city rebuilding but also to the development of innovative services to citizens in order to facilitate the recovery of social cohesion and cultural heritage.

The ENEA-SUN model proposed for the town of L'Aquila was aimed at promoting the growth of a "smart community" with the purpose of supporting the

consolidation of a "sense of community" through the creation of collective contributions related to goods, assets and cultural processes. The ENEA-SUN can therefore be seen as an aggregator of experiences and an incubator of the cultural processes that take place in the city, aiming at strengthening the social identity of the community.

The approach adopted to stimulate cultural process and community revival is focused on the enhancement of the community identity (material and intangible assets, e.g. cultural heritage and identity, history, memory) and on the enhancement of creativity as a building block to join cultural heritage, social cohesion and shared values.

The ENEA-SUN architecture for City 2.0 consists of several interconnected tools that represent different layers with specific functions to fulfil end-users requests.

The first layer is related to social networks allowing citizens to provide the main contributions and cultural contents through the most widespread social networks (Facebook, Youtube, Twitter, Pinterest, etc.) or directly by an App.

The second layer is built upon the contents deriving from the first layer and promotes the semantic analysis, classification and storage of the contributions in a database. The semantic analysis is aimed at developing a set of indicators on the issues arising from the social networks, on specific cultural, creative elements, sense of community, mind-set and feelings (e.g. emotional city, discomfort, etc.). The indicators were characterized on the social network model (network theory) that was used to derive the evolution of connectivity features (intensity of connection, network model, the presence of cultural hub of specific issues).

A selection of indicators was displayed on a web portal that, besides explaining the content of the project, has the purpose of providing an organized representation of L'Aquila real life, building creative contents galleries and showing the streaming of the community from the social networks. To this issue the SUN is supervised by a "Community Promoter-CP" with an in-depth knowledge of the town (usually a cultural associations member) that acts as a facilitator of social and cultural processes being in charge for managing the information from the database. The CP is a facilitator, which is a well-known representative within the urban community, selected with a bottom up process for his ability to organize participatory events in relation to the most relevant content expressed by the community.

The physical object that represents the City 2.0 project is a smart node. It is an interactive installation where creative expressions are contained in the database and preliminary selected by CP. These issues are then visualized and can be voted by citizens.

Contents can be uploaded directly from a smart node to be sent to the semantic database for their subsequent storage and analysis with dedicated software. A first set of collective creative issues has been provided through experiential workshops in order to elaborate an experience program for the development of social skills at the Scientific High School "A. Bafile". One of the City 2.0 project goals has been the creation of school labs and free associations to enhance citizens' creativity. In this

framework, community engagement was fostered by a competition aimed at creating a "Smart Community Living Lab". This is a virtual laboratory that triggers synergies where people can share and learn ideas and activities on the city future and the community. Another important element was the realisation of thematic participatory events organized by the CP to enlighten the relevant topics for the development of cultural identity and creativity development, made easier by the SUN architecture and the smart nodes promoting a bottom-up knowledge sharing approach.

9.3 Methodology

The experience gained in the framework of the ENEA-SUN model developed for L'Aquila town was translated in a new urban context in Southern Italy with a strong tourism potentiality.

9.3.1 A Social Urban Network for Matera 2019 (SUN4Matera)

The overall objective of the Social Urban Network-SUN in Matera (SUN4Matera) was to support a sustainable growth of local communities, enhancing their capacity and promoting informed choices and active participation. This will be realised by developing innovative tools to support the transfer of knowledge and good practices sharing that allow overcoming the cooperation barriers among policy makers, citizens and businesses. Furthermore, a suited core-set of sustainability indicators is under implementation and will allow to measure and monitor the use of resources. In particular, the SUN4Matera was designed to:

- encourage public participation in decision-making;
- enhance social/cultural capital through ICT tools and Living Labs;
- overcome the interoperability between management systems;
- facilitate the exchange of relevant information;
- implement innovative Decision Support and Knowledge Management Systems for the definition and assessment of the effectiveness of sustainable resource use strategies at local level, improving the access to information on policies, plans and programs;
- develop a model of effective knowledge to have free access to territorial resources;
- activate innovative participated tools for enhancement and conservation purposes.

While the ENEA-SUN model proposed in L'Aquila aimed at promoting the growth of a smart community with the purpose of supporting the consolidation of the "sense of community" through the creation of collective contributions related

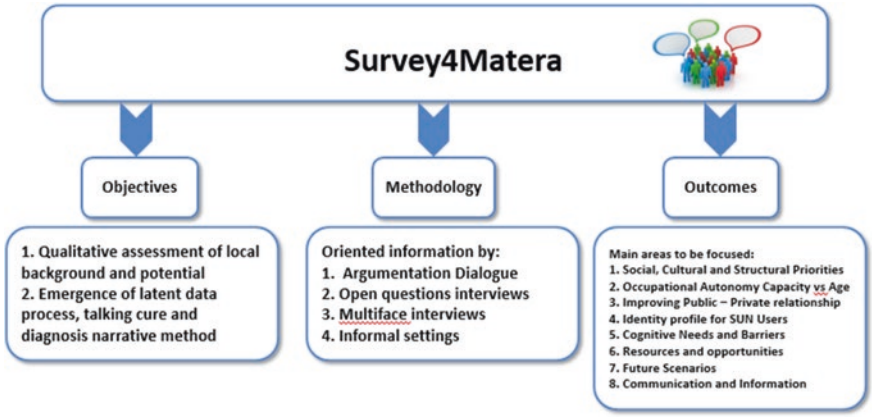

Fig. 9.2 A schematic representation of the Social Urban Network—SUN4Matera

to goods, intangible assets and cultural processes; the Smart Basilicata project in comparison aimed at developing innovative advanced tools to support decision making and public participation at local and regional scale.

In summary the project goal for SUN4Matera was the creation of a model supporting the development of the social and cultural heritage of the territory, in terms of quality life, well-being and collective participation, as integral elements of its economic development with a particular emphasis on tourism. The SUN4Matera provides a structured dialogue system for citizens (smart participation) as well as a system to boost tourism and businesses (smart tourism and culture), both managed by a single platform, based on a physical intelligent nodes (smart nodes), as represented in Fig. 9.2. The proposed model is aimed at supporting the creation of a *close community network* to increase and/or rebuild the community identity and economy, working as incubator and booster of the human capital.

9.3.2 Survey Research and Interviewing

The methodology adopted for conducting the survey for Matera (Survey4Matera) was developed utilising a diversified approach integrating different techniques for data mining. Taking into account the overall objective of the Smart Basilicata project as well as the peculiar context of the Matera town, the methodology was aimed at covering different fields of investigation as well as at innovating the traditional method of ethno-anthropological survey in Italy (Fabietti and Matera 1999; De Martino 1959). To this issue diversified methodological survey lines were selected and adopted in relation to the spatial context and main contents. The methodological pillars are sketched in Fig. 9.3.

The survey was addressed to a qualitative assessment utilising the argumentative dialogue method drawn from the methodology of participant observation,

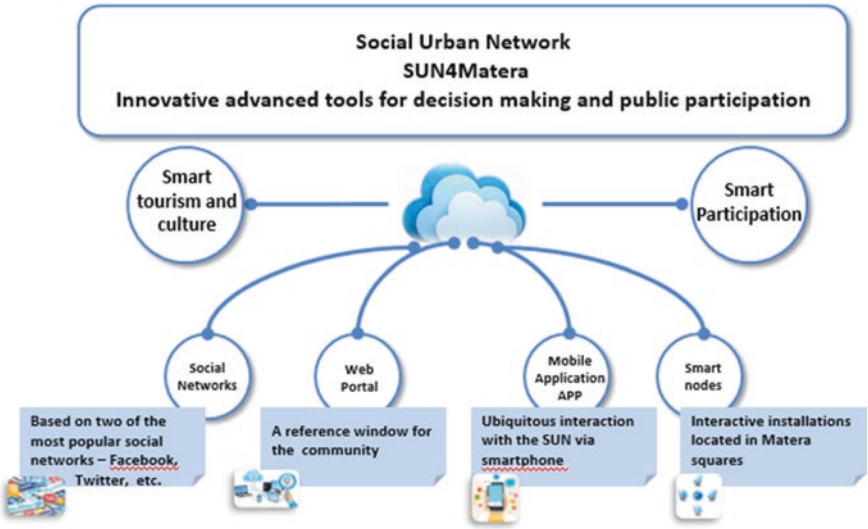

Fig. 9.3 An innovative ethno-anthropological methodology for Matera survey

which is typically used in ethno-anthropological sciences data collection diagnosis to the production of data mining and the emergence of latent data. Individuals were interviewed on few selected issues submitted in a very general open formulation and dialogue mainly focused on Matera functional barriers and cultural skills.

The approach placed a great deal of importance on listening carefully to interviewees in order to identify priority needs. The role of the interviewer was essentially to support the interviewee, to bring out latent and deep personal opinions. The open questions methodology was supported by submitting to the interviewee a set of questions formulated in order to receive an "open answer" that highlights their own opinions. In this context the interviewer operated as an information node bringing back the response of other people participating in the survey and observing the interviewed reactions. Table 9.1 summarizes some basic open questions used to conduct the interviews.

The survey included both single face-to-face surveys (1 interviewer, 1 interviewee) and multifaceted dialogue (i.e. more interviewers and one interviewee, as in the case of the interview to the Matera's mayor, or 1 interviewer and many contemporary respondents). Furthermore, informal settings such as hangouts elicit important additional qualitative information that has a high value in this kind of investigation. Except in the informal settings, interviewees were audiotaped under their consent.

The interviewer staff was made up of four researchers involved in the project with different professional profiles, living in the Basilicata Region, coordinated by a Cultural Anthropologist (expert living outside the region, co-author of the paper). The survey was held in the Matera town from 3 to 7 February 2014 on a survey sample of 45 interviewed people (Table 9.2).

Table 9.1 Some basic open questions followed to conduct the interviews

	Target	Topics to address/investigate
General audience	Citizens	– Perception of the town – Personal and social priorities – Evaluation of the quality of life in Matera – Personal opinions on public services (technological, infrastructures, etc.) Matera offers to citizens and tourists – Suggestions to improve Matera's livability – Suggestions to improve tourism attractiveness – Sound out citizens' willingness to participate in social and cultural actions both in "virtual and physical form" in view of Matera 2019
Specialised audience	Tourists	– Comments on available services: how they evaluate them, what kind of information is missing – Preferred typology of information: graphic information or more descriptive ones – Comments and desiderata on Matera's cultural offer – General opinion on the town – Good and bad points of the town
	Elderly people	– Suggestions on how historical memory could be transmitted and become useful for Matera's development – Opinion on the services offered by the town for elderly citizens – Proposals on how to make Matera a senior-friendly town
	Teachers	– Opinion on the links between knowledge acquisition and direct experience – Teaching methods to develop autonomous learning of students
	Decision makers	– Suggestions on how to promote information exchange among different sectors – Proposals for Matera's sustainable development – Information on how they live their lives as individuals, and if it affects their institutional choices

Table 9.2 Survey sample composition

Age	F	M
0–15	0	0
16–28	1	2
29–38	8	6
39–45	3	8
46–56	2	6
>57	2	7
Total	16	29

9.4 Results and Discussion

The integration of diversified set of techniques used in the survey made clear a number of relevant and useful information to be collected for future analysis. This innovative methodology, referred as "anthropology of becoming", can contribute to uphold the development of a new emerging data mining process, integrating the diagnosis method developed by Deleuze et al. (Deleuze and Guattari 2003;

Deleuze 1984) with the more traditionally "participatory and argumentative dialogue" approach. Using this approach, it was possible to elicit interviewed people opinions through maximising the dialogue in a narrative proactive emergence of latent data and circulating information received in previous interviews (e.g. to foster a provoked information). The involvement process was more effective when the interview oriented the interviewers to support new choices and new possibilities in relation to its own capacity and creativity.

Citizens' response collected in the Survey4Matera allowed to find out eight main themes of dialogue to be focused by the SUN:

(1) Social, Cultural and Structural Priorities
(2) Occupational and Autonomy Capacity versus age
(3) Improving Public–Private relationship
(4) Identity profile for SUN users
(5) Cognitive Needs and Barriers
(6) Capacities from Tangible and Intangible Resources
(7) Future Scenarios
(8) Communication and Information.

Transversal issues were identified to promote a structural development and to exploit resources and ability in order to intercept opportunities and contribute to the development of future plans. The main issues arisen from the discussion are summarised in Table 9.3.

Table 9.3 Summary of the main issues by theme pointed out from Survey4Matera

Themes	Main issues
1. Social, cultural and structural priorities	– Developing inter-modal connection infrastructures (trains, bus) for tourism expansion – Improving the potential conditions to increase employment in order to fulfil the strong labour demand – Organizing and scheduling socio-cultural events within a unitary hierarchical direction – Training institutional subjects and citizens for skills improvement – Reducing the gap between institutions and citizens – Improving communication both at public and private level fostering a synergy between the economy, institutions and services
2. Occupational and autonomy capacity versus age	– Under 30s interviewed people: Great willingness to changes, to work in an innovative way and strong demand for new job opportunities and modalities still unknown – Older than 30s interviewed people: Sense of inadequacy, strong pessimism and perpetuation of traditional mental schemes for job searching
3. Improving public–private relationship	Main barriers: – Unbalanced development of public and private sectors due to an unbalanced distribution of public funds favouring public bodies and few private entrepreneurs and promoting individualism – Fragmentary and short-term investments without a strategic vision resulting in inefficient services for citizens and tourists
4. Identity profile for SUN users	– Identify the typology of information dedicated to very young people and retired persons – Think up specific initiatives to successfully involve each category of users

(continued)

Table 9.3 (continued)

Themes	Main issues
5. Cognitive needs and barriers	Needs: – Completing and upgrade the unfinished infrastructures (e.g. cycle lanes, Ethno-Anthropologic Museum, etc.) – Fostering the transfer of knowledge and training for skills improvement – Improving resource management and public information – Promoting industrial investments and new business incubators – Increasing green areas per capita – More flexibility in shops opening hours especially in the "Sassi" area – Improving public transportation and city services – Increasing and support citizen participation, empowering their role in the decisional processes – Supporting young people in realising their occupational vocation – Valorising the territory through by promoting creativity and intuitive skills – Developing a comprehensive strategy to attract tourists and increase the duration of their stay – Improving city's governance for a coordinated enjoyment of cultural and tourism attraction Barriers: – Lack of infrastructures – Scarce and fragmented financial resources – Prevalence of moonlight workers in the tourism sectors and patronage system – Self-centred attitudes and initiatives – Lack of management competences – Scarce knowledge of the territory and its resources – Difficult access to resource and information – Scarce cooperation and limited links with the territorial policies – High risk perception by the regional authority to allocate funding for Matera – No long-term investments – Lacking approaches for farsighted strategies – Scarce willingness and attitude to mind-set change – Unsustainable tourism exploitation – Scarce human resources allocated to the municipal tourism department – Uncoordinated autonomous initiatives – Lacking organisation of information (not designed for a direct usability) – Late and lacking response of public administration to citizens' inquiries – Out-of-date business models – Cultural models based on matriarchy

Table 9.3 (continued)

Themes	Main issues
6. Capacities from tangible and intangible resources	Material resources: – Historic, artistic and architectural heritage (represented by the "Sassi" Area and the old towns) – Industrial areas in the neighbourhoods – Protected Designation of Origin (PDO), Protected Geographical Indication (PGI) and Traditional Specialities Guaranteed (TSG) food products Natural resources: – Geomorphology of the "Sassi" area – Archaeological historic-naturalistic park of the Murgia Materana Intangible Assets: – People friendly city and unique atmosphere – Proactive young generation – Diffusion of organised volunteer associations – Strong sense of identity resulting in social cohesion and a warm hospitality – Excellent sports initiatives – Good educational system (secondary schools and university) – Excellent health care services – Low criminality – Artistic and creative flair – Willingness and flexibility to changes
7. Future scenarios	– Boosting the economy – Creating a technology district for the production and commercialisation of local goods – Creating a knowledge pole for training and specialization – Developing the tourism potential – Empowering citizens' role and participation – Improving infrastructures and services – Increasing urban green space enjoyment – Improving the relationships between public and private stakeholders
8. Communication and Information	– TRM TV (excellent) –"Matera chiama Info" magazine (closed) – Matera Municipality website (low level) – Social Networks (Excellent as newspapers source of information, young generation and retired people) MATERA PULITA App (inactive)

In particular, the survey pointed out that information to be spread and channelled by the SUN should address the main needs in a comprehensive way in order to promote innovative business models, improve the knowledge of the territory and its resources, valorize entrepreneurial competences and enhance collective responsibility. In this context an ICT smart infrastructure based on a social urban network model can strongly contribute to establish collaborative synergies, empower the European dimension of Matera town and support the development of sustainable tourism.

9.5 Conclusions

In recent years, Matera's conditions have been improved however there is still a need for further substantial development to meet citizen expectations and to foster their active engagement. The Survey4Matera represents the first step for the development of the SUN4Matera that, taking advantage from a modular innovative ICT structure, will greatly help to connect the city potential with citizens needs and expectations as well as contribute to reduce the main identified barriers.

As a first step in the process of creating a framework for collaborative urbanism that places a great deal of emphasis on promoting a bottom up approach, the methodological approach adopted at Matera demonstrates a set of innovative data collection and data aggregation methods to obtain a qualitative rather than a quantitative assessment to enhance both perceptive and subjective information. During the anthropological survey a transition performance of the subject (that is, a set of actions aimed at favouring the passage from an unsustainable mental and physical condition to better living conditions) was developed to produce new subjectivities. Moreover, through the participative dialogue and argumentation approach, interviewed people are guided to think about potential opportunities and threats in order to highlight latent opinions and barriers to be removed.

The main results from the survey were as follows:

- the necessity of improving comprehensively the existing different weak areas
- a general lack of coordination and organization
- cultural barriers, uneven funding distribution
- scarce knowledge of opportunities
- unskilled workers.

In addition the survey showed that fixed mindset and individual rather than collective entrepreneurial capacities represented an obstacle to social and economic development, supporting an economy based on public subsidies. A long-term strategic vision with well identified objectives for Matera's future development is thus essential to ensure the fulfilment of citizens' expectations as well as to foster an optimal allocation and management of public funding.

In this framework the Smart Basilicata project can strongly support a sound cultural renovation. In this framework the survey set the foundation of an operating diagnosis process that triggered community reflections on evolving sustainable and virtuous behaviours as well as cooperation modalities driven by the Social Urban Network SUN4Matera.

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References

Annunziato, M. (2013). Smart Cities - la roadmap per le città sostenibili (in Italian). IV Forum "Green City Energy", Pisa, 4–5 July 2013. http://greencityenergy.it/pisa/files/Smartcities-Mauro_Annunziato.pdf. Accessed 18 Nov 2015

Annunziato, M., & Pede, G. (2012). City 2.0. Smart ring project in L'Aquila. http://www.uttei.enea.it/tecnologie-per-le-smart-cities/files-smart-cities/city-2-0-uno-smart-ring-a-Laquila. Accessed 23 Nov 2015.

COM/2007/0723 final. (2007). A European strategic energy technology plan (Set-plan)—'Towards a low carbon future' {SEC(2007) 1508} {SEC(2007) 1509} {SEC(2007) 1510} {SEC(2007) 1511}. Brussels: EUROPEAN COMMISSION; 2007. http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1411399552757&uri=CELEX:52007DC0723. Accessed 3 Nov 2015.

CoM initiative. (2015). The covenant of mayors. www.eumayors.eu. Accessed 3 Nov 2015.

Deleuze, G. (1984). Logica del senso. Feltrinelli. Milano. ISBN 88-07-10028-2 ISBN 88-07-81866-3 ISBN 978-88-07-81866-0

Deleuze, G., & Guattari, F. (2003). Millepiani. Castelvecchi, 2003. ISBN 88-7394-031-5

De Martino, E. (1959). *Sud e Magia*. Milano: Feltrinelli.

EIP-SCC (2015). Smart cities and communities—The European innovation partnership on smart cities and communities. http://ec.europa.eu/eip/smartcities/. Accessed 3 Nov 2015.

European Commission. (2012). Press release, Brussels, 10 July 2012. Commission launches innovation partnership for Smart Cities and Communities. http://europa.eu/rapid/press-release_IP-12-760_en.htm. Accessed 3 Nov 2015.

Fabietti, U., & Matera, V. (1999). Memoria e identità. Simboli e strategie del ricordo. Meltemi Editore srl.

ISTAT, (2011). 15th Population and housing census 2011. http://www.istat.it/en/population-and-housing-census/population-and-housing-2011. Accessed 16 Oct 2015.

Mozannenzadeh, F., & Vettorato, D. (2014). Defining smart city. A conceptual framework based on keyword analysis. TeMA Journal of Land Use, Mobility and Environment. Smart city planning for energy, transportation and sustainability of the urban system. Special Issue; 2014. http://www.tema.unina.it/index.php/tema/article/viewFile/2500/2539. Accessed 4 Nov 2015.

UNESCO. (2015). World heritage centre. http://whc.unesco.org/en/list/670/. Accessed 16 Oct 2015.

Chapter 10
Digi-Tel—Bespoke Technology for Connected City of Tel-Aviv

Zvi Weinstein

Abstract The chapter describes bespoke technology developed by the Tel Aviv Municipality, Israel called Digi-Tel. It aims to engage, involve and connect city residents directly to municipal departments, and enable them to benefit from the efficient two-way use of Information Communication Technologies. As such Digi-Tel delivers updated information in a variety of domains, providing municipal services, encouraging residents' engagement, transparency and mobility, with the aim to improve their quality of life. Digi-Tel composes three elements—the people (citizens, residents and visitors), the second a friendly city (quality of life) and the third is data (technology). These essential elements are integrated into the city's vision to create a city for all residents. The local municipality promotes a policy of transparency of the information provided to the general public, enabling residents to access the municipal database on one hand. This encourages residents to proactively engage the municipality, while additionally reporting on events, activities and concerns on the other hand. It manages a variety of components divided into three main classifications—applications, logistical infrastructure and physical infrastructure. As a neo-liberal solution, Digi-Tel raises two questions: (1) what is new and original with this endeavour in comparison to past and present endeavours and (2) what are the actual impacts in terms of effective involvement of ordinary citizens in knowledge production and creation processes.

10.1 Introduction

The Digi-Tel was conceived in 2012 as a result of the local municipality's recognition that there was a need to establish personal contact with the residents of the city, and to inform them on the activities that take place in the city by means

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of information communication technologies (ICT). Similar to most cities around the globe, residents criticize their city hall for not paying enough attention to their daily needs and problems. In most cases, the relationships between the two entities—city and residents—are maintained through tax collection or parking tickets, legislation and de-legislation, or top-down influence of policy decision. In other words, a kind of disconnect exists between what the citizens think about the city and what they really think about the local municipality's managerial level. This internal insight encouraged the municipality of Tel Aviv to change its attitude toward resident-led participatory policy, and to re-structuring the approach of building sustainable processes of decision-making where residents become important partners in these processes.

The question raised was: How will the local municipality be able to activate a change that was never before implemented? To reach this unprecedented and fundamental point, the local municipality began to invite citizens from mixed neighbourhoods and regions, different peer-groups and stakeholders, to participate in focus groups discussions. These groups discussed different issues that concern them in their daily lives, and their relationships with the city. The main purpose of that activity was to discuss and understand the sources of conflicts existing in the relationships between various city hall departments and the residents, and how to improve these relationships. This process lasted about a year, and at the end of the day, a new idea that seemed like an imaginary and unfeasible start-up concept began to develop through business-like thinking.

There is no similar duplicate city start-up project in existence elsewhere in the world like this one. Thus, this innovation is considered original in its aspirations and conceptualization to change old policy and perceptions of the relationships between the city and its residents with the aim to bring about a significant change.

The solution was shaped from a concept derived from the business sector. It is as follows: as a neo-liberal approach towards introducing e-democracy, the residents became clients of the city with open and free access to its multiple services. Residents will become members of a unique and inclusive club, which provides personal information, benefits, and offers advance and innovative e-services. Close relationships on a personal basis will be established between the city's residents and the municipality. A municipality that actually has a monopoly on providing services to its residents does not maintain a conservative approach. It adopts tools from the commercial and business world to establish a cohesive city that enables its subjects to enjoy and benefit from the large variety of the municipality's personalized services and products.

To launch the project, the municipality initiated a marketing campaign in the city. The fact that more than 50 per cent of Tel Aviv's eligible population registered (as of January 2016) to join the club, demonstrates the effectiveness of the campaign and proved that Digi-Tel was seen as a useful tool—for the municipality and the residents—to share a mutual goal and to bring about a real, positive change in their relationships.

10.2 Operation

The first step to joining the Digi-Tel Club is to fill a registration form with personal details such as ID, postal and e-mail addresses necessary to identify that he/she is a resident of Tel Aviv. All Tel Aviv residents, eligible from age 13 and up, can come to one of the many registration locations centres in the city such as: community centres, day-care centres, social services and education departments, city libraries, or sport centres. All are located in the neighbourhoods and can be easily accessed. Each applicant is asked about his/her priorities and domain of interests according to the list of services and benefits the municipality offers him/her. Once they are registered, residents receive personal notifications on items of interest to them. They also receive access to a private area in the municipal website where they can receive personalized information on many different topics. The resident receives the Digi-Tel City Card and can use it to enjoy benefits at places outside of the city's services domain, including cafes, shops, museums, restaurants and more.

The personalized information for every citizen is available in a "personalized area" on the city's official website. The municipality can use this personalization data for its app to actively notify the resident cardholder of events and promotions through posts, e-mails and text messages. For example, Digi-Tel professionals and technical staff will inform resident that the bridge he normally crosses is closed, suggesting that he take an alternative route to reach his destination on time; Digi-Tel will inform another resident that the deadline for registering his/her child for kindergarten is approaching and can easily register online; Digi-Tel will keep yet another resident, who loves music, posted about discounted tickets for tonight's performance. The above examples are a few among many of how the network operates, based on the unique profile of each Digi-Tel Club member.

There are several principles and features that are keys to the operation of the Digi-Tel program:

1. Digi-Tel delivers information and services are specific to the requests and demands of each resident;
2. Digi-Tel provides direct and active notifications to the resident according to his/her personalize profile;
3. Digi-Tel takes an active and proactive attitude towards Tel Aviv residents;
4. Digi-Tel promotes openness, transparency and information-participatory.

Digi-Tel is using the platform of cultural organization change, the central and most important result of the focus groups discussions. One of the most significant outcomes is the service revolution among all municipal departments that deliver information to the residents. This crucial change is executed through improving service centres, where residents come for assistance on anything from consultancy on issues like child enrolment to educational institutions, improving physical infrastructure in their neighbourhood, or for updates on community events and public works in their street (Fig. 10.1).

Fig. 10.1 The Digi-Tel Card

The second one is an improvement in the efficiency of working processes that emphasize the motto "with the face to the community and the residents" by means of the ICT tools. This change is expressed in making service appointment more time efficiency, and answering calls and handling application processes better. A collective organizational language that works toward improving services began to take hold in the municipality's personnel on all infrastructural levels, something that is a vital first step in overall improvement. Interestingly it was driven by the adoption of shared set of values as expressed in Fig. 10.2 that in turn drove technological and managerial changes.

All municipality employees participated in special training workshops to raise awareness in order to achieve the optimal levels of services (and changes in attitude) when dealing with the residents. The Venn diagram of service values presented in Fig. 10.2 became ingrained into each employee on all levels of the city's administration and bureaucracy. Adopting these services values is the new approach, inevitably leading toward more citizen engagement and closer participation in a more bottom-up process.

The other factor that led to the implementation of Digi-Tel Club was data and information management among the managerial ranks and employees in other municipal departments. In this process, they learned how to document information and deliver it to others by means of internal information management and communication tools.

The result of these processes was a paradigm transformation from "knowledge is power" to "participation is the power". City Hall supported it and guided the organizational culture change from reactive to proactive, by providing the resident with information, services and benefits suited to the individual's lifestyle.

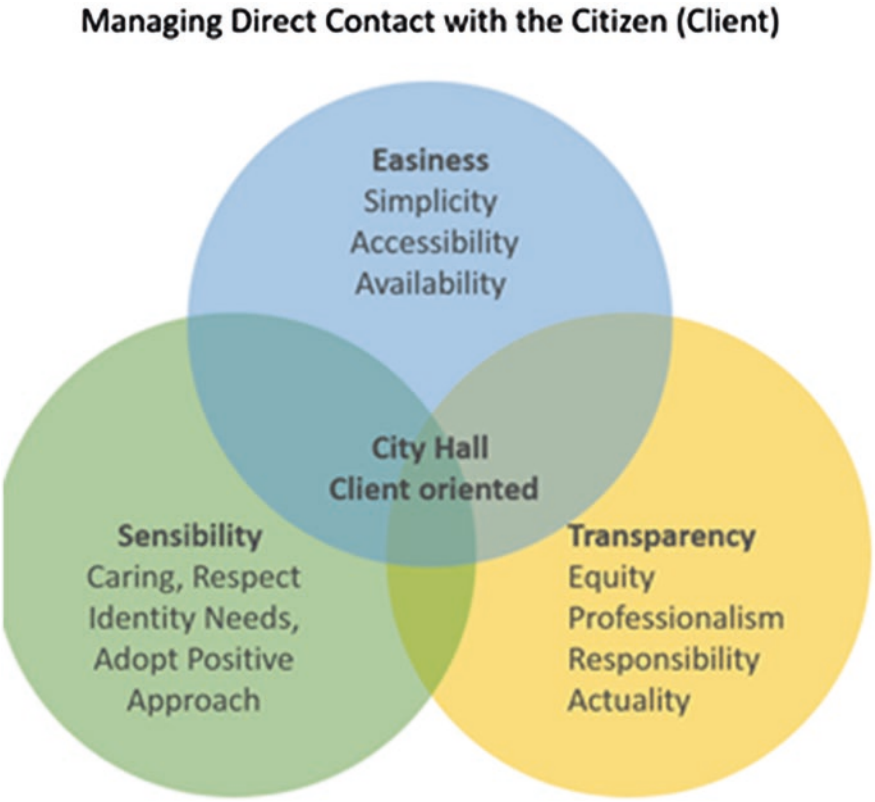

Fig. 10.2 Service values

10.3 The Digi-Tel Vision

The Digi-Tel vision complements the designation of Tel Aviv as the Smart City. Tel Aviv, the "Nonstop City", considers engagement a key value in implementing Smart City principles. It actively involves residents in the urban experience and urban development, while at the same time emphasizes engagement in decision-making processes in the modern era (Fig. 10.3).

Digi-Tel, the technological and social tool available to the city's residents, offers better use of communication and ICT to streamline the management of existing resources and assets in the city. This is expected to enhance the quality of life. The target criteria for making Tel Aviv-Yafo to be a city for all demographics of residents through the Digi-Tel program are as follows: an appealing city to live in; a city for lifetime; quality and egalitarian education; equal opportunity and bridging social gaps between the north and south parts of the city; strengthening the sense of community; and fostering pluralism.

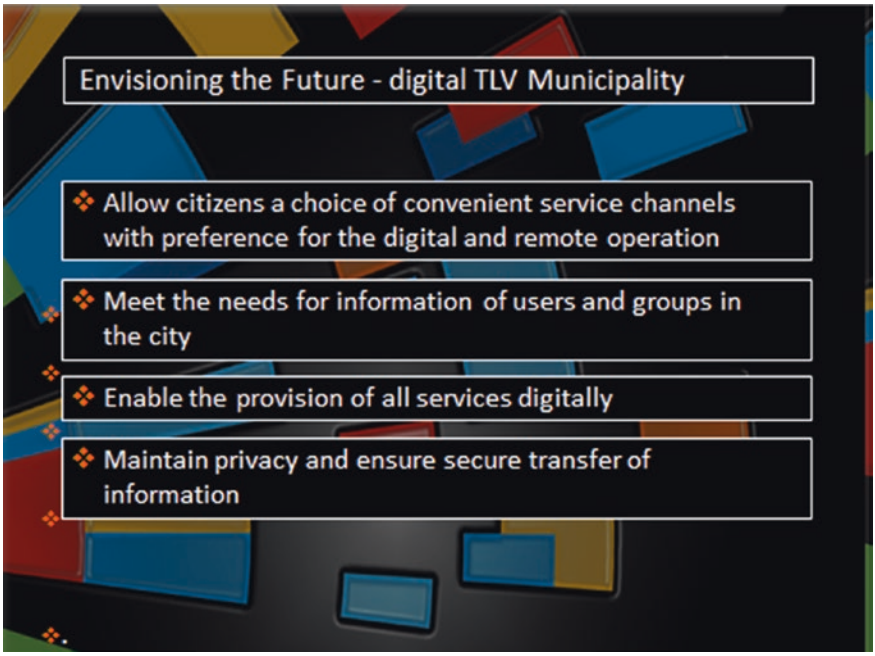

Fig. 10.3 Digi-Tel vision

The strategy supports the three main objectives outline in the city vision: implement citizen-oriented government, create a city for all residents, and maintain an appealing urban environment.

Hollands (2008) and Angelidou (2015) define the smart city as a process of embedding technology into the fabric of the city. Therefore, the smart city is described as an ongoing project, rather than a finalized reality.

Tel-Aviv's main motivation, as can be seen by the city's own definition of smart city and consistent with the challenges the city faces, was to improve resident engagement and strengthen trust between residents and the municipal government. Tel-Aviv's municipality defines this process as "citymaking", that is, transforming a space and place, where a space is a physical entity, while a real place draws people, has a clear narrative, and is embedded with meaning (Toch & Feder 2016)

10.3.1 The Digi-Tel Concept

The Tel Aviv Municipality has set in motion a unique and innovative digital transformation. The Municipality's aim was to strengthen the contacts, sense of participation and satisfaction of the city's residents and the success of Digi-Tel is reflected in the growing numbers registering for its services.

For example, many projects that combine the Digi-Tel approach divided into three sections of applications, logical infrastructure and physical infrastructure are presented in Fig. 10.4.

The network, or **physical layer**, aims just to connect people to the Internet, like the free WI-FI project, which aims to cover all the main public areas in the city; all the beaches, the boulevards, and the public squares. Currently, the WI-FI network covers all main pedestrian streets of the city center and part of it's outer neighborhoods.

Eighty zones of WI-FI were established around the city. Reports already have shown that there are approximately 50,000 unique users per month on average. It supports for broadband connectivity infrastructure development (Ziv and Ramati 2013).

There is no need to register for the service. Each user is redirected to a landing page, which displays the main current events that are taking place in the city.

The logical layer contains infrastructure app's like the City App, which offers location-based information about the city; leisure, culture and art (outdoor community events, arts); traffic and parking (bicycle stations and availability, closed roads, parking lots); and so on.

Another tool is the geographic information system (GIS), the Iview, which makes spatial information available to the public in a variety of areas: engineering, transportation, community, tourism, education, art, and more.

Fig. 10.4 The Digi-Tel components

As a resident of the city, one can view all the geographic information relevant to his/her neighbourhood: preschools, schools, public parks, pharmacies, community centres, outdoor sculptures, etc.

Engineers can find blocs parcels, electricity and water infrastructures, and view a particular zoning plan and its accompanying documents.

As part of the city's policy to promote the accessibility and transparency of the information provided to the general public, the municipality allows direct access to municipal databases and archives that are not of a confidential nature. For example, the building archive is open online to the public, free of charge. The archive includes planning information about all the housing in the city. The Open Data environment enables the public and application developers to make use of the information in municipal databases that deal with community affairs, culture, public health, budgets, statistical data and security.

The Application layer contains applications and systems that aim to address a specific task/need. The latter includes, for instance, management and exportation of the information about community centres. Community centres are an important link in the connection between residents and city management. Tel Aviv residents can view the list of classes offered at the local community centre online and general information about a particular class, such as cost, the instructor, etc.

Digital registration and online payment for the classes will be available in the near future, meaning that every resident will be able to perform all the tasks associated with class registration in a simple and effortless manner.

Upcoming projects include computerization of schools, and online requests for construction and building.

The variety of innovative and advanced services offered through Digi-Tel has a direct influence on the relationship between the municipality and its residents.

One of the most important tools of Digi-Tel is the enhancement and empowering of public participation. Public participation has been part of the Tel Aviv municipality's organizational culture for decades since the 1980s. It began with Project Renewal's bottom-up principle to share decision making policies with local residents, creating an even playing field. Over the past three years, this process has also been carried out through the Digi-Tel program. For example:

- Including residents in conducting a dialogue with them about the design of the beach strip;
- Involving the public in a municipal master plan for young adults;
- The municipality allocating funds to improve quality of life in particular neighbourhood (participatory budget). Its residents are engaged in deciding how to allocate the designated funds, whether on renovation of public institutions, development of public spaces, planting trees or sidewalks repairs, or something else;
- Digi-Tel allows residents to participate in open public planning discussions on plans about redevelopments construction regarding their neighbourhood, choosing among alternative plans such as public institutions, open spaces, parking lots as well as city master plans to give their comments.

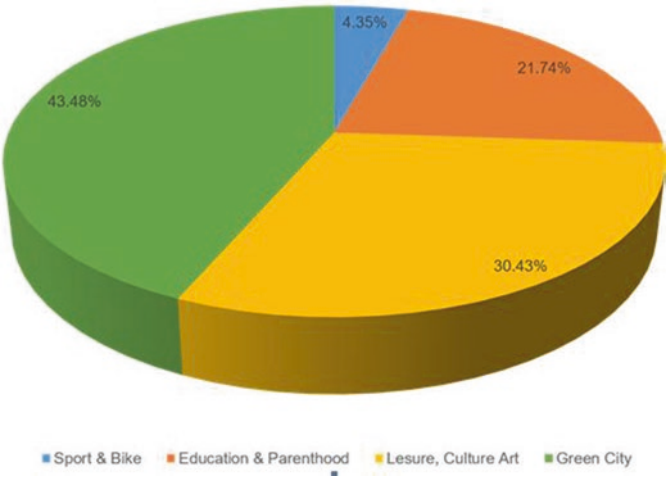

Fig. 10.5 Important priorities quality of life for the residents in Digi-Tel. *Source*: Center for Economic and Social Research

After two years of Digi-Tel operation, a report was published in March of 2015 to analyse different aspects of using this network. The following figures demonstrate the success of this modern innovation.

For example, Fig. 10.5 describes the distribution of the main domains chosen by the residents as the most beneficial services for them, using the Digi-Tel technology communication network. The most important priorities for the residents are: environmental efficiency (green-ness); leisure culture, art and education; and parenthood.

Figure 10.6 describes the distribution of Digi-Tel age demographics. The most prominent demographic belongs to the age group of 31–40. They comprise 27 % of the total eligible population and are characterized as the young residents in Tel Aviv, many of whom work in the Hi-Tech industry. They strongly influence the nature of the city's performance in the leisure, culture, and art domains.

Lastly, Fig. 10.7 shows the dramatic growth of residents registering for the Digi-Tel direct communication between the period 2013 and 2015. The applications from residents are most surprising, considering the relatively short period the program has existed. It is expected that the numbers will climax in less than a two-year period.

The Centre for Economic and Social Research Unit for the local municipality conducted a feedback survey, in January 2015, to analyse the residents' habits using the Digi-Tel card and their level of satisfaction with the services they received. A questionnaire was digitally sent to 6550 participants, who registered during the period of March 2013 and November 2014. Seventeen per cent of residents replied, which geographically covered the nine boroughs of Tel Aviv.

The statistical analysis team concluded the following:

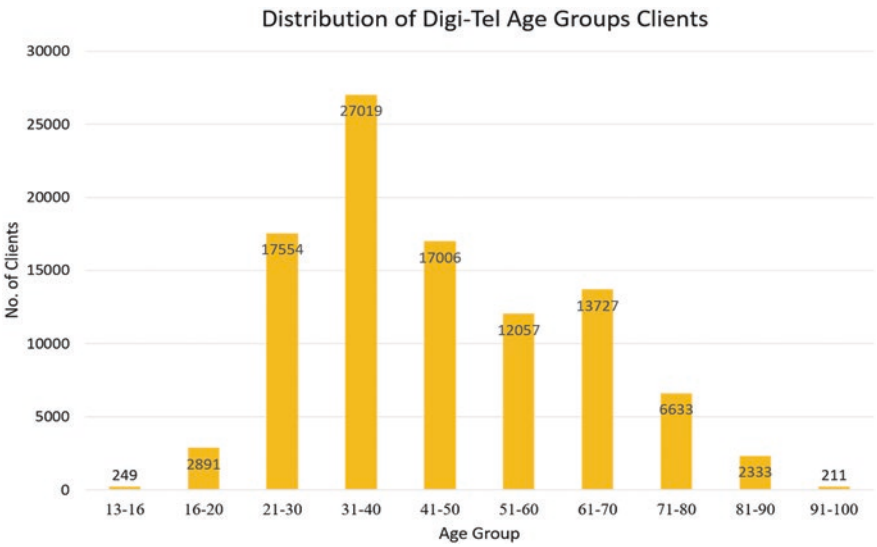

Fig. 10.6 The distribution of Digi-Tel. *Source*: Center for Economic and Social Research

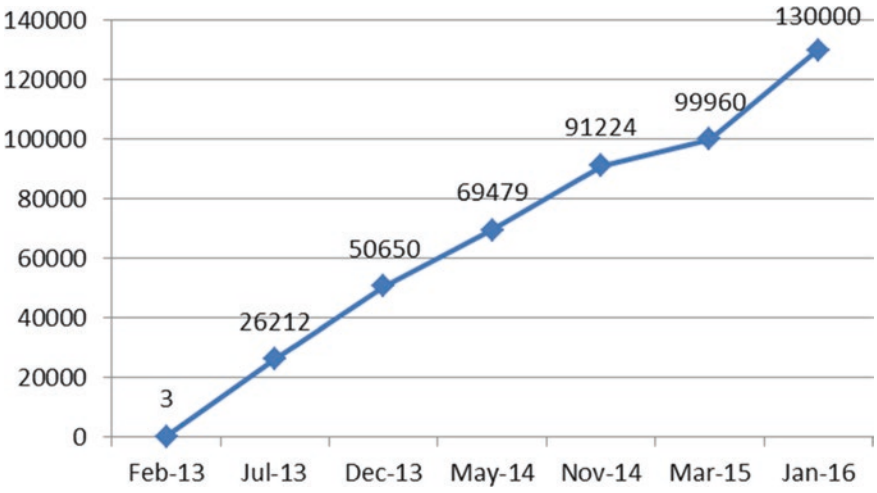

Fig. 10.7 Accumulation of registered citizens

- The profiles of the residents showed that the greater numbers of people aged 40+ used the Digi-Tel Card as a communication tool with the local municipality's different departments;
- Couples with children, or families in general, were much more satisfied with the services offered with regard to their personalized orientation compared to couples without children. This is understood to be due to the abundance of services, benefits and activities aimed at young children and their convenient use;

- Nearly 80 % perceived Digi-Tel as an effective communication channel between residents and local municipality departments;
- Adults people in the aged group of 40–59 (69 %) and 60+ (74 %) are more satisfied with Digi-Tel services compared to younger people (only 60 %). This is understood to be due the fact that elderly people who have retired have more free time and better reason to benefit from cultural and community events;
- As a whole, young teenage adults are a minority in Digi-Tel platform (2.79 and 3.49 respectively).

Following the feedback survey, the Centre for Economic and Social Research recommended several improvements to be considered: (1) To use suitable and uniform terminology which will differentiate it from other services and define it whether as a club card, a service or an umbrella of services; (2) To promote the 'added value' of Digi-Tel as a resident card, and update its relevancy; (3) To develop new digit services specially for under-served populations; (4) To strengthen the personalized feature online through content development and broaden the consumer awareness on the available options of using it.

The following two figures—Figs. 10.8 and 10.9—are further evidences that the Digi-Tel platform is perceived to be an effective and useful tool by the majority of the cardholders. Furthermore, an overwhelmingly apparent intention to join Digi-Tel platform becomes a reality with over 130,000 residents already being registered as for January 2016. The issue of attracting young people to Digi-Tel is still under investigation since this group age does not use mails as mean of communication. The municipality is studying it to find out how they can be part of the Digi-Tel club.

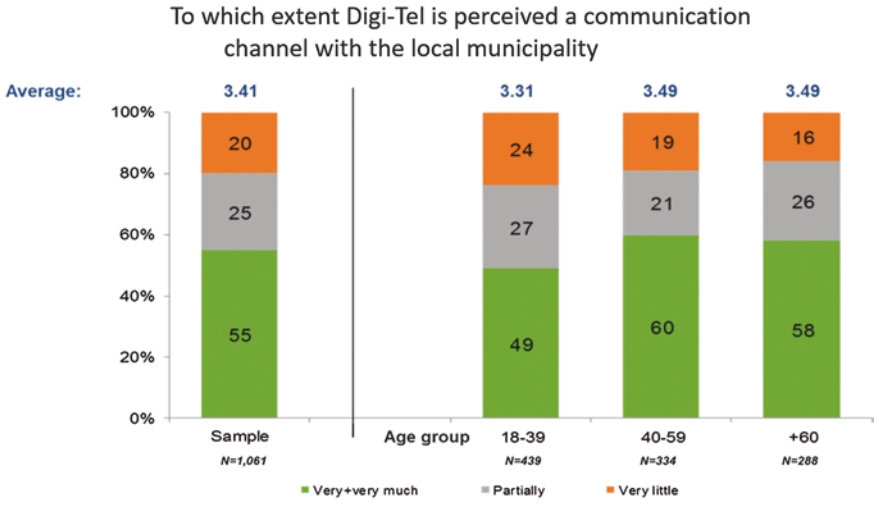

Fig. 10.8 Digi-Tel platform

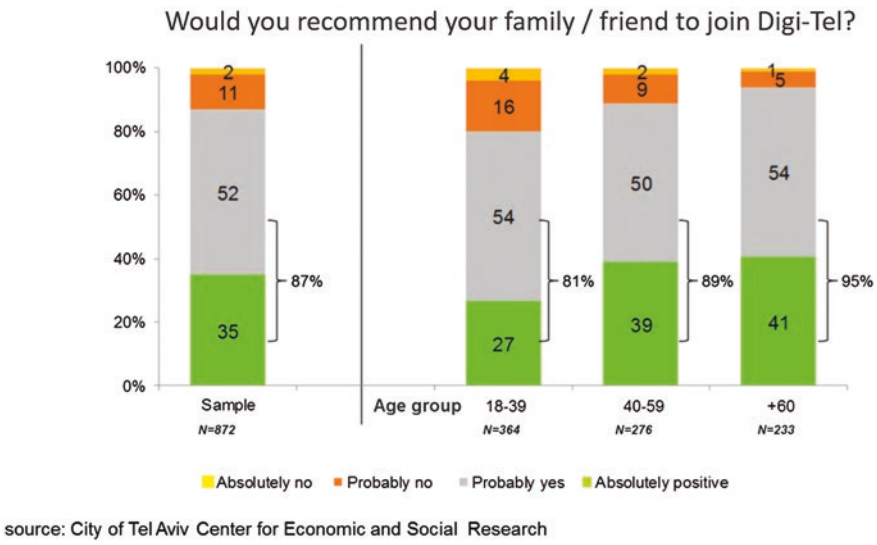

Fig. 10.9 Digi-Tel platform

The data provides by the Tel-Aviv Center for Economic and Social Research for 2015 emphasizes the importance and relevant of Digi-Tel platform for the citizens of Tel-Aviv: The popular age range to register is 30–39 years old; 190 employees in municipal services, and community centres, feed contents to the Digi-Tel website; The most field of interests are leisure, culture and arts including: theater shows, museums, entrance to beaches, biking; marathon race; There are—84 K activated citizens, 74 K citizens who watch Digi-Tel content; One out of five citizens realize the proposed benefits by Digi-Tel.

10.4 Citizen Engagement

The involvement of ordinary citizen in knowledge production and creation places in the city of Tel-Aviv has passed through four distinguished stages in the relationship framework between local government and its citizen. They are as follow: local government to local government; local government to local citizen; local citizen to local government; and local citizen to local citizen. These stages represent the fundamental change in the networks between these two entities from top-down to bottom-up participation approach.

Stage one: local government to local government: Stage one deal with Tel-Aviv municipality initiative to establish an effective and efficient new type of organization structure focused on culture as service to its citizens received the political commitment of the city hall. The state of mind of the municipality changed to emphasize the service awareness.

Tel-Aviv municipality began a process of building democratic partnership with its residents by taking inter-organizational steps among all levels of employees aiming to improve services skills, one language communication with the citizens of the city as well as visitors from outside, measuring quality of top-down relationships and fostering accessibility and connectivity. Evolving Digi-Tel could not be achieved without deep process of management culture among the departments of services suppliers such as engineering, town planning, environmental, welfare and social services, municipal call centres, city tax unit just to mention few.

The preparation of the people employed in the city different departments demands lots of resources, knowledge management skills, infrastructure organization of data, documentation knowledge in portals, feeding information from the city units according to multi characters of the clients such as: type of event, targeted population, classification of age, gender, religion, income, personal priorities, citizen consuming habits and location. Following these steps citizen established stronger trust with the municipality.

Stage two: local government to local citizens: This stage represents the top-down relationships between the city and its citizens.

In smart Tel Aviv, engagement is a key value in implementing smart city principles, while the goal is to create a city for all its residents, and a resident-oriented government. The city actively involves residents in the urban experience and urban development. It enables them to help determine how the use of funds the local government has allocated will be prioritized on projects improving quality of life in different neighbourhoods.

Investing in citizen empowerment and increasing transparency as well as enhancing participatory democracy are integral part of Tel Aviv municipality official policy. It asks and encourages citizen to send their opinions on every issue whether it is urban policy on the agenda or local one. Widening the connections between local government and its inhabitants causes the shift and encouragement to using ICT tools and apps mediums. The new networks enable changes both in democratic relationships and the notion of participation with more than 50 % eligible citizen registered to Digi-Tel (Centre for Social and Economic Research 2015). The implementation of Digi-Tel enables citizen to access directly and openly to knowledge information and municipal data individually. This transparency aims to strengthen the connectivity between city hall departments and citizen needs in their daily life agenda.

Stage three: local citizen to local government: Tel Aviv Digi-Tel became a platform for bottom-up civic engagement in the context of communication, data sharing, application developments, open data and especially personalized-led resulted in collaborative governance. This is the place to point out that the paragraphs of the “Tel Aviv Independence Scroll” dealing with citizen participation were written by the author for the present elected mayor who already serves in his position twelve years.

Digi-Tel enables civic engagement to jump a step ahead in playing an active role in the creation and sharing of information in two-ways directions which we

termed “pull and push”. The “pull” way is deployed by active citizen who report about problems and events to the information centres of the local municipality regarding roads, waste, sewage, street lighting, parking, traffic jam, public gardens and parks, unsocial behaviour, public spaces and institutions. The “push” way is the respond manner delivered by the information centres to the city departments to take the steps necessary to treat the issue given from the citizen as soon as possible. That kind of respond is taken place by the local management zones wardens. The usual quick respond of the city is expressed and translate with more support from the citizen who achieve more confidence and strengthen trust towards the issue of how their city reacts coping with residents reports.

Stage four: citizen to citizen: The citizen to citizen idea aims to create and enable better well-being conditions for the benefit of local citizen in their neighbourhoods among themselves and to build a strong community. One example is Digi-Tel demonstration of a democratic tool when discussing participatory budget. Every year the city of Tel-Aviv allocates sum of budget to each neighbourhood allowing it to manage an independent decision making process to prioritized actions and programs concerning investments by the local municipality. The sum of money is usually between 130,000 up to 250,000 Euros. The action and program aim to improve infrastructures and community activities for the well-being and quality of life of the citizens. For example: play grounds, sport facilities, community building renovation, planting trees, bike tracks, benches in public spaces, community activities etc. This process is activated by the municipality. It sends SMS announcements to all neighbourhood inhabitants registered in Digi-Tel platform to participate and prioritize the action or program they would like to be implemented and seen in their neighbourhood. The discussions are executed among the citizen of the neighbourhood themselves in places such as community centre, public institutions, community events and citizen local committees. Their decisions are sent back to the city hall. When the results are gathered, Digi-Tel staff declares the priority of the item elected by the majority of the citizens and begin its execution through its relevant departments.

A second example is the creation of neighbourhood community coin to develop intensive and active actions among the neighbourhood’s inhabitants with the businesses and private services suppliers, to connect between consumers of products, to develop community life in variety of aspects such as local leadership, social mobility and human development. These are part of the notion called “citizens make a city”. In the era of “crowd wisdom” partnership among neighbourhood citizen might be creative and innovative tool in the relationships between citizen to citizen as well as between them to local government.

The Digi-Tel platform was developed by the City’s IT branch. The Municipality of Tel Aviv has invested 60 M NIS (Approx. 15 M Euros) to enable its creation and development. This department developed all the applications that residents currently use. The nature of the system is extremely complex and requires integration of different tools like CRM (Customer Relationship Management), campaign tools, distribution tool, Mobile Platform, GIS Platform, and Information Security tools to create an integrated platform. The in-house development was an important

factor in the design to create a complex platform in a very short time (the base capabilities were developed in only one year). It enabled the city of Tel Aviv to create the technology to make the Digi-Tel a reality, and likely faster than if the process had been outsourced.

In essence, Digi-Tel initiative aims to improve municipal services, enhances resident's quality of life, and forges the condition for sustainable urban development. Above all, it exemplifies the city's active and intelligent role in employing technology to strengthen civic engagement and ensure that the city is accessible and responsive to all concerns.

Digi-Tel platform facilitates a direct and holistic connection between the city and the residents, whether it is alerting residents to neighbourhood construction, informing them of the nearest bicycle-sharing station, sending specific reminders for school registration, or cultural events taking place in the city. Digi-Tel encourages residents to proactively engage with the municipality as well. Residents can find cultural events and activities as well as report communal hazard or concerns, and follow their review.

10.5 Metrics and Measurements

Tel Aviv's top-priority project targets a few strategic goals, first and foremost raising the municipality's approval rating by its citizens, creating a better public image and increasing trust between citizens and their local government. For this purpose the municipality does surveys using several indicators and methods regarding Digi-Tel innovation:

1. Measures of usage and utilization: number of registered users (see Fig. 10.7), data collected the number of entrances to Digi-Tel app, number of application downloads and number of application uses (Center for Economic and Social Research, Tel Aviv Municipality, annual surveys);
2. Measuring residents satisfaction: satisfaction with various municipal services, communication with different municipality departments, residency and quality of life;
3. Metric is focused mainly of citizens registration for Digi-Tel residents club (above 130,000 residents as for January, 2016). Other metrics counts number and frequency of visits to the personal area by residents using the Digi-Tel platform.

10.6 Discussion

The city of Tel Aviv is named as "The State of Tel Aviv" due to the fact it is the economic, cultural and educational centre for many institutions of government, private and business sectors for the whole state of Israel. It leads the list of

start-ups numbered more than one thousand. As such, there is no surprise Tel Aviv became a living laboratory environment where communication and joint citizen decision-making are embedded within the vision of the city.

In the case of Digi-Tel the overall approach was inspired by the business sector with the creation of a club style organization where residents could join without charge. This club style organization focused initially on improving the delivery of services already provided by the municipality. Only later in the project did the municipality engage with residents in shared decision making by identifying specific projects such as the beach improvement scheme. This was an example of collaborative urbanism but fell short of full empowerment that would allow the residents to identify priorities for future development of the city's hard and soft infrastructure. Instead it is an example of modularized collaboration where the citizens are given directionality as described earlier in the chapter of Certomà and Rizzi.

The other important characteristic of Digi-Tel was the use of shared values to drive innovation. All too often in smart city and community initiatives subjective value systems for individuals and communities is demoted below technological challenges where the development of sensors and neutral networks can be seen of higher priority or challenge. In the case of Digi-Tel shared values as expressed in Fig. 10.2 were given priority early on in the project and guided future actions. This means that the rational for deploying digital platforms can be checked against the shared values to justify the investment in time and money.

Nevertheless, several questions still exist about the effectiveness of Digi-Tel. The first query is the low uptake by teenage adults as shown in Fig. 10.6. The city's social research unit recognized this but it is still unresolved. Another query is the different importance attached to different services as shown in Fig. 10.5. In this case a "Green City" received highest priority. The meaning of "Green" is related to standards of green building, walkable streets, priority to bike tracks, public gardens and it was the highest priority for all demographic age groups. These might seem minor criticism but success is often dependent on detail especially when attempting to attract engagement from all demographic groups. Nevertheless, Tel Aviv as justification for claiming itself as a leading technology hub, with developed advanced solutions for urban administration and more importantly, civic engagement. Lastly, as part of the effort to increase accessibility and transparency of information along with the civic engagement, municipal databases were opened to the public, followed by a competition in which residents developed mobile apps for public use based on the open databases. The city actively employs social media as a platform for involving the public in municipal decision-making and community improvement initiatives. The IView system renders geospatial information readily available and easily useable for all. All these initiatives are facilitated by free citywide Wi-Fi in public places. This is the best system, compared to other cities in Israel which chare for all the Wi-Fi. As is well known, public spheres create a platform for people to communicate, to share common interests, to discuss daily issues aimed at improving all residents' quality of life.

10.7 Conclusions

In summary, Digi-Tel became a social media tool engaging major part of Tel Aviv population. The more Digi-Tel apps are provided, improved, delivered and accessed to the citizen they become more empowered, responders and care to receive better services of education, community, transportation, infrastructure, local neighbourhood services and more.

Digi-Tel has been shown to be a workable model to develop institutional framework that support tools and resources stemming from an earlier survey of city hall employee values. Tel Aviv municipality is acting and performing an open government regulations due to its integrated open data policy facilitating direct data collection on issues such as building files, master plans, constructions, policy decisions by the city departments, leisure, community events, infrastructure works and other information sources to keep high level residents quality of life in the city. In other words, we can describe Digi-Tel tool as the e-City portal that enables citizen to access data, to share applications program interfaces in order to create added value expressed in raising their quality of life in a complex city like Tel Aviv. Digi-Tel as a smart technological tool accessible to every citizen plays an important function in limiting inequalities between the south and the north neighbourhood sections of Tel Aviv. It enables different classes to take part in a wide variety of activities in accordance to age, gender, income level and field of interests. In addition, it establishes generativity that leverages technology in ways, which inherently open up policy to widen citizen participation.

More than 25 % of Tel Aviv inhabitants are young people up to the age of 30 years. As such, they represent the technological, sophisticated and connected individuals living in urban environment who use the Information Communication Technologies (ICT) that help them to be updated. These youngsters play an important function in civic engagement as urban citizenry.

We can label Digi-Tel platform as an ambitious program that succeeded to fully realize itself and to fulfil its vision: “Afford citizens the option of convenient service channels; meet the needs of users and different demographics in the city; form provisions of all services digitally and maintain privacy and ensure secure transfer of information”.

The greatest proof of Digi-Tel’s successful government-oriented citizen program is the enrolment numbers of 130,000 inhabitants out of 250,000 eligible, in a matter of three years. It proves that residents recognize the importance and significance of being connected to the local government’s multi-service products available through ICT digital tools.

References

Angelidou, M. (2015). Smart cities: A conjuncture of four forces. *Cities, 47*, 95–106.
Center for Social and Economic Research. (2015). Tel-Aviv municipality: Digi-Tel surveys January 2015 and January 2016.
Hebrew. (2013). Digi-Tel—How to join Digi-Tel club. http://www.tel-aviv.gov.il/Tolive/digitel/Pages/joiningdigitel.aspx.
Hollands, R. G. (2008). Will the real smart city please stand up? intelligent, progressive or entrepreneurial? *City, 12*(3), 303–320.
Smart City Tel Aviv Leaflet. http://www/tel-aviv.gov.il/GlobalCity/documents/SMART CITY TEL AVIV.pdf.
Toch, E. & Feder, E. (2016). International Case studies of Smart Cities. Institutions for Developing Sector Fiscal and Municipal Management Division. Inter-American Development Bank. Discussion Paper No. IDB-DP-444, June 2016. Tel Aviv, Israel.
Ziv, A., and M. Ramati. (2013). Tel Aviv's Free Wi-Fi: you Get What you Pay For. Business. Retrieved from http://haaretz.com/israel-news/business/.premuim-1.548760.

Interviews

Liora Schechter, Chief Information Officer, Tel Aviv Municipality
Zohar Sharon, Chief Knowledge Officer and Digi-Tel Project Manager, Tel-Aviv Municipality

Link to Movies

Digi-Tel. (2015a). Digi-Tel- Tel Aviv Digi-Tel Revolution Part A: http://www.youtube.com/watch?v=w9_mnLKto.
Digi-Tel. (2015b). Digi-Tel –Tel Aviv Digi-Tel Revolution Part B: http://www.youtube.com/watch?lyomYj5opak.

Chapter 11
Digital Tools for Capturing User's Needs on Urban Open Spaces: Drawing Lessons from Cyberparks Project

Carlos Smaniotto Costa, Alfonso Bahillo Martínez, Fernando J. Álvarez, Ina Šuklje Erjavec, Marluci Menezes and Montserrat Pallares-Barbera

Abstract The chapter discusses how ICT can be used to enhance the understanding of the relationship between space, users and social practices. As an example of possible use of ICT for capturing and better understanding user's needs, the new digital tool WAY Cyberparks is presented and discussed. A "cyberpark" is defined as a new type of urban landscape where nature and ICTs blend together to generate hybrid experiences and enhance quality of life. The WAY Cyberparks digital tool consists of a smart phone application, server/cloud and web services. Through the experiences from testing it in selected urban open spaces in Barcelona, Lisbon and

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Ljubljana opportunities are presented and lessons are drawn about relevant aspects of the ICT towards building a more participatory and collaborative process in planning of public spaces. A relevant aspect of the ICT lays in their ability to enhance communication with (potential) users, transforming the production of public open spaces into an interactive process, and enabling creative community participation and empowerment. Furthermore, some challenges of the increasing penetration of digital technologies devices (smart phones, smart watches, tablets, etc.) within the broader context of their use in public urban open spaces such as parks, gardens, squares, plazas are discussed, together with the consequences of this interweaving, which is growing at a rapid pace, unfolds research needs in the future.

11.1 Introduction

Urban open spaces are widely recognised as an important aspect of the quality of life and environment as well as sustainable and people friendly development of cities. They enable contact with nature, provide possibilities for variety of every day and occasional activities and experiences, they are places for communication, interaction, connection and encounters for inhabitants and visitors. Throughout this chapter, the shorthand phrase—urban open space—is used to represent the full spectrum of different and diverse open spaces within the public realm in cities, i.e. all urban and green spaces provided for communities to use and enjoy, for mobility, for the merit of their environmental benefits, and to address ecology and biodiversity. Among them are streets, squares, plazas, market places, parks, green spaces, greenways, community gardens, playgrounds, waterfronts, etc., each one playing a vital role in the city. In this chapter, collecting the visions of different discussions in the literature and in different disciplines, we work the definition of a new concept, the Cyberpark. A Cyberpark is a new type of urban landscape where nature and ICTs blend together to generate hybrid experiences and enhance quality of life. The attributes of a Cyberpark (referenced from the Smart Cities initiative) could be defined by the use of sensor technologies in a connectable space, accessible to the public through ubiquitous technologies used in sociable and sharable ways where the virtual is made visible or augments the landscape. ICT can be used in this context to give or gather information, to aid co-creation of space, to allow crowd sourcing of information and opinions, and to allow affective sharing or self-monitoring of activities. Hardware may be embedded in the environment in the form of responsive sound or lighting systems, control systems, kinetic objects or artworks, passive sensor technologies and display systems. We recognize that the use of such affordances will be qualified by such considerations as the time of day, the duration of the visit, the weather and temperature, location, season, individual or group engagement, age, gender, purpose of visit and the topology and size of the space.

Many research works emphasize importance of urban open spaces and highlight their social, ecological, spatial, and economic and health benefits, from a single as well as from a cumulative perspective (GreenKeys 2008; Pallares-Barbera

et al. 2011; Smaniotto Costa 2012, 2014; Šuklje Erjavec 2010). There is a consensus that the creation of healthy, attractive and sustainable urban environment not only depends on the presence, distribution, interconnection and accessibility to open spaces, but also usability in terms of attractiveness for different uses and users, its responsiveness, and inclusiveness are important. Regarding the social function, open spaces are social gathering places, where outdoor interactions between people and people, and people and spaces can occur. They are sites of sociability, as they afford the common ground for communication and information exchange. They are places to express cultural diversity, to see and be seen, or even be anonymous in a crowd (Thompson 2002; Whyte 1980). The social interactions are important for defining a sense of place, for contributing to our physical, cultural, and spiritual well-being, for the personal development and social learning and for the development of tolerance (Šuklje Erjavec 2010).

Studies as well as practical experiences highlight the need for comprehensive understanding and consideration of users' needs for successful and effective planning and design of open spaces that should fulfil a wide range of functions and roles (Šuklje Erjavec 1994, 2001; Šuklje Erjavec and Goličnik 2006). A wide typology of open spaces is needed to provide different possibilities for use, by different users' groups, and to fulfil equivalently the different needs and expectations, to provide good accessibility and welcoming atmosphere for all, not only in physical, but also in psychological and social senses, forming territorial identity and image (Šuklje Erjavec 2010).

There are different methodologies for capturing users' needs as well as interpreting them. They range from different forms of questionnaires, pools and surveys that directly collect and investigate personal opinions, needs, values and motivations, to different observation and monitoring techniques. They have been developed to provide more objective and comprehensive insight into human needs and behaviour. The main subject of this chapter is a review of new possibilities provided by ICT (as a collective term that encompasses digital technology and its facilities and devices) for capturing users' needs and how the increasing presence of ICT is affecting contemporary lifestyles and through them also values and needs of contemporary and future users of open spaces.

Particularly the global access to Internet by smart devices, such as smartphones, smart watches, tablets, etc., making information available and shareable by almost everyone, everywhere and at any time, at low cost and to an unprecedented degree in history (Wilkins et al. 2014), makes the world increasingly hyper-connected. That has decidedly had strong social impact already and has changed the priorities and lifestyles of many citizens. The development of ICT is related to interacting, innovation, and novelty; and it is opening new forms of action in all spheres, from the level of individuals, to society, and that of the state and governance. In fact, our society is increasingly dependent on ICT at home, for work, education, and recreation. Some authors call this already a digital society, having the main driver the digital telecommunication and the wireless connectivity systems. This gives rise to the question whether ICT can support urban sustainability and civic innovation, and encourage greater community engagement and social participation.

Building a theory and studying the social, political, economic, and cultural impact of the ICT is not an easy task because their use is in a constant and accelerated development, transformation, resulting in turn in new interrelations. Due to this constant change, the analysis of opportunities and impacts of ICT faces the risk of dispersion and missing the point. To prevent this, it calls for a precise description and definition of the subject of study: the interactions of ICT in public open spaces. The consequences of the interaction and innovation, of the increasing penetration of digital devices placed within the broader context of their use in urban open spaces (parks, gardens, squares, plazas, etc.) are not yet fully investigated. These facts accompanied by rapid development and increasing application possibilities, challenges urban designers, social scientists and ICT experts to rethink the possibilities and use them in the new ways.

In this chapter, we present niche information addressing development and research of the applicability of ICT tools in public open spaces, which serve as the interface between the space and the people. Such interface can help public space designers and decision-makers to catch the perception, demand, attention, or complaints of people using a space. Moreover, it can be used to enhance the interaction opportunities with contextual information, games or socializing. An example of interactive research methodology is the digital tool WAY Cyberparks.[1] It enables tracking users and their movements in public spaces, and as an interaction interface, it allows through augmented reality to display the information about the possible changes and improvements of the space and its elements, and as social reporting it enables users to give feedback, to provide information about problems, or warning in case of incidents. The main theoretical and methodological perspectives are outlined in context of studies in Barcelona, Lisbon, and Ljubljana, where the digital tool WAY Cyberparks is being used. Its features and ability as a research tool are discussed, as well as lessons are drawn towards a possibility to use ICT for building a more participatory and collaborative process in the production of open spaces.

11.2 Understanding the Relationship Between Users, Social Practices and Space

Considering that space is one of the most important dimensions in the analysis of social phenomena of the contemporary world, it is a key to acknowledge that the term space embraces plurality, as it conveys ambiguity of meanings (Bettanini 1982). The analysis of the relationship between social and the morphologic organisation of space is challenged with the interaction between individuals, society and

[1]This work is based upon work from COST Action TU 1306 Cyberparks, supported by COST (European Cooperation in Science and Technology) 2014–2018, www.cyberparks-project.eu.

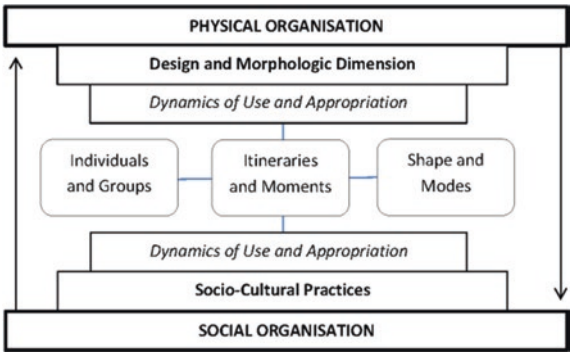

Fig. 11.1 The observation elements of the relation between the social and spatial organisation of the space. *Source* Menezes (2003, 2010)

environment, and among individuals and groups, between themselves and with others, as well as behaviours, temporal aspects, and with real and virtual space (Menezes 2010, 2012) (Fig. 11.1).

Such analysis advances deepen knowledge of aspects as characteristics of users—individuals and groups—(e.g. sex, age, style, activities, etc.), their behaviour patterns, and associated images. It can outline socio-cultural assets that are activated in the appropriation of the space and the concerned temporalities (rhythms and time of activities, frequently changing on a daily or seasonal basis, durability and stability, and changes with time). Hence, the analysis allows detecting insights in the relationship between these aspects and morphology and physical organisation of open space (street, plaza, green space, coastline, among others). It can reveal, on the one hand the signals or risks of certain users or user groups of being segregated or excluded, and on the other, certain spaces of being vandalized and neglected (Menezes 2010; Fyfe 1998).

The observation of space identifies a social reality because the morphology and layout embodies a representation (Lévy and Segaud 1983), and how that space is experienced by users (perception) and both are reflexive. The represented space reflects a capacity of users to perceive the space, and this in turn, enables them to construct a mental figure—an image, which is used for information, psychic-spatial reformulation and reflection (Menezes 2010). Hence, it is relevant to identify variables, which in the course of use, experience, and appropriation of the space are used as socio-spatial reference by individuals and/or groups (Ferrara 1993; Menezes 2003). The analysis of images and representations of space enables the creation of a set of associations that enhance the knowledge of the relationship between space and society (Fig. 11.2). A more complex issue arises when the connection between physical (as tangible) and virtual (as intangible) spaces realities is introduced, but it can also enrich the spatial perception, thus contributing to the set of urban images and imaginary, eventually creating hybrid spaces The physical and virtual spaces not necessarily concur with each other, quite possibly articulate or juxtapose themselves. That is, the relationship between physical and virtual spaces complicates and enriches the processes and dynamics of use, ownership,

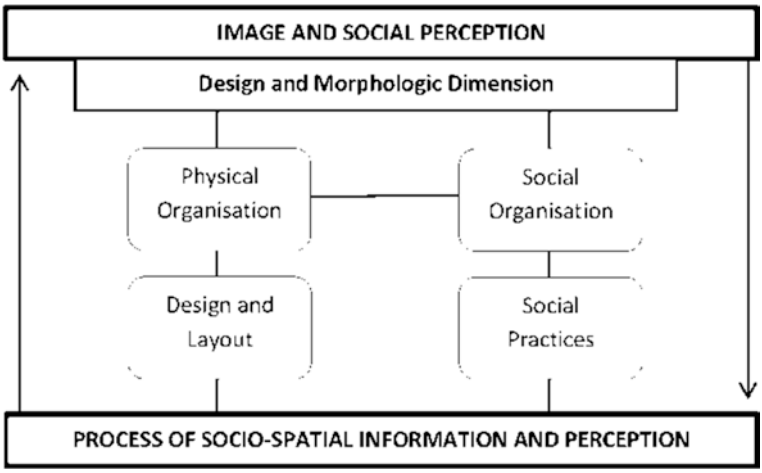

Fig. 11.2 The process of socio-spatial information and perception. *Source* Menezes (2003, 2010)

perception and socio-spatial representation. The differences of tangible and intangible order create combined and articulated realities that, in some cases, can also be juxtaposed. However, in general, the relationship between physical space—as example for the material order—and virtual—as example for immaterial order—could be exemplified by the idea of hybrid spaces.

Therefore, it is important to understand an open space from the social practices, as they through a set of reciprocal relationships create and transform the meanings of space. These can be different between male and female, young and old, we and others, indoor and outdoor, private and public, local and global, time and space, daily life and extraordinary situations, real and virtual, leisure and work. All these aspects are equally important to understand the different expectations of the people and define their needs. Then, the challenge is to identify the contribution of ICT to give expression to aspects that come out of the relationship between users, social practices and spaces.

11.3 The Cyberparks Social Engagement and Location Technologies

In the era of big data, cities and communities create data that can serve different needs of their citizenry. The production and user-friendliness of open spaces in the public realm is a matter of increasing concern to councils and citizens alike. The concern is driven by a greater understanding on environmental issues and a growing concern about quality of life. There is a strong relation between people and places. As Silberberg et al. (2013) state, the relationship between both is not linear,

but iterative, and mutually influential. This raises the question if city governments will do more for those people/communities who raise their voices. What happens with such passive citizens/communities, will they still be heard? No doubt, the more involved people are in their environment the more they feel collectively responsible for it. The engagement of people, achieving their needs, the quality of places and the public investment in these places, etc., are part of a virtuous circle (GreenKeys 2008). In this process, technology can be the fuel that keeps the process in motion, as ICT enables the creation of platforms with digital engagement at their core. For this work the question is centred on how open spaces can be not only designed for people but also with people. Considering that technology is shaping, and will continue to shape people's perceptions and social interactions, and probably the emergence of social and political thoughts, which will reflect not only in the way people use urban spaces but also on their needs and requirements regarding the design and quality of these spaces.

There is a wealth of evidence that the involvement of people can provoke a real change in the quality of the urban environment (Šuklje Erjavec 2010; GreenKeys 2008), thus improving the quality of life. The emergence and penetration of ICT has led to various forms the appropriation of the open spaces where the ICT facilities and devices play more and more a significant role. In this context, the COST action TU1306 coins the term *Cyberparks*, as a new type of urban landscape where nature, society, and ICTs interact to generate hybrid experiences and enhance quality of urban life. This hybrid space plays a prominence role to advance knowledge on the relationship between people, social practices and places, and the resulting social and spatial interactions. Urban ethnography will bring together knowledge about the use of new media technologies in public spaces from an ethnographic point of view and set up the understanding of the public spaces and human behaviour in the context of new media. In order to understand how best to connect technology and public spaces, we will observe both uses of technology within space, but also user-behaviour in that space not linked to technology. The constant and increasing presence of ICT makes the world increasingly hyper-connected, what decidedly have strong social impact. Considering only a small part of these impacts, on a micro scale, this work focus on the intertwining of ICT with open spaces. The diffusion of ICT is increasingly changing our relationship with our physical and social environment for work and recreation. Understandably the blurring of boundaries between physical and virtual life gives rise to concerns however it opens new opportunities to social interaction, communication, and media services.

Another systematic for ICT in relationship with open spaces is proposed by Ioannidis et al. (2015) with an approach based on a cognitive-based strategy. It classifies the interrelation into three frameworks: (1) Position informatics, (2) Sensory informatics, and (3) Synergistic interface. In their view the interactions is a two-way system that learns people how and what to decide/choose/prefer while they move in an open and mediated space. Further, the authors consider that it should enable people to reconsider their own roles in the action-sensitive environments of a Cyberpark. This approach can be a possible tool to understand

the role of the digital information in a digitally mediated open space. From these three frameworks, the synergistic interface is in the core of this work. To evolve, the mediated space has to be understood more than configuring wireless sensor network spots or about designing green landscapes accessorised with wireless Internet access spots (Ioannidis et al. 2015). Instead, it requires a creative re-imagination of urban open spaces. Technology support, like recording, filtering, grouping, or sharing different opinions and preferences, can provide new pathways for generating and advancing knowledge on places and people interaction.

These days the experiences are moving beyond initial artistic, political, marketing, towards a more academic outlook by aiming for a more sustainable and a people's more friendly urban development. The metaphor of digitally mediated open spaces, where different physical access and paths are provided to enable things to happen, seems to be a promising line of thought. In this context, the cooperative design and decision-making processes can be enhanced with new views and approaches. However, more important than rather limiting people to mere users, digital platforms enables people to take part in an urban process. ICT and the social interactions enable therefore an evolving of a more people-centred framework not only for urban, but also for cultural, economic, and political development. In general, the use of ICT for the provision of a framework based on cooperation can lead to an enhancement of democracy and people's empowerment. In another words, cities must be considered as platforms, with citizens involved to utilize technology to creatively built and redefine core functionalities (Grech 2015). The possibility of ICTs' use in a connectable space, accessible to the public through ubiquitous technologies used in sociable and sharable ways, is opening many new opportunities for interrelation of ICT and urban open spaces. In the case of the COST action Cyberparks three different mode of communication were defined:

1. Communication among users (phoning, messaging, web surfing, gaming, etc.);
2. Transmission of useful information for users (digital advertising, assisted navigation);
3. Interaction on urban issues via mediated, through social software for enhancing communication and connecting people on urban issues. These encompass networking and social reporting, improving participatory and/or consultation processes, in decision-making processes, e-planning, or new ways for governments and citizens to interact.

As argued above, ICT is deeply redefining relationship between individuals, community, and governments; it is introducing new opportunities but also new challenges and risks. Digital divide and literacy is an apparent manifestation of this, and must be considered not only in relation to ICT appropriation within the various age, cultural and economic groups, and relational circles, but on technologies than the results can be influenced. Before further examining the issues in more detail, we should reflect on some fundamental questions about the influence of technology providers and associated hardware and software. The question inevitably arises as more societal, political and cultural processes become digitised, and

what is the role of ICT to shaping these processes. Our goal is to create a social infrastructure around open space, where ICT can be a fuel that could support the creation of a more inclusive urban environment.

11.4 ICT for Capturing User's Needs

ICT opens different ways to increase the knowledge available in the interaction between people and spaces. Ubiquitous computing, i.e., computing capacity anywhere and anytime is becoming a reality these days thanks to the appearance of smartphones, tablet computers, and embedded processors seamlessly controlling more and more of the objects that are part of our everyday lives. This enormous computing capacity, combined with the continuous development of more efficient digital sensors capable to extract richer information from the environment, and supported by a global communication network like the Internet, constitute a powerful tool to establish a broadband communication channel between people and their surrounding spaces. Furthermore, social networking services (Twitter, Facebook, Instagram, etc.) are revealing themselves as a very adequate vehicle to activate this channel due to their growing popularity and generic end-user design.

However, many of these opportunities are not yet fully investigated, i.e. only recent studies are available to understand the behaviour and opinions through social networks and corporate mapping tools. Nevertheless, to gain knowledge is difficult as long as ICT is not targeted to the respective context. This questions the credibility of data and results. The blind and des-contextualised communication can be overcome if ICT and open space issues are balanced, and seem as a common product. New digital media is especially effective for gathering different data and information about users' preferences and concerns. With appropriate adjustments, ICT can be used also for research purposes for gathering relevant information about behaviour, needs, preferences, motivations as well as opinions and suggestions of users. This information can help professionals to design places that meet users' needs, to manage them more effectively, as well as to present better their importance to decision makers and society in general.

11.5 A Tool for Monitoring the Use of Open Spaces

A method to extract synergies is proposed by the COST action Cyberparks, which is synthesized in a digital tool called WAY Cyberparks (Bahillo et al. 2015). It consists of three main elements: a smartphone application (app), a set of web services and the cloud. The Fig. 11.3 shows the logical architecture of the monitoring tool. The smartphone uses its sensors to collect the so-called "signals of opportunity" (SoOP), which transmitted for localisation or non-localisation purposes may be exploited to this end. The smartphone app is in charge of computing its own

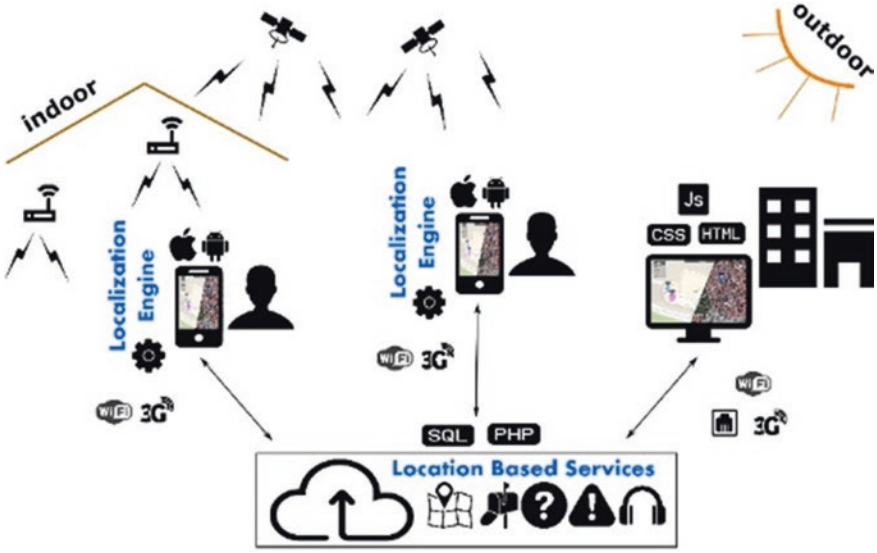

Fig. 11.3 The logical architecture of the monitoring tool. *Source* University of Deusto (2015)

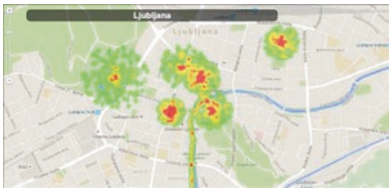

Fig. 11.4 The monitoring tool allows creating behavioural maps. The aim of this functionality is to help urban planners, designers or decision-makers to view how participants use the space (place vs. time vs. user profile). University of Deusto

position by fusing those SoOP according to a localisation engine. It also allows the user to define an own profile, get contextual information, answer contextual questions, as well as choose and send augmented reality suggestions.

All this information, participant profile, position, answers, and suggestions, is sent and stored into the cloud, from where the web services get the information, allowing visualising participants' suggestions, answers, weather conditions, real time positions, or the paths filtered, inter alia, by the user's profile. It operates in two modes: online and offline. In the first mode, the app continuously sends user data (profile and position) through the active communication service (GPRS, 3/4G or Wi-Fi) to the cloud. In offline mode, the app saves the data in the smartphone memory and sends them to the cloud whenever the user wants, for example when arriving to a place with Internet connection. Some examples are depicted in Figs. 11.4, 11.5, 11.6, 11.7, 11.8 and 11.9. They show some of the mentioned functionalities. The tool WAY Cyberparks it is based on the combination of users'

Fig. 11.5 The monitoring tool allows creating context based audio tracks. Every time the user enters the operational range of each audio track the tool notifies the user with the corresponding audio track. University of Deusto

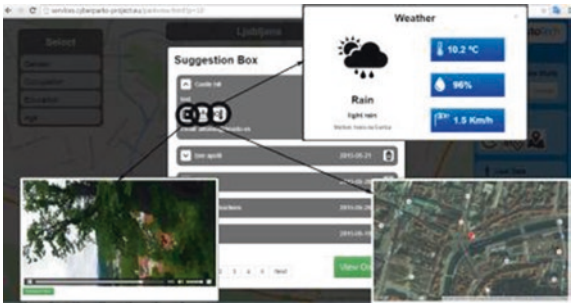

Fig. 11.6 The monitoring tool automatically sets not only the place but also the actual weather conditions where the suggestions were taken. University of Deusto

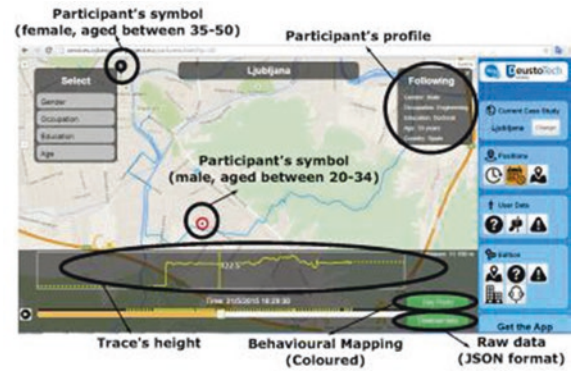

Fig. 11.7 The monitoring tool allows tracking the users' path, and it uses different symbols for different genders and ages. University of Deusto

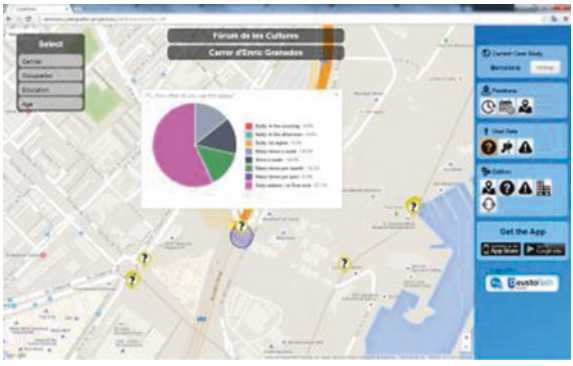

Fig. 11.8 The monitoring tool allows creating several context-based questions. Every time the user enters the operational range of each question the tool notifies the user and stores the answer. University of Deusto

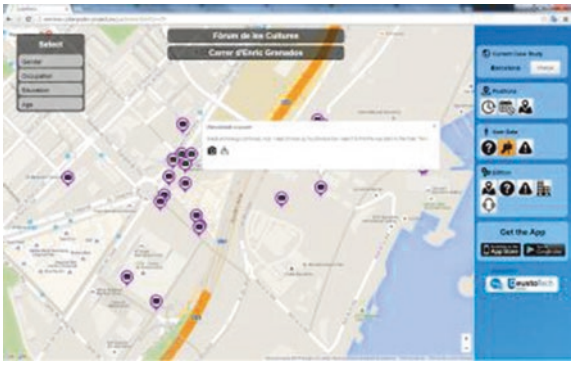

Fig. 11.9 The monitoring tool allows the user to send suggestions regarding the public space that has been visited. The user can attach text, audio and/or video data to better describe the suggestion. University of Deusto

analogue and digital responses to external stimuli in order to enhance the knowledge on the use of hybrid spaces and spatial experience. It takes account on the one hand, that the use of open spaces is influenced by personal decisions and preferences, as well as also by weather conditions and the availability of suitable and accessible places and on the other by significances, images, and representations people attach to open spaces. The reflection presents a significant added value than by assembling digitised sensory experiences based on the habitual seeing, and then filtering them in terms of their relation to space in order to interface users, places and facilitators, a second approach emerges, this of the sensory informatics framework, as described by Ioannidis et al. (2015: 280).

With the tool WAY Cyberparks, users become themselves nodes of the network and are more than simple sample. Besides uploading their personal profile they can also share media material (images, videos, audios and text notes, etc.) depicting the content of their individual space-related experiences. The methodological comparison discloses that the understanding of the relation *people and place* is more complete when quantitative data is combined with qualitative (images and maps). The analysis of local knowledge reveals meanings and identities attached to places, and situational uses of the spaces. With their opinions and proposals users are also able to directly influence and co-create the future development of the place.

11.6 Experiences and Lessons Learnt from Using the Way Cyberparks Digital Tool in Barcelona, Lisbon and Ljubljana

The *WAY Cyberparks—a Tool for Monitoring the Use of Open Spaces* has been tested within different open spaces in the three cities, Lisbon, Barcelona and Ljubljana. These cities are very different regarding their open space structures. For better understanding the general situation in the cities, information about planning,

design and management of open spaces and their experiences and policies of the use of new technologies, especially ICT, have been collected. Testing the digital tool was linked with fieldtrip observations and perception analysis. In Lisbon for example, the tool was used to monitor the movement and collect preferences within the big multifunctional urban park *Quinta das Conchas.* This park, one of the highest biodiversity spots in the city, is inserted in an area with high urban growth and surrounded by a densely built fabric, which concentrates a considerable part of the city's population. In Barcelona, on the other hand, two charismatic but completely different types of open spaces were analysed, the Enric Granados Street (*Carrer Enric Granados*) and Forum of Cultures (*Fòrum de les Cultures*. The former is a residential lively, dense street with services and amenities located centrally in the Cerdà Enlargement (Example) (Pallares-Barbera et al. 2011); the latter is mainly a reunion of buildings and cement plazas built for the 2004 Forum of Cultures exhibition. For the most part, locals and neighbours use Enric Granados Street, while Forum's facilities are used for large meetings, conventions and festivals, while other times it is an empty space. In Ljubljana, the tool was used for creating behaviour map of urban open spaces' visitors in the city centre. It included a wide range of different types of spaces from small and old to big modern squares to urban parks. Experiences gathered were used for further development of the idea of monitoring the preferences and behaviour of the people when using an open space, and of capturing their needs and ideas for improvement and development of the place, as well as to improve the tool further.

The results and information collected pointed out some important benefits and added value of the use for such a digital tool for capturing the user's needs. Very strong advantage of such methodology is the combination of more objective behaviour monitoring with the interactive questionnaire that enables gaining wider range of data from the same source, frame of time and environment. The flexibility of the tool, which can be easily updated and adapted to a particular spatial and social context, along with changes in the interactive questions enables a researcher to decide about the research focus and range of aspects. At the same time, the digital tool can be used as an interactive, participative or monitoring tool for planning, design management and development of urban open spaces, giving feedback in real-time and directly from the users of space. Weaknesses in the system are mostly due to the need for users to own smartphones, download and use the app, what limits the users' group now, but this will be very probably of minor importance in the close future.

The combination of ICT, GPS and GIS devices allows new and far-reaching types of analysis of open spaces, and this can result in improvement of surveys, what can lead to measures for participative planning and production of open spaces, and urban policies. Such use of ICT can enhance the understanding of the relationship between spaces and the users and their practices, aiming towards the production of inclusive and cohesive urban spaces. An integrated GPS-tracking, web services (as in the tool WAY Cyberparks) create a promising technology and research field for data collection and spatial analysis of people's behaviour in urban spaces.

Digital technologies have much to offer regarding the management and planning of urban spaces. One of the main challenges is how to address technology to integrate open space and public life. ICT allows feedback, enables a two-way communication and can be used for social reporting. It can help to enhance the attractiveness and responsiveness of the public spaces, as users can share information, expose their opinions, needs and desires. ICT can be a tool for scenario simulations and challenges city councils to rethink the communication among the cities and communities and build development strategies in entirely new ways. But city councils have a part to play, they must create the appropriate and stimulating environment in which citizens can propose and prioritise new ideas as well as react to them in proper time frame, avoiding loosing information in the cyberspace. For effective use of ICT possibilities is important to introduce interactive approaches into the official processes of planning and decision-making. In Lisbon and Barcelona, for example, the aspect of use of new technologies is already a topic and partly incorporated into city development but more in terms of the Smart Cities as of more people friendly and interactive urban environment. Also in the city of Ljubljana the use of ICT for different administrative and urban development needs is already recognized as an useful approach within the urban planning processes. An interactive platform for public has been open by city municipality as a part of the spatial strategy and urban plan development process. These few examples show that there is a wide range of possibilities to create different pools linked to information sharing and gathering, collection of resources and expertise or connecting different groups of interested citizens.

Different aspects of new technologies have been also used in different contemporary open space designs and elements. Different ICT devices, sensors, apps and games are already used as a part of the open space programme, incorporating urban furniture, screens and other elements. The free Wi-Fi in the open space also enables new ways of its use, which are also attractive to people with more “wired and indoor lifestyles”.

11.7 Conclusions

Both, the significance and relevance of the subject—sustainable and mediated open space—are directly related to the overarching goals of the UN Agenda 2030 for Sustainable Development, which was adopted at the last Summit held in New York in September 29, 2015. The agenda aims to wipe out poverty, fight inequality, and tackle climate change over the next 15 years. In line with its 11th and 17th objectives towards achieving better value for communities by ensuring universal access to safe, inclusive and accessible, *green and public* spaces, in particular for women and children, older persons and persons with disabilities. The WAY Cyberparks digital tool addresses these UN goals by collecting data directly from the users, enabling their direct involvement and thus supports the creation of a universal and inclusive design of public spaces. In general, we all can benefit from

freely accessible technology and knowledge resources and from an interactive tool more than a one-way communication model. The grade of penetration of ICT into open spaces varies not only among the cities, but also among their spaces—this makes drawing general conclusions depending from case to case.

For sustainable and people friendly cities it is necessary to set issues of open space and urban landscape in the forefront of the urban development agenda along with a broad understanding that they are not an optional add-on, an aesthetic consideration or a desirable enhancement for future, but a fundamental part of the solution. The creation of digitally mediated spaces that allow incorporation of user's concerns and preferences, can help to create healthier, safer, and more prosperous cities and encourage a process for achieving sustainability in urban development.

The introduction of the ICT into urban open space design and functions can attract more people to engage into outdoor activities, especially the groups of citizens that are more attached to the wired lifestyle and are now staying mostly indoors.

When discussing about inter-relation between ICT, places and users it is also important to take into consideration that the penetration of ICT into urban spaces is creating a new typology of urban landscapes. The physical dimension receives a more dynamic form and this involves understanding such spaces as more than a simple spatial unit. A digitally mediated space employs different characteristics to carry out different functions and provide potential diverse benefits—from attracting new types of users to allow space process and transmit a large amount of information not previously encountered. For instance, functions such as crowdsourcing processes on particular open spaces; and group of users gathering to use particular ICT for practicing sports, dancing, conducting crowd meetings with other groups placed in other far away Cyberparks.

The efforts of this work are centred on the analysis of how ICT can be used to enhance the understanding of the relationship between spaces and the users and, their practices, aiming towards the production of inclusive and cohesive urban spaces. A relevant aspect of the ICT lays in their ability to enhance communication with (potential) users; this enables creative participation and community empowerment. ICT can be a tool for scenario simulations, and used for social reporting it can help to enhance the attractiveness and responsiveness of the public spaces, as users can share information, expose their opinions, needs and desires. To this end, a digital tool, called WAY Cyberparks, has been developed and initially tested in three cities.

The blurring boundaries between real and virtual life gives rise to concerns but also open new challenges, regarding the concept of social interaction, communication, and media services. The relationship between individuals and their local contexts are as old as the scientific knowledge in general. The emergence and penetration of ICT has led to various forms the appropriation of the open spaces where the ICT facilities and devices play more and more a significant role. The experiences are moving from those with an initial artistic, political, marketing, or experimental goal, into a more academic aiming to a more sustainable and a

people's more friendly urban development. Though technology inherits huge benefits, as the potential mentioned in this work, particular attention has to be given to the use of ICT and their devices. ICT can be another means of excluding, segregating, rather than integrating people, provoked not only by the access to technology, but also by the speed of technology advances. There are risks to be aware of, not only in terms of mediated open spaces, but also in terms of socio-political challenges. Another important challenge lays in managing risks and potentials of the relationship ICT, open spaces, and social practices. In this context, particular importance are given to ICT as an active mediator in the relationship between the production of knowledge of urban open space—for research purposes aiming at advancing knowledge, and to frame a strategy for interventions—for planning purposes aiming at comprehensive urban spaces—for social purposes aiming at increasing people empowerment. Hence, the contribution of ICT to transform our cities into more social environments, rather than just more high-tech, is not conclusive yet. The question how to make cities more digitally responsive at the same time more inclusive and people friendly remains a challenge.

References

Bahillo, A., Golicnik Marušic, B., Perallos, A. (2015). A mobile application as an unobtrusive tool for behavioural mapping in public spaces. In *Ubiquitous Computing and Ambient Intelligence*. LNCS, Springer (accepted for publication).

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science, 19*(12), 1207–1212. doi:10.1111/j.1467-9280.2008.02225.x

Bettanini, T. (1982). *Espaço e Ciências Humanas*. Rio de Janeiro: Paz e Terra.

Ferrara, L. (1993). *Olhar Periférico*. São Paulo: EDUSP/FAPESP.

Fyfe, N. R. (Ed.). (1998). *Images of the street—Planning, identity and control in public space*. Routledge: London and New York.

Grech, G. (2015). *Cities as platforms*. Retrieved on August 10, 2015 from http://techcrunch.com/2015/08/07/cities-as-platforms

GreenKeys Project. (2008). *GreenKeys @ Your city—A guide for urban green quality*. IOER, Dresden. Retrieved from www.greenkeys-project.net

Hicks, L., & Higgins, J. (2010). Exergaming: Syncing physical activity and learning. *Strategies: A Journal for Physical and Sport Educator*s, *24*(1), 18–21. doi:10.1080/08924562.2010.10590908

Ioannidis, K., Smaniotto Costa, C., Šuklje-Erjavec, I., Menezes, M., Bahillo Martínez, A. (2015). The lure of CyberPark—Synergistic outdoor interactions between public spaces, users and locative technologies. In I. Theona & C. Dimitris (Eds.), *Hybrid city: Data to the people* (pp. 272–281). Athens: URIAC

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology, 15*(3), 169–182. doi:10.1016/0272-4944(95)90001-2

Kaplan, R., & Kaplan, S. (1989). *Experience of nature: A psychological perspective*. New York: Cambridge University Press.

Lévy, F. P., Segaud, M. (1983). *Anthropologie de L'Espace*. Paris: Centre, Georges Pompidou/CCI.

Menezes, M. (2003). *Da construção social do espaço à prevenção socio-urbanística*. Urbanismo Preventivo, Colecção Fórum, 6. Lisboa: URBE.

Menezes, M. (2010). Ser urbano em espaço público: Captar a (in)visibilidade das práticas de (in)sustentabilidade urbana. In M. F.Gomes & M. J. Barbosa (Eds.). *Cidade e Sustentabilidade: Mecanismos de Controle e Resistência* (pp. 41–58). Rio de Janeiro: Terra Vermelha.

Menezes, M. (2012). L'espace du social dans un monde de (multi)représentations socio-spatiales: meta-réflexion méthodologique à partir d'un regard géo-anthropologique. In C. Cerreti, I. Dumont, & M. Tabusi (Eds.), *Geografia Sociale e Democrazia – La Sfida della Communicazione* (pp. 87–94). Roma: Aracne Editrice.

Nelson, P. (2015). *The complete integrated city*. Retrieved on November 19, 2015 from http://depts.washington.edu/open2100/Resources/1_OpenSpaceSystems/Open_Space_Systems/BarcelonaCaseStudy.pdf

Pallares-Barbera, M., Badia, A., & Duch, J. (2011). Cerda and Barcelona: The need for a new city and service provision. *Urbani izziv Urban Challenge, 2*(22), 122–136.

Silberberg, S., Lorah, K., Disbrow, R., Muessig, A. (2013). *Places in the making: How place-making builds places and communities*. Retrieved on October 15, 2015 from http://dusp.mit.edu/cdd/project/placemaking

Smaniotto Costa, C. (2012). De quintas a parques. *Visitando os Parques da Quinta das Conchas e da Quinta dos Lilases em Lisboa. Arquitextos* (pp. 1–11). www.vitruvius.com.br/revistas/read/arquitextos/13.146/4429

Smaniotto Costa, C. (2014). Can we change processes in our cities? Reflections on the role of urban mobility in strengthening sustainable green infrastructures. *Journal of Traffic and Logistics Engineering, 2*(2), 141–155.

Smaniotto Costa, C., Menezes, M., & Mateus, D. (2014). *How would tourists use green spaces? Case studies in Lisbon. Entretextos* (Vol. 52). Lisbon. www.ceied.ulusofona.pt/pt/investigacao/publicacoes/entretextos

Šuklje Erjavec, I. (1994). *Relationship between form and function in landscape architecture* (Master of Science Thesis M.SC.). Department of Landscape Architecture, Biotechnical Faculty, University of Ljubljana.

Šuklje Erjavec I. (2001). *Overlooked potentials of open spaces—New types and categories of urban landscapes*. Urbani izziv 2, Prenova mesta - odprti prostor, no 12, Ljubljana: UPIRS.

Šuklje Erjavec, I. (2010). Designing an urban park as a contemporary user-friendly place. In B. Golicnik Marušić & M. Nikšič (Eds.), *Human cities—Celebrating public space* (pp. 39–51). Oostkamp: Stichting Kunstboek.

Šuklje Erjavec, I. (2012). Pomen in možnosti uporabe zunanjega prostora šol v vzgojno-izobraževalnem procesu. *Sodob pedagog 63*(1), 156–174.

Šuklje Erjavec, I., & Goličnik, B. (2006). Potrebe, navade in pričakovanja prebivalcev v stanovanjskih krajinah. In V. D. Gazvoda & M. Simoneti (ur.), *Stanovanjske krajine: trendi, perspektive : zbornik predavanj in prispevkov ob Konferenci Stanovanjske krajine, Ljubljana* (pp. 34–37). Ljubljana: BF, Oddelek za krajinsko arhitekturo, Trajekt, zavod za prostorsko kulturo.

Thompson, C. W. (2002). Urban open space in the 21st century. *Landscape and Urban Planning, 60*(2), 59–72.

Thompson, C. W., & Travlou, P. (Eds.). (2007). *Open space: People space*. Abingdon: Routledge.

Tschumi, B. (1983). *Parc de la Villette*. Paris: Tschumi Architects.

Turner, M. (2004). Urban parks as partners in youth development. In: *Beyond recreation—A broader view of urban park* (pp. 1–7). The Urban Institute, The Wallace Foundation. doi:10.1037/e688712011-001

UNO. (2015). *Transforming our world: The 2030 agenda for sustainable development*. Retrieved on October 15, 2015 from www.un.org

Whyte, W. (1980). *The social life of small urban spaces*. Washington: The Conservation Foundation.

Wilkins, K., Obregon, R., & Tufte, T. (2014). The handbook of development communication and social change. *Wiley,*. doi:10.1002/9781118505328.ch0

Chapter 12
Facts and Prospects of Open Government Data Use. A Case Study in Romania

Lorena Pocatilu Bătăgan, Daniela-Luminita Constantin and Liliana Mihaela Moga

Abstract This chapter examines the necessity and the benefits of implementation of Open Government Data in Romania. It provides an exploratory research based on a documentary study regarding the benefits of open governmental data, to improve the quality of life. Furthermore the relationship between the efforts made by EU organizations and national government regarding the open data solutions is analysed. This chapter analyses the necessity for OGD and the stage of implementation based solutions at international scale, with a focus on Romania. Initially the approach is to examine the principles of open government data followed by analysing impact of OGD solutions at the local neighbourhood scale. The research describes a case study that concentrates on Romanian institutions, aiming to highlight the stage of OGD solutions implementation. It starts from the idea that the Romanian Government has adhered to the principles of the Open Government Partnership (OGP), which promotes transparency and the use of open data solutions in governmental development. Finally the opportunities derived from the Digital Agenda of the "Europe 2020" Strategy are identified and discussed.

12.1 Introduction

At present, governmental institutions represent an important source of data, of which open government data (OGD) are playing a growing role. Public and private organizations in various areas are setting up digital information infrastructure

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for interconnecting government, businesses and citizens in providing and using open data. This data is connected with areas like agriculture, business, education, energy, finance, health, local government etc. In our age, OGD offers an important advantage in development economy and quality of life. Based on OGD the companies, institutions and anyone interested can freely reuse the available government data and produce information in innovative ways. Any governmental institution tries to implement efficient OGD.

Access to information is a pre-requisite of good governance. Previous research underlines the connection between the citizens' access to information on the decision-making processes of government, and the performance of the state and accountable government (Davies 2012). The first concerns with open data started in 2004. Subsequently, in 2006 the OKF—Open Knowledge Foundation (McNulty and Mindes 2015) has proposed a definition of what constitutes open content namely: "A piece of data or content is open if anyone is free to use, reuse, and redistribute it—subject only, at most, to the requirement to attribute and/or share-alike" (Moore 2014). The access to integrated services offered by government may stimulate transparency and innovations as a step to good governance (Klievink et al. 2014).

The European Union (EU) has been for many years been interested in the issue of open data as a resource for innovative products and services and as a means of addressing social challenges and fostering government transparency (Moore 2014; European Commission 2013). From the outset, the most important use of open data has been in governmental area. International Data Corporation (IDC) (Vesset et al. 2012) define the open data as a new generation of technologies and architectures used to extract economic value from volume and a wide variety of data, allowing quick access, discovery and efficient use of data. Scholars are exploring ways such as social accountability and citizen-led accountability that can offer more effective ways for citizens to hold governments or states accountable (Ubaldi 2013). The opening up of data is a strategy that plays an important role in these new approaches, at the same time being relevant to traditional forms of political accountability (Khan and Foti 2015).

Modern democracy is based on the idea that governments, institutions and officials can be held to account for their decisions. Increasingly it is recognized that citizens should also be able to exercise rights to call companies to account for their actions, including their use of natural resources (Davies 2012). Open data is one of the key trends and has a particularly important impact in urban governance. Efficient use of open and big data allows us to collect data in real time in our environment, analysing massive datasets and making decisions in real time (Janssen et al. 2012).

If open data is to form a key part of future urban development then cities need to be more interconnected, intelligent. This is especially the case if as assumed urban development is based on good governance and hence needs access open data solutions. Open data can allow information from many different sources to be brought together, and for patterns to be found. In terms of urban governance open data solutions gives us the most updated information on changes registered at the

city level. For example, the Indian Government has introduced SMS service that allows people to make reports of excessive emissions of buses and other vehicles (European Commission 2013). Advancement in mobile technology (3G and 4G) has empowered people to gather information on all urban activities.

12.2 Open Data and Urban Governance

Using the open data solutions in urban governance is a real support for urban development, and on the other hand is essential for a smart city. "Cities generate a lot of useful data" said Tuomo Haukkovaara, General Manager of IBM Finland (IBM Corporate Citizenship 2013), and all the city must work actively to make such kind of data open. Although this comment begs the questions about what is useful data.

Leaving aside for present such moral and philosophical questions, open data in itself is now seen as a fundamental component of open government—a broader strategy that looks at the evolving roles of governments and citizens in delivering public services to society. The expectations are that by adopting open government principles, governments—in collaboration with business, non-profit organizations and engaged citizens—can deliver more services with higher quality and improved democracy.

Some of the most important benefits of open data solutions are (IBM Institute for Business Value 2012; Janssen et al. 2012):

- the increase of transparency: with new technologies, anyone can see and understand data;
- a greater accessibility: open data supported informing and engaging citizens;
- the reduction of corruption: anyone can see and access data and these help the reduction of corruption;
- cost reduction: open data can reduce the public organizations' transaction costs and the access costs;
- delivering trusted information through integration: for example, master data management can enable a single version of the truth across all information to be maintained without a rip and replace strategy;
- information security and information governance: it is important to specify and enforce the ways in which information is created, stored, used, archived and deleted. This can include defining processes, roles, standards and metrics;
- data quality: it is important to ensure clean, standardized, and non-duplicated information. It could be useful to indicate the degree to which data has been cleaned, validated, etc., to help bolster user confidence;
- real time connectivity: providing access to diverse and distributed information in real time may involve supporting federated queries, single sign-on, unified views, and bi-directional data access services.

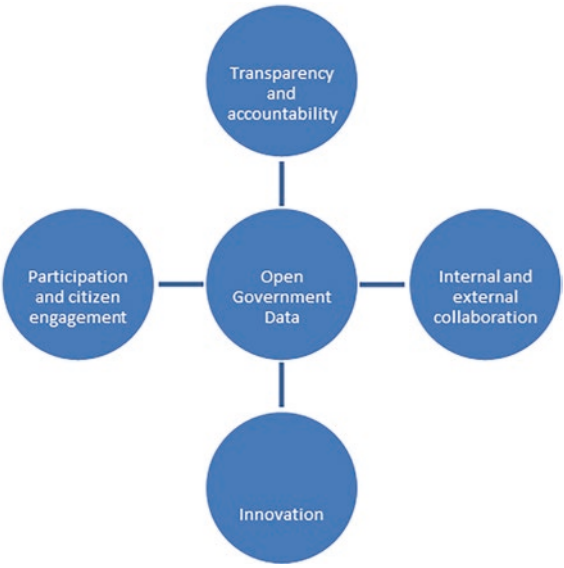

Fig. 12.1 Open government data benefits

Smart urban governance represents the continuous optimization of service delivery, but at the same time a continued participation of citizens at urban administration activities (Davies et al. 2013).

The citizens are not able to engage in the governance process in a continuous way in our age (Davies et al. 2013). Introducing the open data in governance enables the citizens to be directly informed and involved to varying degrees in decision-making from consultation to full empowerment (Pollock 2013; Open Knowledge 2015; Organisation for Economic Co-Operation and Development 2007).

In summary OGD is seen as providing several benefits (Fig. 12.1) in the following areas (Tauberer 2011):

- transparency and accountability;
- participation and citizen engagement;
- internal and external collaboration;
- innovation.

Hence no surprisingly smart urban governance (Chen 2013) has an important impact in every part of our society: economic, social and political. From economic part one can identify four important benefits of smart urban government: improve quality of life, increased GDP, reduction in data transaction costs and increased service efficiency. The most important political benefits of smart urban government are increased transparency and accurate of information. Social benefits of smart urban government mainly consist in the increasing of inclusion and the quality life.

12.3 Open Data Solutions

Initiatives linked to open data solutions can be found in different areas. CCA Organization (Tinholt 2013) pointed out that this data may lead to improve administrative and business activities. A large number of countries, including the United States of America, France, Britain, Denmark, Spain and Finland, firmly acknowledged that open data have an important impact on urban governance.

The first step in using open data was made by the United States Government by means of the www.data.gov site from 2009 and United Kingdom Government by means of the data.gov.uk, in 2010 (Batagan 2012). These two sites are well known, and are the most advanced open data sites to date. The open data movement is spreading rapidly and today everybody (countries, states, regions and cities) try to do the first steps with open data sites.

The Australian government published in 2010 a Declaration of Open Government (Gruen and Steward 2010)—in order to promote greater participation in Australia's democracy—in which it supported informing and engaging citizens through increased government transparency.

Ireland through Ireland's Open Data Portal data.gov.i.e./data promoting innovation and transparency through the publication of data in open, free and reusable formats.

In other Western countries open data has increasingly been placed on the agenda by politicians and policy makers.

Open Government Declaration from Italy in 2011, fully in line with the Italian public administration reform effort aimed at improving the quality and efficiency of public services and making government more transparent and open.

The data are the most important source for the development of new products and services. In addition, data are important to exercise one's democratic rights. Citizens are better informed about and in governance process.

The IBM team (IBM Corporate Citizenship 2012) was asked to help the city of Helsinki to develop strategies in order to:

- create visualizations that can enable citizens make use of and benefit from open data;
- define the necessary components to grow a sustainable, repeatable platform, process and ecosystem to leverage the principles of open data, turning data into information, information into action, and action into change.

Helsinki is the leader in open data strategy for Finland. The main example of this is Helsinki Region Infoshare (HRI). This was made by the Forum Virium Helsinki organization for the City of Helsinki and "aims to make regional information quickly and easily accessible to all. The data may be used by citizens, businesses, universities, academies, research facilities or municipal administrations. The data on offer is ready to be used freely at no cost" (IBM Corporate Citizenship 2012).

The expectations are that by adopting open data principles, governments—in collaboration with business, non-profit organizations and engaged citizens—can

deliver more services with higher quality and improved society. Helsinki has made important steps towards it with HRI, and this demonstrated that open data is an opportunity for development, evolution and changes.

Many cities around the world have implemented various smart solutions in order to get smarter.

In Romania, the Open Governmental National Action Plan (Romanian Government 2013) reflects the priorities of the Romanian Government with regard to promoting good governance. The measures are addressing the following challenges: improving public services, increasing public integrity and managing public resources more effectively. In the Global Open Data Index (Open Knowledge 2015) from 122 countries Romania is ranked 13th. This index was calculated according to the Common Open Data Assessment Framework (World Wide Web Foundation 2014) where are four different ways to evaluate data openness—context, data, use and impact.

In (Romanian Government 2013) the Romanian Government highlights that "the public open data refers to data generated or collected by public authorities, which are made available to the citizens to re-use and re-distribute free of charge and in an accessible format".

12.4 Open Data Solutions in Romanian Institutions

As a good example of the challenges and benefits of introducing OGD, the following case study describes the lessons learnt at the level of Romanian institutions, The project was instigated by the Romanian Government in adherence with the principles of the Open Government Partnership (OGP) that seek to promote transparency and the use of open data solutions in governmental development.

To assess the characteristics of OGD projects a comprehensive survey was commissioned among the Romanian institutions using the following four main criteria:

- how existing infrastructures are used;
- the use of new technologies for online communications;
- how employees perceive the implementation of open data solutions;
- whether employees consider beneficial the implementation of open data solutions.

To explore these criteria in detail 15 questions were grouped into the following categories:

- general data about the employer: age, gender;
- questions regarding how existing infrastructure is used in public sector;
- questions regarding how open data change the public sector activity;
- questions regarding how open data governance influence the community.

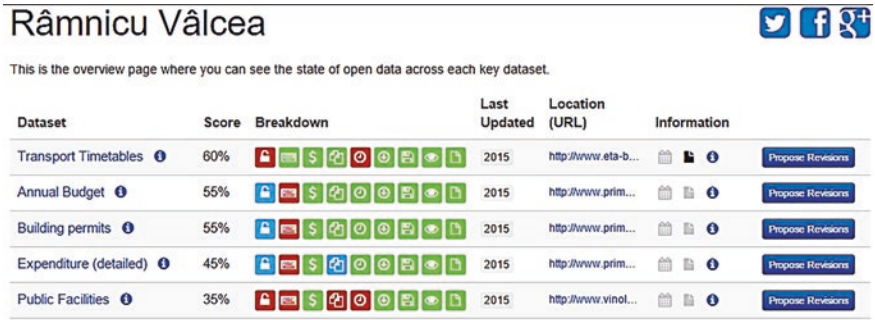

Fig. 12.2 Open data—Ramnicu Valcea

Based on the results of the survey a data collection sheet was prepared as shown below. The methodology of the survey contains open and close-ended questions. The survey was circulated to variety of institutions of public sector (administration, education, health and transportation) from a Romanian city—Ramnicu Valcea (Sercaianu 2015) (Fig. 12.2).

The survey was conducted in the first part of the year 2015. 200 employees from public sector have undertaken this survey, of which some the information from 180 applicants was considered to be valid. The total population or the total number of employees is of 380. The representative sample to achieve a minimum accepted error of 5 %, with a minimum dispersion error of 0.25 and a confidence interval of 95 %—associated to $z = 1.96$, is of 167 participants. Thus the sample was considered to be representative for the total number of employees.

As mentioned earlier the survey had four directions and for every part of our study we have elaborated a set of questions. The results are presented for each direction: in the first part general data is presented about the respondents, in the second part there is a focused on the use existing infrastructures, in the next part the level of use of new technologies has been analysed for online communications, and lastly information about how employees and the perception about the implementation of open data solutions and if employees consider beneficial the implementation of open data solutions.

The subjects of the analysis were selected from employees of the public institutions (administration, education, health and transportation) from a Romanian city—Ramnicu Valcea. A set of procedures was developed for distributing, collecting and analysing more than 167 observations.

By gender, the sample population is distributed as presented Table 12.1. The majority of the subjects were female (67 %), which is representative for general population.

The majority of our subjects have between 35 and 50 years (66 %). The number of the employees from this category is considered very important because the age group finished the school and most have a family. The distribution by age highlights that it is very important to analysis the use of new technologies for online

Table 12.1 Sample distribution by gender

Gender	Proportion (%)
Male	33
Female	67

Table 12.2 Sample distribution by age

Age	Post-test mean
25–35	38
35–45	118
More than 45	24

communications, most of the respondents know to use existing infrastructures (Table 12.2).

Furthermore, the survey highlight that all the subjects have connection to Internet from home and from office.

12.5 Results

12.5.1 The Use of Existing Infrastructure

This part of the survey revealed that all the respondents use the existing online infrastructure. Whilst all employees use technical infrastructures to access data, communication and inform, the responders highlight that an important services for accessing information is the Internet (89 %). The majority of our subjects from the public institutions use the Internet to inform and for email. Most of the employees responded that Internet was used for accessing the information and email (93 %), for documentation (78 %) and for navigation (67 %). Another important aspect is that most of the respondents use the Office Packet (96 %) (Fig. 12.3).

12.5.2 New Technologies and Online Communications

The third part of the survey focused on the extent of employing of online communication and new technologies.

According to the survey, most of the employees believe that the online communication is essential in their activities and for interaction with other employees (94 %). A large number of employees from public institutions believed that documentation and information are improved through online communication and free access of data. This indicated that the use of open data would be a real support for their activities.

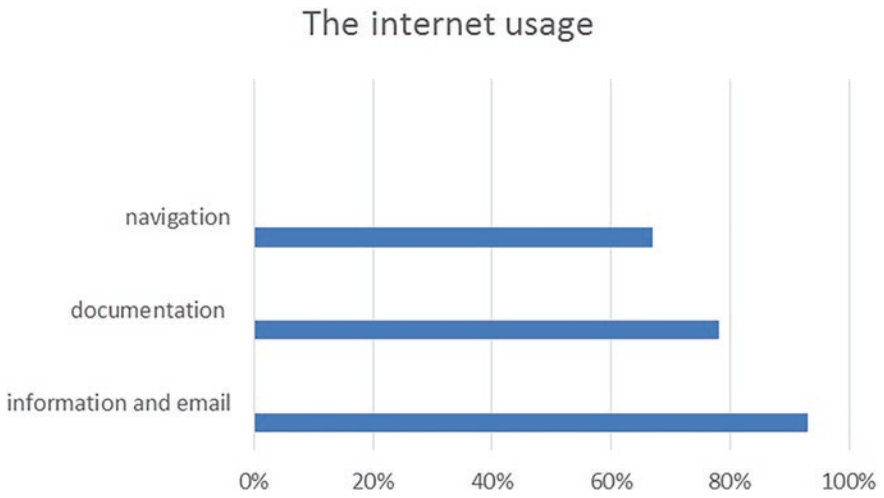

Fig. 12.3 The internet usage

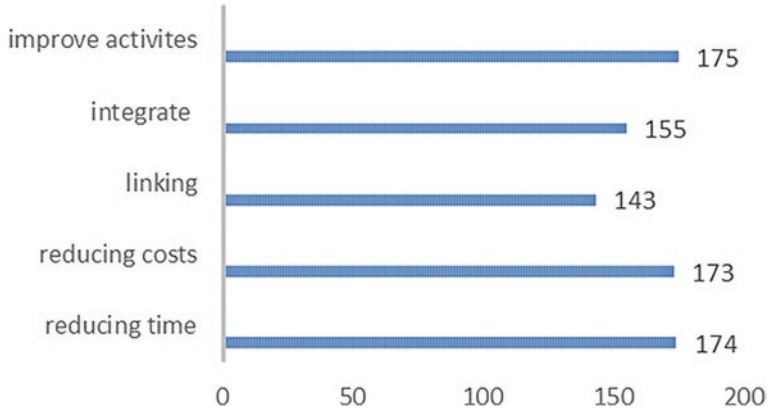

Fig. 12.4 Social networks facilities

Furthermore the survey shows that the online communication is considered essential by the majority of subjects for reducing time, costs, integrate and improve their activities (Fig. 12.4).

In addition, respondents highlighted the possibility of obtaining additional information through online communication with other employees and thus helping them to improve their knowledge.

12.5.3 The Implementation of Open Data Solutions

The survey revealed that almost all the employees had used open data solutions from public administration for their activities. Furthermore the survey showed that almost all employees (96 %) considered use of open data solutions to be a positive benefit to their activities.

Likewise the survey shows that open data solutions made data more accessible for users (93.45 %). The analysis of the responses indicates that the employees use open data solutions to access data and to improve their activities.

The results indicated that open data have changed and will change the way in which the employees collect and access information, collaborate, communicate and share information. These will help citizens to take the good decisions in real time.

The open government data aim is to make the city information quickly and easily accessible to all. This case study confirms that open data is a resource with a huge potential for more interconnected services in which the needs of the citizens are better satisfied. Open data solutions promote innovation, challenge and knowledge because increase transparency, communication and accessibility and on the other hand reduce the corruption and the costs. These services represent a real support for better meet of the citizen's needs.

12.6 Policy Implications and Responses

A key driver for the survey was an improved understanding of OGD and how it could assist with implementation of strategic goals for EU in particular the strategic objective of "Europe 2020"—smart, sustainable and inclusive growth.

The results of this case study as well as the results of other studies (Ubaldi 2013; Davies 2010; Davies and Bawa 2012; Manolea and Cretu 2013; Rothenberg 2012; World Bank Group 2014) in the same field (on open data, open government data, open government partnership and good governance) serve as reference point for the identification of the real needs and the orientation of project proposals supported by the European funds. With this aim in view the study recognised that two of the 11 derived thematic objectives (TOs) are directly connected to the OGD issue.

The first of these thematic objectives relates to TO 2, which refers to the improved access, use and quality of ICT. In the case of Romania this objective is seen as relating to two priorities, namely (a) the implementation of the open data system in all public institutions in order to improve the online collaboration and electronic systems and (b) the increase of the e-governance systems use, including public servants' training (Romania—EU Agreement 2014).

The other thematic objective namely TO 11 prioritises the consolidation of institutional capacity and an effective public administration. This study into the

development needs and financing priorities associated with TO 11 revealed a series of items that can create important synergies with issues for TO 2. In these context the most significant issue for the OGD is seen as improved decision-making processes by bureaucracy reduction, open administration, increased transparency, integrity, accessibility and responsibility on government and public services by means of improved coordination mechanisms between public institutions—both horizontally and vertically (Romania—EU Agreement 2014; European Commission 2014).

Furthermore, the Digital Agenda—one of the emblematic initiatives of the "Europe 2020" Strategy points to the use of advanced ICT, combined with new ways of thinking, action and work in public administration as the solid foundation of e-governance. The corresponding strategy in Romania aims at the implementation of the 2.0 e-governance concept by taking into consideration the cultural and behavioural transformations as well as the extra-benefits deriving from the social aspects of the government—user's interaction (e-services, e-democracy, e-participation, e-management, etc.). In this view the provision of better public services by the government via the ICT use goes hand in hand with the citizens' involvement in supporting the government actions. Hence the e-governance projects are expected to have a significant impact on the economic and social life in Romania through the provision of services for citizens and businesses in an integrated, transparent and safe manner, at the same time with the reduction of operational expenses (Ministry for Information Society 2014).

As a result, investment in OGD and ICT is seen as improving economic competitiveness and quality of life. Accordingly, the Competitiveness Operational Programme (COP) for Romania envisages four main fields of action for ICT development, as follows:

- e-governance, inter-operability, information security, cloud computing and social media;
- ICT in education, inclusion, health and culture;
- e-commerce, innovation in ICT;
- broadband infrastructure and digital services (Ministry of European Funds—Romania 2014).

These priority areas within the Digital Agenda based on e-governance 2.0 principles are intended to make available public services on line to meet the needs of businesses and citizens. In this context special attention is given to the so-called "life events" which focus on: how to start a business; business selling and buying; changes in business development; getting financial resources; bankruptcy; property transfer; getting driver licence; contract establishment; voting; tax payment recording; car recording; house buying/rent; library signing-up; job search; work accident, work incapacity; retirement; sign-up for disabled allowance; appointment for medical examinations in hospitals; birth; marriage; divorce; decease; identity card issuance; adoption; immigration to Romania; getting Romanian citizenship; travel guides and information; getting visa; getting a passport; illegality denouncement; etc.

The prioritisation of the e-governance services relating to these life events should provide a significant improvement of the way of regarding the government and the public institutions by the citizens and will be a source of synergies with other public service strategies in Romania (Ministry for Information Society 2014). However, particular attention must be given to ensuring universal access and understand-ability for all citizens irrespective of age, size and ability.

Hence, the Romanian Government has established as one of its investment priorities the consolidation of ICT use for e-governance and e-learning in order to ensure the on-line provision of such services the COP's Priority Axis 2—ICT for a competitive digital economy. The strategy concentrates on two specific objectives, namely the increase of e-governance systems use and the increase of Internet use, with three concrete actions: (1) the consolidation and assurance of inter-operability of information systems for 2.0 type e-governance services, focusing on businesses and citizens' life events, the development of governmental cloud computing and social media communication as well as of open data and big data; (2) ensuring the cybernetic security of ICT systems and information networks; (3) the improvement of the digital content and ICT infrastructure for e-education, e-inclusion and e-health (Ministry of European Funds—Romania 2014).

An important requirement for finding the best use of the funds allocated for this axis is the careful selection of the proposed projects, which will have to demonstrate the impact on economic development and quality of life increase via better on-line services for businesses and citizens. In addition, the intermediary and ex-post evaluation of the COP implementation—in correlation with the Operational Programme of Administrative Capacity Development implementation—will be expected to prove the steps forward in exploiting the benefits of e-governance services based on big data and open data compared to their stage of development at the beginning of the 2014–2020 programme period.

12.7 Conclusions

In summary, the study carried out within Romanian public services revealed that OGD is already seen by employees and employees has an important impact on urban governance. OGD is seen as allowing information from many different sources to be brought together, and easy to access. Furthermore, data and information are considered the most important resource for the development and exercising of democratic rights in society. Within this context future planning and prioritization of investment for ICT and OGD in Romania will focus on the so-called "life events" which focus on: how to start a business; business selling and buying; changes in business development; getting financial resources; bankruptcy; property transfer; getting driver licence; contract establishment; voting; tax payment recording; car recording; house buying/rent; library signing-up; job search; work accident, work incapacity; retirement; sign-up for disabled allowance; appointment for medical examinations in hospitals; birth; marriage; divorce;

decease; identity card issuance; adoption; immigration to Romania; getting Romanian citizenship; travel guides and information; getting visa; getting a passport; illegality denouncement; etc. The ultimate aim is to make available public services on line to meet the needs of businesses and citizens. In doing so particular attention must be given to ensuring universal access and understand-ability for all citizens irrespective of age, size and ability.

These results can serve as a good orientation for the proposal of useful projects supported via EU-funded programmes in the 2014–2020 period, able to respond to the real needs regarding the effective OGD solutions implementation.

References

Batagan, L. (2012). Open data for smart cities. *Informatica Economică, 12*(1), 136–142.

Chen, Y.-C. (2013). *Smart urban governance: An institutional and system perspective.* In *Proceedings of the 7th International Conference on Theory and Practice of Electronic Governance* (pp. 227–230). ACM

Davies, T. (2010). *Open data, democracy and public sector reform. A look at open government data use from data.gov.uk*. [Online] Available at: http://www.opendataimpacts.net/report/wp-content/uploads/2010/08/How-is-open-government-data-being-used-in-practice.pdf

Davies, T. (2012). *How might open data contribute to good governance?*. [Online] Available at: http://www.timdavies.org.uk/wp-content/uploads/How-might-open-data-contribute-to-good-governance-Commonwealth-Governance-Handbook.pdf

Davies, T., & Bawa, Z. A. (2012). *The promises and perils of open government data*. [Online] Available at: http://ci-journal.net/index.php/ciej/article/view/929/955

Davies, T., Perini, F., & Alonso, J. (2013). *Researching the emerging impacts of open data.* [Online] Available at: http://www.opendataresearch.org/sites/default/files/posts/Researching%20the%20emerging%20impacts%20of%20open%20data.pdf

European Commission. (2013). *EU implementation of the G8 open data charter—Europa*. [Online] Available at: https://ec.europa.eu/digital-agenda/en/news/eu-implementation-g8-open-data-charter

European Commission. (2014). *Summary of the partnership agreement for Romania, 2014–2020*. [Online] Available at: http://ec.europa.eu/contracts_grants/pa/partnership-agreement-romania-summary_en.pdf

Gruen, N., & Steward, A. (2010). *Report of the government 2.0 taskforce*. [Online] Available at: http://www.finance.gov.au/sites/default/files/Government20TaskforceReport.pdf

IBM Corporate Citizenship. (2012). *Helsinki report*. [Online] Available at: http://www-05.ibm.com/fi/ibm/wdc2012/pdf/IBM_SCC_Helsinki__English.pdf

IBM Corporate Citizenship. (2013). *Corporate citizenship in Finland*. [Online] Available at: https://www.ibm.com/ibm/responsibility/downloads/profiles/2013_Profile_Finland_1013.pdf

IBM Institute for Business Value. (2012). *Opening up government.* [Online] Available at: http://public.dhe.ibm.com/common/ssi/ecm/gb/en/gbe03451usen/GBE03451USEN.PDF?

Janssen, M., Charalabidis, Y., & Zuiderwijk, A. (2012). Benefits, adoption barriers and myths of open data and open government. *Information Systems Management*, *29*(4), 258–268.

Khan, S., & Foti, J. (2015). *Aligning supply and demand for better governance*. [Online] Available at: http://www.opengovpartnership.org/sites/default/files/attachments/IRMReport-OpenData.pdf

Klievink, B., Zuiderwijk, A., & Janssen, M. (2014). Interconnecting governments, businesses and citizens—a comparison of two digital infrastructures, electronic government. *Computer Science*, 84–95.

Manolea, B., & Cretu, V. (2013). *The influence of the Open Government Partnership (OGP) on the open data*. [Online] Available at: http://www.epsiplatform.eu/sites/default/files/The%20influence%20of%20the%20Open%20Government%20Partnership%20(OGP)%20on%20the%20Open%20Data%20discussions.pdf

McNulty, M., & Mindes, B. (2015). *What is your country status?*. [Online] Available at: http://blog.okfn.org/2015/12/09/the-global-open-data-index-2015-is-live-what-is-you-country-status/

Ministry for Information Society. (2014). *Digital agenda national strategy for Romania.* [Online] Available at: http://www.mcsi.ro/Transparenta-decizionala/Proiecte-2014/Digital-Agenda-Strategy-for-Romania,-8-september-2

Ministry of European Funds—Romania. (2014). *Competitiveness operational programme.* [Online] Available at: http://www.fonduri-ue.ro/poc-2014

Moore, S. (2014). *Issues in open research data.* [Online] Available at: http://www.ubiquitypress.com/site/books/read/12/177/issues-in-open-research-data/#epubcfi(/6/2[cover.xhtml]!4/1:0)

Open Knowledge. (2015). *Global open data index report.* [Online] Available at: http://index.okfn.org/place/

Organisation for Economic Co-Operation and Development. (2007). *Principles and guidelines for access to research data*. [Online] Available at: http://www.oecd.org/sti/sci-tech/38500813.pdf

Pollock, R. (2013). *Annual report.* [Online] Available at: https://okfn.org/about/governance/annual-report-2013-2014/

Romania—EU Agreement. (2014). *Partnership agreement Romania—EU.* [Online] Available at: http://www.fonduri-ue.ro/acord-parteneriat

Romanian Government. (2013). *Open government partnership national action plan.* [Online] Available at: http://ogp.gov.ro/wp-content/uploads/2013/08/ROMANIA-OGP-National-Action-Plan.pdf

Rothenberg, J. (2012). *Towards a better supply and distribution process for open data*. [Online] Available at: https://www.forumstandaardisatie.nl/fileadmin/os/documenten/Internationale_benchmark_v1_03_final.pdf

Sercaianu, M. M. (2015). *Râmnicu Vâlcea open data census.* [Online] Available at: http://ro-city.census.okfn.org/place/ramnicu-valcea

Tauberer, J. (2011). *Open government data.* [Online] Available at: https://opengovdata.io/

Tinholt, D. (2013). *The open data economy*. [Online] Available at: https://www.capgemini-consulting.com/resource-file-access/resource/pdf/opendata_pov_6feb.pdf

Ubaldi, B. (2013). Open government data: Towards empirical analysis of open government data initiatives. *OECD working papers on public governance,* Issue 22.

Vesset, D., Woo, B., Morris, H. D., & Villars, R. L. (2012). *worldwide big data technology and services.* [Online] Available at: http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=6242

World Bank Group. (2014). *Open data for economic growth.* [Online] Available at: http://www.worldbank.org/content/dam/Worldbank/document/Open-Data-for-Economic-Growth.pdf

World Wide Web Foundation. (2014). *Towards common methods for assessing open data.* [Online] Available at: http://opendataresearch.org/sites/default/files/posts/Common%20Assessment%20Workshop%20Report.pdf

Erratum to: Citizen Empowerment and Innovation in the Data-Rich City

Chiara Certomà, Mark Dyer, Lorena Pocatilu and Francesco Rizzi

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