Cities and Smartness: A Critical Analysis of Opportunities and Risks

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Abstract. The term "Smart City" is to-date widely used, but little clarity appears in the definition behind it. Several approaches led to a growing emphasis on the combined use of geographic information and communication technology to build cognitive frameworks in city planning and management. The present paper tackles an effort to define 'smart cities' and to identify both elements of smartness, and critical aspects related to the current interpretation of the term. In particular, the risk of considering the technological layer of Smart City as an innovative element has been observed, highlighting, on the contrary, the need to consider Smart Cities in terms of a major urban planning effort to coordinate and harmonize different urban players, sustained by ICT instruments.

Keywords: Smart city, Smart communities, Neogeography, Open data, Citizens as sensors, Governance.

1 Smart City: A Non-unique Definition

Although the term "Smart City" is to-date widely used, little clarity appears in the definition behind it and particularly on its actual meaning.

The idea behind a Smart City is that in the current digital age, not only physical infrastructures and endowment of a city characterize an urban area and its functions, but something less 'hard' and not so easy to identify, as quality of knowledge communication and 'social infrastructure', or social and intellectual capitals. In such an (urban) environment, mood and attitude, the concept of Smart City arises, as a device or, better, as a framework where 'traditional' urban production factors are coupled with the social, cultural capital, by means of a massive use of ICTs.

The stress – quite agreed to-date – tends to be on 6 main axes of 'smartness' including economy, mobility, environment, people, living and governance (Table 1). Such axes include the concepts behind neoclassical theories of urban growth, sustainable development, ICT and citizens' participation in urban governance.

In these terms, a smart city is something more than 'just' a digital or an intelligent city, where the attention is mainly drawn on the ICT components, as enabling connection and exchange of data and information within an urban environment. Given the '6 axes' and the attention to growth, sustainability, ICT and citizens' governance and

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participation, a smart city appears more like a new 'urban utopia', although not too difficult to be realized, and basically as the evolution of the sustainable city, in terms of combining economic, social and environmental aspects to elements of social and cultural capital, as well as to the power of ICT technologies and applications. Going back to the beginning of this paragraph, if it is true that a city's physical infrastructure, as well as its endowments, are the result of a process of interaction between humans and (urban) environment, it is also true that physical infrastructures (buildings, roads, utilities) are built by humans to ease urban growth and development, while their presence and essence give also a direction for future development and evolutions or represent a constraint. So there is a mutual exchange of influences and causal relations. As De Biase states, reminding Winston Churchill's words: "We shape our buildings; thereafter they shape us". Smart cities are not so different in this sense. Of course, buildings and infrastructures are still being built in cities, but to-date, such buildings and infrastructures are also those not immediately visible and 'fix' in space and time. ICTs infrastructures, as well as devices based on them, shape structures and functions of cities, being XXI century equivalent of medieval cathedrals, ordered Renaissance' squares and XIX century railway stations.

Other definitions containing an attribute coupled with the term 'city' in the (also recent) past provided quite a concrete and almost precise orientation and meaning. Without going back to utopian cities population, various periods of human times or ideal cities dating back to the Renaissance, also the recent concept of sustainable city hold a quite strong and well-defined set of attributes describing its characters.

This is not true, at present, for the locution 'smart city'. The different definitions meanings provided in different areas of the World have in common the implication of technology, and, particularly, the wide use of ICT infrastructures and devices. However, such elements can represent either the most important and relevant part or just a component of an overall meaning.

2 Virtual Cities, Computable City and Ubiquitus City

The concept of Smart city can derive from several approaches, sometimes slogans, which lead to a growing emphasis on the combined use of geographic information and communication technology to build cognitive frameworks in city planning and management.

Since the late '90s, with the growing diffusion of the internet, the experience of Virtual Cities beginning [1] has focused on construction and representation of urban scenarios. The use of Virtual Reality Modeling Language (VRML) allowed the creation of virtual environments and three-dimensional models of cities usability on the internet. This experience is not only restricted to simulation fields, but, using the large internet diffusion, it has been used to create online participatory experiences, allowing part of the population to take part in urban policies creation. In other cases, citizens were allowed to contribute to a neighbourhood renewal project choice [2] [3] [4] [5] simply by means of electronic vote.

Batty [6] considered the huge possibilities deriving from a massive convergence of computer and communications through various forms of media.

Initially computers were used as a deeper support in city planning and programming. In subsequent years, interest has been moved on how computers and information technologies are changing cities. The result is the concept of Computable City [6], focused on the simultaneous analysis of both aspects. This concept examined both the ways in which computers were changing methods for city understanding and changes in city structure and dynamics. Later on, other types of computing with strong impact on the city have been adopted, such as ubiquitous computing, pervasive computing, physical computing, tangible media, each as facet of an interaction coherent paradigm, which Greenfield [7] (2006) defines "everyware". At the end of 1990s, Openshaw [8] [9] coined the term Geocomputation, considering two main issues: intensity of the process and increase of knowledge and intelligence. This expression has been interpreted according to several meanings. Ehlen et al. [10] analyzed four aspects of Geocomputation: from a high performance computing point of view, as a set of spatial analysis methods, as the essential aspects of Geocomputation and as their relationship with GIS [39] [40]. In some cases there is a transition from a vision based on a computing power to a distributed environment where computers, seen in their traditional sense, disappear.

Consequently, the concept of computable city assumed increasing importance with the growth of electronic devices in our physical environment [11].

The transition towards a not only virtual environment, i.e. an environment with a deep human and social interaction through computers, characterizes urban computing [12]. These theories take into account the social dimension of human environments, placing computers at the background. Shepard and Greenfield's [12] theories on urban computing coupled with ubiquitous computing research developed at the Xerox Palo Alto Research Centre [13] promoted the first experiences of ubiquitous cities [14], mainly concentrated in Asia. The objective of an ubiquitous city (U-city) is to create an integrated environment, where citizens can get any type of services, in all places, at any time and with all kinds of ICT devices [15]. These applications are based on infrastructures with the aim to support local needs by improving daily life of local communities.

The possibility of using real time acquired data, allowing continuous monitoring of main urban phenomena, can substantially improve the effectiveness of spatial planning and urban management. There is a transition from a traditional approach, based on the sequence real city, computer, virtual representation, to the sequence, computer, real city, ubiquitous city.

The traditional sequence considered many people working on one or on a few computers, while in U-city sequence only one person handles much computers and electronic devices [16].

3 Open Government and Gov. 2.0

A large amount of information produced by human activities and automated systems Information-Explosion Era [17] is available, not only in Asia, where experiences of U-city are mostly concentrated.

In the last five years, acceleration occurred, supported by the diffusion of GPS devices and 3G connections in mobile phones, which has led to a large production of geo-localized or social networks based applications. This has led to a huge activity of Crowdsourcing [18], where suggestions services, ideas and any decision support can be achieved by online communities' actions. Population directly provides certain services that government is not interested to develop and private sector does not consider convenient to realize.

There are more and more initiatives (OpenStreetMap, WikiMapia, Google Map Maker, Geo-Wiki) of Volunteered Geographic Information [19], based on mass collaboration to create, manage and disseminate geographic data where citizens are voluntary sensors [20]. The huge production of data on the web has led to "Neo-geography" [21], defined as a new approach to geography without geographers [22] which describes the bottom-up production of maps with geo-tagged photos, videos, blogs, Wikipedia, etc. [23].

Another important tendency in progress in recent years is open government. Such an approach is based on a more participative method of government and it starts from the assumption that ideas of citizens have always to be collected, not only before elections. Consequently, public involvement, getting ideas and suggestions, is a daily activity, aiming to have a wider inspiration in managing and to collect feedback in already started actions. Obama's administration has given a great impetus to this approach, implementing such a policy and enlarging the possibility to capture public imagination by means of social networks, blogs and all possible solutions to directly interact with citizens.

This new approach is often called Gov. 2.0. Open government without a 2.0 approach is still based on a direct action. "Providers" are a sort of Right to Information, where the administration tries to inform people, but interacting just with main stakeholders. Gov. 2.0 is a more open approach, which "enables" citizens to have an important role in defining policies. Social media and all 2.0 platforms are a key element in generating a direct contact with citizens. Extensions of 2.0 philosophy changed completely the relationship between citizens and administration [24].

It is a type of governance where aspects related to participatory decision-making are central and the transition from Government to Governance is combined with visioning techniques.

Since early '90s a transition occurred from an approach where local authorities directly provide to problem solutions (Government), to another approach, where local authorities tend to accompany the process (Governance). In the latter one, administrations enable and facilitate the search of different solutions, in collaboration and agreement with other public and private stakeholders [25] [26]. In the same years visioning methods were adopted in order to develop bottom-up contributions, fundamental in planning process. This technique emphasizes plan communication aspects, highlighting the importance of social imagination as a contribution to the definition of a scenario of desirable actions in planning process [27].

In a lot of cases traditional participatory approaches, based on public meetings, proved to be unsuccessful, due to restricted number of participants who did not represent a significant sample. Electronic participation goes beyond space and time

dimensions, allowing all citizens, who may be working during the meeting time, or live in a distant place, or are embarrassed of public speaking, to express their opinions and producing a significant contribution in improving ideas.

Ten years ago, Kingston [28] adapted Arnstein [29] ladder to electronic era, defining E-participation Ladder, adopting several levels from a simple web site to online decision-making. Haklay [30], considering citizens cooperation, distinguishes four levels of citizens science, where crowdsourcing is the lowest level and the highest level is a sort of collaborative science, where citizens can have the responsibility to define problems and to find possible solutions. Today we are living in wikification era, with many successful initiatives based on mass collaboration [31] [32], which may also lead to a wiki approach to decisions and planning [33] [34].

4 City Sensing and Smart City

City sensing is based on electronic and human sensors or on the combination of both [35], on voluntary or unconscious actions [36], and it is a key component in Smart City.

It is central to correctly define the relationship between city sensing and smart city, because these are new concepts without a precise and unambiguous definition.

Considering also that the application domain is the city, whose elements are rooted in our daily lives, there is a risk, in analogy with what happened with the concept of sustainability, that after many years we have collected a lot of words and few results. The correct relationship between city and sensing Smart city must be based on equal dignity of all aspects. It could happen to forget the city, focusing the attention only on technology. The main risk would be represented by a fall of electronic devices on the city, which does not have a direct relationship with its main problems.

In analogy with the beginnings of geographic information systems, when the market was mainly determined by supply more than by demand, the risk is to invest significant resources in purchasing hardware and software without having a clear idea of administration needs and their possible use in city management.

The European experience differs from U-city in giving less importance to computational aspects and in paying more attention to the potential of technologies for the improvement of city quality. Great attention has been paid to digital citizenship that leads to new forms of social organization related to information technology.

A shared definition identifies smart cities in a synthesis of physical and social infrastructures [37], where the first one can represent a catalyst for knowledge communication, increasing social and intellectual capital. A superficial approach combined with a rush to be included under "smart umbrella", can lead to ignore these aspects, mainly focusing on improving devices and technological systems which quickly get old. A city can be considered smart if it can quickly integrate and synthesize data produced by each type of sensor, to improve efficiency, equity, sustainability and quality of life [38]. It is important to consider the big impact of technologies on new forms of policy and planning. In analyzing smart cities, Batty et al. [38] identify seven points on which the attention should be focused, analyzing key problems of cities, using information and communication technologies:

1. a new understanding of urban problems;
2. effective and feasible ways to coordinate urban technologies;
3. models and methods to use urban data across spatial and temporal scales;
4. developing new technologies for communication and dissemination;
5. new forms of urban governance and organisation;
6. defining critical problems about cities, transport, and energy;
7. risk, uncertainty and hazard in the smart city.

It is important to give priority to the construction of cognitive frameworks and to a wider knowledge in supporting decisions in urban planning, compared to approaches based on procedural efficacy. Today, especially in Europe, compliance with procedures is mainly considered the production of a bureaucratic truth, in most cases very far from reality, when analysing urban phenomena. Recently, a lot of reports have been published in order to define variables to classify smartness level of municipalities in a hypothetical path to smarter cities. Table 1 is an attempt to synthesize the main variables adopted in reports which analyze smart cities.

Table 1. Synthesis of the main variables adopted in reports analyzing smart cities

Dimension	Variables
Smart Economy	Employment rate; presence of innovative enterprises, presence and quality of universities and research institutes; infrastructures (roads, railways, airports, electronic infrastructures, etc.).
Smart Environment	Air quality, percentage of separate collection of municipal waste (also electrical and electronic equipment waste), presence of green spaces in the city, efficiency and quality of water supply (water leakage and water treatment).
Smart Governance	Not only related to e-government, percentage of ecological cars, use of recycled paper, energy saving, adoption of ecological policies for city planning and development, ability to network with other municipalities.
Smart Living	Investments in culture and welfare providing several services, from childcare facilities to community libraries, from counselling structures for old people to cinemas, number of people below poverty level, hospital emigration rate, immigrants social integration, criminality rate.
Smart Mobility	Extensive and efficient public transportation network, park and ride, great diffusion of ecological cars, limited traffic areas, cycle paths, bike and car sharing.
Smart People	Education and early school leaving level, number of women working and holds positions within the administration, presence of foreign students, political participation, involvement in voluntary associations, newspapers diffusion and level of participation to cultural events.

In most cases they are traditional indicators, concerning the city based on old variables, with the addition of the "smart" attribute. If we delete this last term in the above table we achieve typical socio-economic or environmental sustainability indicators.

Indicators concerning smartness level of our cities should consider the following aspects:

1. adoption of OpenData and OCG Standard;
2. free wifi;

3. projects implementation of augmented reality for tourism;
4. crowdfunding initiatives;
5. decisions taken by crowdsourcing;
6. implementation of INSPIRE Directive;
7. quantity of public services achievable through App.

5 Smart City: The Pillars

Identifying what makes a city smart is related to the different dimensions, which are connected to concepts quite consolidated in references dealing with urban topics. In the *smart* meaning, the technological component is particularly related to ICT features and infrastructures. These play an important role, in particular as facilitators of processes of innovation, sharing and active participation by citizens/users, as well as of the development of elements typical of knowledge economics. Following some of the most interesting interpretations [42], smart cities are cities in which a 'technological layer' is overlaid onto the existing urban structure and fabric, allowing its citizens and users to connect to the net, interact among them and with other different players – public administration, suppliers of goods and services, etc., actually optimizing a city and its spaces. Since world population is growing and such growth is expected to be particularly concentrated in cities, technology can play an important role in limiting soil consumption and enhancing quality of life.

However, one of the risks today is that decision makers, politicians, citizens, enterprises focus just on the fashion of the technological side of "smartness", with little attention to insert it into a process of urban planning and project.

In a *smart city* the technological infrastructure related to ICT is central, in the same way as in the past the realization of new buildings, roads, railways, telephone and energy distribution lines and networks was. Such infrastructures both supported population needs and influenced how such population interacted with the urban space. Infrastructures of a smart city should play a similar role, therefore needing a focused planning, as their use must not be limited to the short terms but it should persist and, actually, persists, having in mind that to-date settings will influence how citizens will interact with the city in present and future times. In a smart city, the network metaphor is overlaid onto the urban metaphor; in such sense acting as a new, different infrastructure capable of channelling relations and interactions and to be influenced and shaped by such interactions, similarly to a public transport network developing in an embryonic city to connect and serve places and then evolving and giving birth to 'new' places.

The city should therefore set as an "enabling platform for the activities that citizens are able to develop, linking those inherited from the past to those that can be realized in the future, so it is not focused on just applications but on the possibility that citizens realize them" [41].

A smart city should therefore be passed on different pillars, elements to be organized and linked together. These can be summarized [41] in three main elements (Figure 1):

1. connections - as networks and technological infrastructures;
2. data – open and public or public interest data to allow the development of innovative solutions and the interaction between users/citizens and the city;
3. sensors - these including citizens [19] [20] [22] able to actively participate in a bottom up way to city activities.

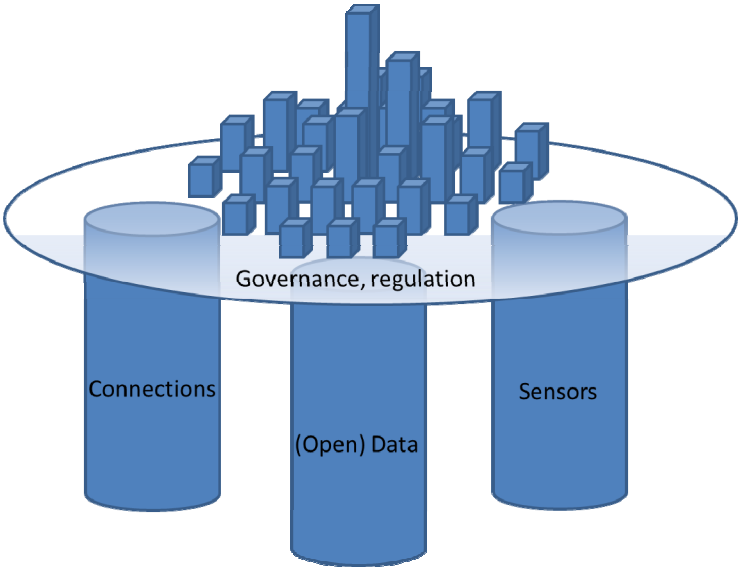

Fig. 1. The Pillars sustaining the Smart City and its Governance (graphical elaboration, after concepts in De Biase, 2012).

These pillars must be coupled with a governance capable of linking them together, giving a direction and a vision to the city. Such governance should regulate the smart city in a neutral way, without entering into the details for applications and contents.

A Smart city therefore appears as an urban project, as a big infrastructure and as a metaphor of the net in an urban context. In a sentence, a smart city becomes an environment where a definite set of elements, as the ones above reported – sensors, data and connections – harmonized by a limited set of basic rules, gives public bodies, citizens, enterprises the possibility of developing applications and solutions able to improve life of the city itself, leaving actually the initiative of doing that to people, groups, firms, etc., allowing also to create new markets and solutions also where the public sector is not able to move.

6 Are Cities Smart?

Finally, are cities smart? Twenty years ago we would have asked: are cities sustainable? In that period, that was the paradigm of the moment – actually it still is – as cities are the places where main human actions take place and therefore the places

where to set policies aimed at a sustainable future in terms of adequate and respectful exploitation of resources from an economic, environmental and social point of view.

How does 'smart' differ from sustainable? And why is it different? What elements were added? Smart cities – and communities! - aim at sustainable development. Actually the six dimensions of smart cities share the basic dimensions of sustainability in development: environmental, economic and social. Of course a difference is in the presence of a 'techy layer' as Ratti [42] pointed out – see above –particularly characterized by the revolution occurred in ICT, that allows an unprecedented opportunity of interactions among places, individuals, organizations. This is the real revolution, coupled with the spreading of mobile devices and the increasing precision in location allowed by geospatial technologies (embedded GPS receivers, etc.). Therefore, the role of citizens or city users changed in time, making them potential and powerful influencers and actors in the urban arena, both in terms of serving their communities, highlighting critical elements, or participating to public meeting on policy choices, but also implementing their own economic activities based on ICT and interaction.

Citizens – as one of the pillars – are considered as sensors. But what sensors? Are sensors only citizens with a mobile device connected to the Internet? A Smart City holds a strong social dimension, particularly in terms of inclusion of its citizens and in enabling solutions to be implemented to tackle that. However, a 'techy' orientation and particularly the view of smartness just and mainly focused on developing smart apps, tools and devices seems to be going towards a direction of affecting just a part of the urban population and users, as those 'Hi-Tech aware', or those that to-date are constantly connected using mobile devices – smartphones, tablet pc, etc. In doing so, digital divide issues can arise. At present and worldwide just part of the population has access to the Internet and to IT devices. In these terms a 'smartness' just limited to a 'rainfall of apps' would only affect a subset of the population, thus worsening social disparities rather than reducing them. Talking about citizens as sensors, we could say that this is not completely new, just faster, simpler and wider. Citizens have been participating to urban issues since the emerging of various media. Letters to newspapers, local municipalities, phone calls, have always been ways of pointing out faults in urban fabrics rather than bad services. Of course at present that can be done by means of a geo-tagged photo shared among social media and networks and therefore more easily reaching a vast amount of users and bodies.

So a Smart City, as an enabling platform, should allow both the development and hosting of 'rainfall of apps' but also including other less-techy users – phone callers, etc. – and in that lays the difficulty: that of building a real network and making things work. What is the point in having cutting edge mobile applications that, say, allow you communicating to your municipality about a sewage leak close to a primary school, if behind that the public body did not set any infrastructure, procedure and habit to tackle such an issue? So smartness should act as a cultural product other than

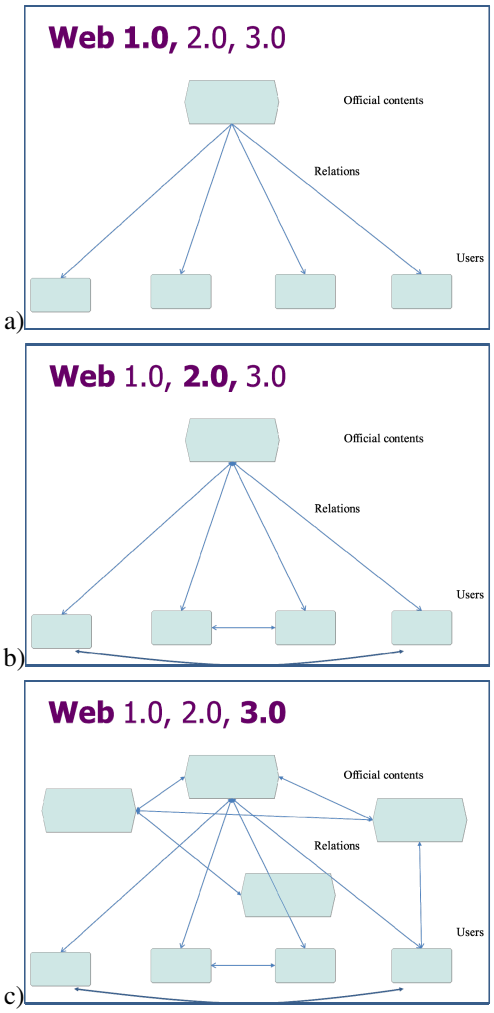

Fig. 2. The evolution of the Web. a) Web 1.0, b) Web 2.0, c) Web 3.0

a technological feature. Also, attention should be put in the interaction between public bodies and public utility bodies, in that allowing the interaction not just in the Web 2.0 approach, but going to the 'Web 3.0' one, in which institutions share their data and contents not just with users but between them, thus generating misunderstandings and mismatching (Figure 2).

The problem of governance and setting common rules becomes the real question in the smartness of smart cities. Thinking about the 'smart infrastructure', a code of rules should be agreed, in a similar way of the highway code that allows us driving on a road network and avoiding – in most of the cases – problems respecting minimal restrictions.

7 Conclusions

Smart city as a paradigm is the result of the evolution of thinking and reasoning over the city and its issues. In particular, it seems to be a combination of concepts related to sustainability and sustainable development, in terms of its urban application. Also, the idea of 'locally acting' originally proposed for urban sustainability, presents some of the suggestions that few years later have been introduced in participation of citizens and the web 2.0. Furthermore, Smart city derives from the evolution of technology and thinking in the digital era. Digital City, Computable City and Virtual City are just a few of the names used to identify a city where the technological component is strongly present and affects how citizens use and interact with the city.

The revolutions of sustainability, digital era, spread of the Internet, of mobile devices and data availability, as well as the revolutions in Geographical Information, led to a widespread availability of devices, connections and data and the opportunity to link them together and develop applications with high added value capable to enhance quality of urban life. An attention to applications and to 'techy' aspects related to city therefore arose, opening new issues and opportunities.

The debate is still on-going, but some reflections lead to think to Smart Cities as a revolution intervening in terms of a new infrastructure and platform, made of both virtual and physical elements, enabling citizens, users and all different urban players to carry on activities and realize applications thanks to the opportunity allowed by improvements in technology and its widespread presence. In such terms, we talk about an infrastructure conceptually not different from transport ones, developed in the past years and centuries, that both allowed to enlarge the city extension and to connect places once not part of the city, as well as to drive the development of new urban areas.

Vital is also the setting of rules and of a governance, acting as an highway code for city users, with little interference with the life of the city itself.

References

1. Smith, A.: Virtual Cities - Towards the Metaverse, Virtual Cities Resource Centre (1998), http://www.casa.ucl.ac.uk/planning/virtualcities.html
2. Levy, R.M.: Visualisation of Urban Alternatives. Environment and Planning B: Planning and Design 22, 343–358 (1995)
3. Batty, M., Doyle, S.: Virtual regeneration. (CASA Working Papers n. 06). Centre for Advanced Spatial Analysis (UCL): London, UK (1998) ISSN: 1467-1298
4. Hudson-Smith, A., Dodge, M., Doyle, S.: Visual Communication in Urban Planning & Urban Design. GIS and Urban Design. (CASA Working Papers n. 02). Centre for Advanced Spatial Analysis (UCL): London, UK (1998) ISSN: 1467-1298
5. Batty, M, Dodge, M, Jiang,B., Hudson-Smith, A.: GIS and Urban Design. (CASA Working Papers n. 03). Centre for Advanced Spatial Analysis (UCL): London, UK (1998) ISSN: 1467-1298
6. Batty, M.: The computable city. In: Fourth International Conference on Computers in Urban Planning and Urban Management, Melbourne, Australia, July 11-14 (1995)
7. Greenfield, A.: Everyware: The dawning age of ubiquitous computing. New Riders, Berkeley (2006)

8. Openshaw, S.: Building automated Geographical Analysis and Explanation Machines. In: Longley, P.A., Brooks, S.M., McDonnell, R., Macmillan, B. (eds.) Geocomputation, a Primer. John Wiley and Sons, Chichester (1998)
9. Openshaw, S.: GeoComputation. In: Openshaw, S., Abrahart, R.J. (eds.) GeoComputation (2000)
10. Ehlen, J., Caldwell, D.R., Harding, S.: GeoComputation: what is it? Comput. Environ. and Urban. Syst. 26, 257–265 (2002)
11. Hudson-Smith, A., Milton, R., Dearden, J., Batty, M.: Virtual Cities: Digital Mirrors into a Recursive World. (CASA Working Papers n. 125). Centre for Advanced Spatial Analysis (UCL): London, UK (2007) ISSN: 1467-1298
12. Shepard, M., Greenfield, A.: Urban Computing and its Discontents. The Architectural League of New York, New York (2007)
13. Weiser, M.: Hot Topics: Ubiquitous Computing. IEEE Computer 26(10), 71–72 (1993)
14. Jang, M., Suh, S.-T.: U-City: New Trends of Urban Planning in Korea Based on Pervasive and Ubiquitous Geotechnology and Geoinformation. In: Taniar, D., Gervasi, O., Murgante, B., Pardede, E., Apduhan, B.O. (eds.) ICCSA 2010, Part I. LNCS, vol. 6016, pp. 262–270. Springer, Heidelberg (2010)
15. Lee, S.H., Han, J.H., Leem, Y.T., Yigitcanlar, T.: Towards ubiquitous city: concept, planning, and experiences in the Republic of Korea. In: Yigitcanlar, T., Velibeyoglu, K., Baum, S. (eds.) Knowledge-Based Urban Development: Planning and Applications in the Information Era, pp. 148–170. Information Science Reference, Hershey (2008), doi:10.4018/978-1-59904-720-1.ch009
16. Lee, B.G., Kim, Y.J., Kim, T.H., Yean, H.Y.: Building Information Strategy Planning for Telematics Services. In: KMIS International Conference, Jeju Island, Korea, November 24-26 (2005)
17. Kitsuregawa, M., Matsuoka, S., Matsuyama, T., Sudoh, O., Adachi, J.: Cyber infrastructure for the information-explosion era. Journal of Japanese Society for Artificial Intelligence 22(2), 209–214 (2007)
18. Howe, J.: Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business. Crown Publishing Group, New York (2008)
19. Goodchild, M.F.: Citizens as Voluntary Sensors: Spatial Data Infrastructure in the World of Web 2.0. International Journal of Spatial Data Infrastructures Research 2, 24–32 (2007)
20. Goodchild, M.F.: Citizens as sensors: the world of volunteered geography. GeoJournal 69(4), 211–221 (2007), doi:10.1007/s10708-007-9111-y
21. Turner, A.: Introduction to neogeography. O'Reilly Media, Sebastopol (2006)
22. Goodchild, M.F.: NeoGeography and the nature of geographic expertise. Journal of Location Based Services 3, 82–96 (2009)
23. Hudson-Smith, A., Milton, R., Dearden, J., Batty, M.: The neogeography of virtual cities: digital mirrors into a recursive world. In: Foth, M. (ed.) Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City. Information Science Reference, IGI Global, Hershey (2009)
24. Murgante, B., Tilio, L., Lanza, V., Scorza, F.: Using participative GIS and e-tools for involving citizens of Marmo Platano – Melandro area in European programming activities. Journal of Balkans and Near Eastern Studies 13(1), 97–115 (2011) ISSN:1944-8953, doi:10.1080/19448953.2011.550809
25. Balducci, A.: Pianificazione strategica e politiche di sviluppo locale. Una relazione necessaria? Archivio di Studi Urbani e Regionali 64 (1999)
26. Gibelli, M.C.: Tre famiglie di piani strategici: verso un modello "reticolare" e "visionario". In: Gibelli, M.C., Curti, F. (eds.) Pianificazione Strategica e Gestione Dello Sviluppo Urban, Alinea, Firenze (1996)

27. Gibelli, M.C.: Riflessioni sulla pianificazione strategica. In: Rosini, R. (ed.) L'urbanistica Delle Aree Metropolitane, Alinea, Firenze (1992)
28. Kingston, R.: The role of e- government and public participation in the planning process. In: Proceedings of XVI AESOP Congress, Volos, Greece (2002)
29. Arnstein, S.R.: A ladder of citizen participation. Journal of the American Planning Association 35(4), 216–224 (1969)
30. Haklay, M.: Citizen Science as Participatory Science (November 27, 2011), http://povesham.wordpress.com/2011/11/27/citizen-science-as-participatory-science/ (retrieved)
31. Tapscott, D., Williams, A.D.: Wikinomics: How Mass Collaboration Changes Everything. Penguin Group, New York (2006)
32. Qualman, E.: Socialnomics: How Social Media Transforms the Way we Live and do Business. John Wiley, Hoboken (2009)
33. Noveck, B.S.: Wiki Government: How Technology Can Make Government Better, Democracy Stronger and Citizens More Powerful. Brookings Institution Press, Harrisonburg USA (2009)
34. Murgante, B.: Wiki-Planning: The Experience of Basento Park In Potenza (Italy). In: Borruso, G., Bertazzon, S., Favretto, A., Murgante, B., Torre, C. (eds.) Geographic Information Analysis for Sustainable Development and Economic Planning: New Technologies, pp. 345–359. Information Science Reference IGI Global, Hershey (2012), doi:10.4018/978-1-4666-1924-1.ch023
35. Bergner, B.S., Exner, J.P., Memmel, M., Raslan, R., Dina Taha, D., Talal, M., Zeile, P.: Human Sensory Assessment Methods in Urban Planning – a Case Study in Alexandria. In: Proceedings REAL CORP 2013, Rome (Italy), May, 20-23, pp. 407–417 (2013)
36. Manfredini, F., Pucci, P., Tagliolato, P.: Mobile Phone Network Data: New Sources for Urban Studies? In: Borruso, G., Bertazzon, S., Favretto, A., Murgante, B., Torre, C. (eds.) Geographic Information Analysis for Sustainable Development and Economic Planning: New Technologies, pp. 115–128. Information Science Reference, Hershey (2013), doi:10.4018/978-1-4666-1924-1.ch008
37. Caragliu, A., Del Bo, C., Nijkamp, P.: Smart cities in Europe. Research Memoranda Series 0048 (VU University Amsterdam, Faculty of Economics, Business Administration and Econometrics). CRC Press, Boca Raton (2009)
38. Batty, M., Axhausen, K.W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., Ouzounis, G., Portugali, Y.: Smart cities of the future. The European Physical Journal Special Topics 214(1), 481–518 (2012)
39. Murgante, B., Borruso, G., Lapucci, A.: Geocomputation and Urban Planning. In: Murgante, B., Borruso, G., Lapucci, A. (eds.) Geocomputation and Urban Planning. SCI, vol. 176, pp. 1–17. Springer, Heidelberg (2009)
40. Murgante, B., Borruso, G., Lapucci, A.: Sustainable Development: concepts and methods for its application in urban and environmental planning. In: Murgante, B., Borruso, G., Lapucci, A. (eds.) Geocomputation, Sustainability and Environmental Planning. SCI, vol. 348, pp. 1–15. Springer, Heidelberg (2011)
41. De Biase, L.: L'intelligenza delle Smart Cities (2012), http://blog.debiase.com/2012/04/intelligenza-delle-smart-city/
42. Roche, S., Nabian, N., Kloeckl, K., Ratti, C.: Are 'Smart Cities' Smart Enough? In: Global Geospatial Conference 2012. Global Spatial Data Infrastructure Association (2012), http://www.gsdi.org/gsdiconf/gsdi13/papers/182.pdf