The Role of Open Government in Smart Cities

Marc Garriga-Portolà and Júlia López Ventura

A developed country is not a place where the poor have cars, it is where the rich use public transportation.
Gustavo Petro, Mayor of Bogotá.

1 Introduction

The world built in the last decades, lying on the card house of speculative global finance, is decaying and taking with it not only an old economic model but also provoking a deep rethinking of our social, environmental, spatial, and even spiritual environment (Burkhalter and Castells 2009). Moreover, representative democracy, the system upon which many western countries have constructed their welfare states is been fiercely questioned due to multiple cases of corruption, abuse of power, and incorrect spending of public funds. Movements like Occupy Wall Street in the USA or Democracia Real Ya (*Real Democracy Now,* in Spanish) in Spain include in their demands a complete rethinking of the relationship between citizens and their elected representatives, searching for more participative and transparent processes.

In this scenario, nation-states, the old economic centers of power, are losing prominence in favor of new rapidly growing urban agglomerations that share common features at the global level with other similar structures in different countries: these are the so-called global cities (Sassen 2009) that reemerge as strategic places for a wide range of activities and dynamics, critically embracing a new economic role surpassing their national economies.

Marc Garriga-Portolà (✉)
Passeig del Congost, 36, 08530, La Garriga, Barcelona, Spain
e-mail: mgarrigap@gmail.com

Júlia López-Ventura
C/ Carrer Blasco de Garay 46, 4º 4ª,
08004, Barcelona, Spain
e-mail: julia.lopez.ventura@gmail.com

M. Gascó-Hernández (ed.), *Open Government,* Public Administration and Information Technology 4, DOI 10.1007/978-1-4614-9563-5_13,

ICT, the Revolution

The rapid evolution of information and communication technologies (ICT) has opened up a new world of possibilities for collaboration and, consequently, for urban growth (Yovanof and Hazapis 2009).

On one hand, new technologies have allowed the appearance of new highly collaborative environments that allow the immediate exchange of big amounts of information and facilitate the access and use of this information by its users. Recognizing this, citizens have embraced the use of these spaces and press their direct government representatives to join them in this dialog and use these channels for the sake of a more direct and fluid interaction between citizens and their communities, what is known as Open Government.

On the other hand, the possibilities given by the evolution of the Future Internet technologies, specially the Internet of Things (Schaffers et al. 2011) and the availability of real-time urban information that helps managing the city with some successful pilot projects (Calabrese et al. 2008), are making the futuristic idea of the self-sustainable real-time city a reality. Recognizing this outside academic world, the recent use of new branding names such as Smart Cities has become extremely popular among city managers who are applying these new technologies to their recent urban development plans following a transversal approach that in most cases reaches almost all areas of competence in the city trying to apply a holistic transformational urban plan.

Open-Government Strategies in Smart Cities

In the actual context of a deep economic and social crisis along with drastic budget cuts, global cities face a twofold battle: The urgent need of becoming attractive for investment and the necessity of giving an answer to the increasing openness demands by their citizens.

To resolve the first, many cities nowadays are adopting the smart-city philosophy that claims to be the ultimate solution for achieving a sustainable efficient ICT-enabled city (Giffinger and Gudrun 2011). Therefore, the concept of smart cities seems to be a strategic issue for many cities that see becoming a smart city as a critical device to encompass modern urban development and to highlight the growing importance of ICT in profiling the competitiveness and sustainability of cities (Komninos 2009). However, despite the urban development debate being taken by the smart city discourse and a wide list of examples of this smart city phenomenon, there is little knowledge of what is hiding behind this urban concept, particularly in terms of what the label ideologically reveals and implies (Hollands 2008).

Regarding the second challenge, nevertheless, the social paradigm of open government in which citizenry and elected public representatives dialog and interact in an innovative and active debate (Ramírez-Alujas and Villoria 2012) to directly create and evaluate public policies has still a long way to go in public managers' agendas (despite few success stories). Axes of open government demands like participation,

collaboration, and transparency (Open Gov Standards 2013) of governmental actions are still widely ignored or underestimated by local authorities. Same as the recognition and willingness of citizens to become implicated in the policies and services that directly affect them, not to say as a powerful tool for the accountability of political actions, and the recognition of the capacity of citizens to become direct actors in the coproduction of public services (Cottica 2012). In this field, many bottom-up actions focused on improving urban life coming directly from active citizens (also known as civic innovators or hacktivists) can be mentioned, like Change by Us or Fix My Street (more examples in subsection "success cases").

2 The Smart Cities Global Movement

The concept of the smart cities refers to a movement that recently happened at a global level calling for a transversal transformation of all areas of competence of cities, using information technologies as enablers of this change. Indeed, the use of IT for the improvement of urban services is not new and the use, mostly by private sector, of appealing and easy to remember brands to name this transformation have been varying with time (from digital cities to intelligent cities or to cities 2.0, just to name some) to the smart cities tag widely used nowadays by all involved partners: from city managers to private service providers and academia.

The smart city movement calls for a global transformation of all areas of competence of the cities (may that be mobility, environment, economic promotion, social services, culture, health, tourism, education…) searching for the sustainability of services for citizens in an atmosphere of social change and drastic budget reductions. The main objective of smart city approach in cities is, therefore, to apply technological solutions to the already existing processes following a new innovative approach that guarantees, if not improves, their performance and sustainability, often resulting in radically different approaches or even new services. Ultimately, smart cities are focused on improving citizens' welfare as well as fostering economic progress, allowing cities to continue competing at global level for the attraction of investment.

Although recognizing the wide variety of approaches to smart cities taken by cities all over the world, there is a common opinion among researchers that smart city models should be seen as a broad, integrated approach covering the majority of areas in a city. The Center of Regional Science at Vienna University of Technology first proposed in 2007 a model of smart cities based on six axes of performance (Giffinger et al. 2007):

- Smart mobility
- Smart economy
- Smart environment
- Smart living
- Smart people or smart citizens
- Smart government

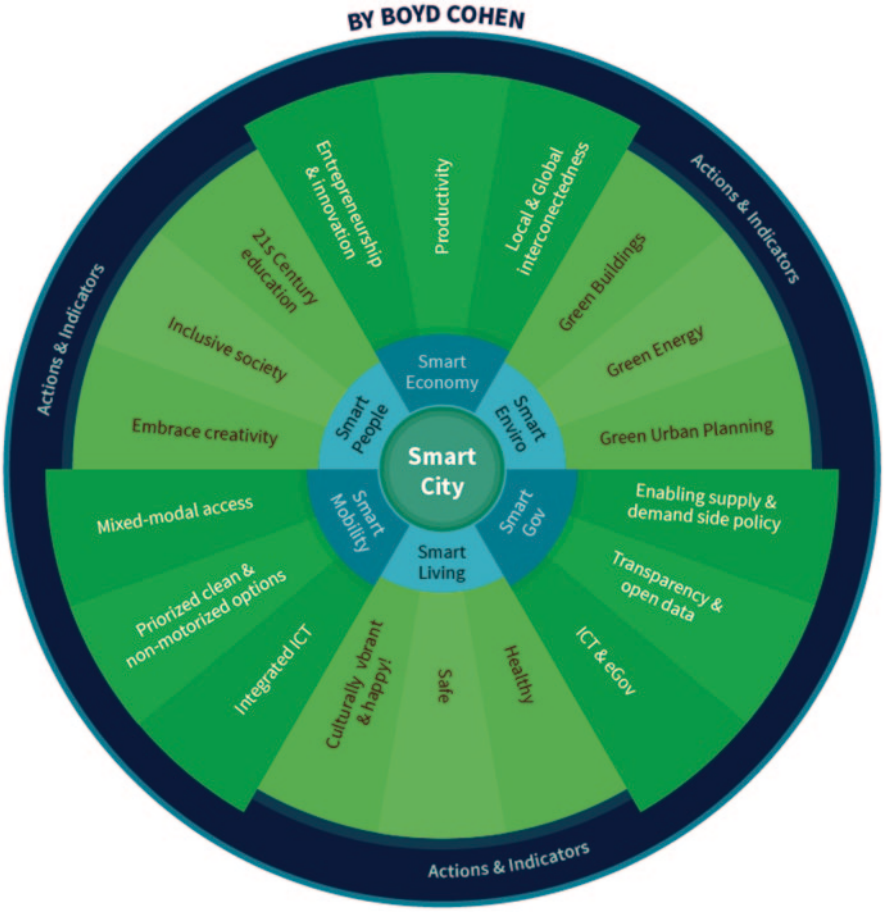

Fig. 1 Smart city wheel (Cohen 2012)

This model has been used as a basis for many studies and papers, one of them being the smart cities wheel published by researcher Boyd Cohen in the publication Fast Company (Cohen 2012) as represented in Fig. 1.

Nevertheless, the new smart city movement has burst onto the urban management scene with unprecedented strength, appearing in the agenda of urban managers as a key strategic tool for the development of cities. The reasons behind this success may well be explained by the following:

- *Unprecedented demographic shift:* For the first time in human history, in 2007 more than 50% of the world's population lived in cities (United Nations 2004; Alusi et al. 2011). This proportion has gone up and will continue going up as years goes by. Since urban resources availability will remain unaltered and scarce, cities are forced to adopt smart innovative solutions to manage them more efficiently.

- *Environment sustainability:* According to UN Habitat, cities are responsible for the consumption of 75 % of the energy produced in the world and 80 % of greenhouse gas emissions. Therefore, cities have to work on finding smart solutions to guarantee the sustainability of urban green spaces and protect natural resources.
- *New service management responsibilities—from skeletons and skins to electronic nervous systems* (Mitchell and Casalegno 2008): Whereas in the past, cities' responsibilities were focused on managing basic networks (such as sewage or electricity networks), information technologies have brought the need of managing new electronic networks to support communication systems and provide connectivity. This situation is forcing cities to change their work paradigm or, in other words, to evolve from working harder to working smarter.
- *Economic crisis:* Lower budgets in cities and the need to adapt to an atmosphere of restrictions and constant cuts that will remain critical for many years, claim for wise solutions searching for the maintenance and sustainability of a constantly growing number of services.
- *Change of social paradigm:* The rise of social technologies going in parallel with a deep global crisis, not only at economical level but also touching the roots of society values, has encompassed the growing demand of citizens to actively participate in the decisions that affect their life in cities. The matureness of social networks that allow the immediate interaction between users and the evolution of data mining and visualization tools, that provide the availability of information in real-time, are pushing for the empowerment of citizens to take personal responsibility on the creation and design of services and decision-making processes directly affecting them, a process also known as cocreation or co-participation.

The smart cities and their promising associated changes are bringing new opportunities for city managers and citizens that are called to take advantage of this enthusiastic will and vision. First, the movement is an invaluable opportunity to engage with empowered citizens to act on commonly shared urban problems using the advantages that new social technologies bring. Second, active citizens willing to actively participate in city projects could contribute to create urban initiatives based on reusable open standards closer to citizens' needs and therefore ensuring a wider acceptance. Third and finally, the movement can be used to consolidate a change in the model and values of the interactions between citizens and their local authorities, a change based on the common work of public services (Rifkin 2011).

3 Open Government: A Social Paradigm

Improvement of government and public administrations, defined by Pollitt and Bouckaert (2004) as changes to the structures and processes of public sector organizations with the objective of improving their overall performance, has been a topic profusely researched by academia since several decades ago, as it will be quickly reviewed in the first paragraphs of this section.

In mid-1930s, Gulick and Urwick presented the POSDCORB method (which stands for planning, organizing, staffing, directing, coordinating, reporting and budgeting) representing a new approach to the internal organization of governments based on the management theory of Henri Fayol. The main—and "new"—ingredient in the POSDCORB method was the "Human Factor" that happens to be implicit in any organization and what differentiates one organization from another. Motivation, leadership, communication, interpersonal relations were the new contributions of this method. Its main objective was to change the way governments acted to be more efficient based on this human factor implied in any public organization.

The following decades brought several criticism to this model, criticism that culminated in the beginning of the 1990s with the new public management (NPM) paradigm first introduced by Hood (Hood 1991) and then by Osborne and Gaebler (Osborne and Gaebler 1992). The main goal was the same: to improve government action; in this case using the influence of the strong entrepreneurial spirit accompanied with required political support. It coincided with Al Gore (then VP of Clinton's Administration) (1993) that proclaimed the need for "a government that works better and costs less." Its main attributes went from talking about citizens to talking about customers and outsourcing of public services. In addition, market mechanisms were introduced in the management of public services and instruments to control expenditure were strengthened, among other measures to simplify (reduce) the administration.

As noted by Ortiz (2008) a couple of decades after the appearance of NPM we were talking about the same or similar things. Ramirez-Alujas (2011) also criticizes NPM "...has left a trail of models, differing experiences and evaluations as applicable noticeable signs of exhaustion and facing new realities that press for the recovery of the audience beyond efficientist instrumental logic…" (free translation).

In addition, in the beginning of 2011, the World Economic Forum published the paper "The Future of Government: Lessons Learned from around the World" (WEM 2011). The main conclusion of this document was the need to transform governments into organizations following what they call FAST (which stands for flatter, agile, streamlined, and tech-enabled) approach. Some of the ideas provided by this paper were the need to decrease the distance between government and citizen using information technologies such as social networks or mobile devices. This technology could also be used to provide and exchange useful information to citizens in the deliberations and decision-making processes. Another idea was to facilitate decision making. Using information technologies greatly facilitate decision making with citizenship and/or internally in government. In addition, thanks to technology, data needed to inform decision-makers can be opened and offered for its reuse, a movement known as open data. Finally, another idea was to collaborate within and between governments and citizens in order to encourage the exchange of ideas, solutions, and provide economies of scale.

In short, according to this World Economic Forum's paper, twenty-first century governments must become work-based FAST organizations in a network of planar,

agile, and flexible structures, with a high use of technology and open to the entire society.

Therefore, without losing all the accumulated knowledge of decades and decades of "improvement" in public administration, it is necessary to formulate a new paradigm that takes into account the traditional bureaucratic sediment, based on fairness and enforcement, and the concern for efficiency and economy advocated by the NPM and the need to go a step further to take into account the needs, values, models specific to the Network Society (Castells 2000), a concept that gathers all the changes occurring at political, cultural, economical, and social level thanks to the spread of information and communication technologies. Therefore, in this new paradigm we must add these "new values" that ultimately talk about transparency, participation, accountability, public innovation, conversation, hacker ethic (Himanen 2002), etc.

Is, thus, Open Government this new paradigm?

Although there is an Open Government Partnership (and its declaration), currently there is still no clear consensus on which is the exact definition of open government (even though there are initiatives such as open government standards).

A proposed definition of Open Government by Garriga (2012) is that open government is the paradigm in which government and public (and the rest of society) are at the same level, they interact face to face, as opposed to "traditional" government where the government is "above" citizenship, deciding upon the policies and services to be performed without consulting (beyond holding elections every 4–5 years).

This definition is, however, more graphical than operational. Another more appropriate definition is that of Ramírez-Alujas (Garriga 2012) is manifested in these principles:

a. "improve levels of transparency and access to information by opening public data (to exercise social control and accountability), and reuse of public sector information (to promote innovation and economic development);
b. facilitate participation of citizens in the design and implementation of public policies (and influence decision-making);
c. encourage the creation of opportunities for collaboration between the various stakeholders, particularly among government, civil society and the private sector to co-design and/ or co-produce public value."

Under this new paradigm lies the central idea of involving citizens (and the rest of society) in public actions, making these not anymore an exclusivity of public administrations. Embracing the concept of open government we are trying to make government work better with the involvement of the whole society and reducing the budgets.

Therefore, the answer of the previous question is yes, Open Government is the new paradigm to rule our governments in the Network Society.

4 Open Smart Cities: The City of the Future Needs Open Governments

Smart Citizens for Open Governments

According to the popular 6-axes definition of smart cities provided by the Vienna University of Technology, smart citizens and smart government are two of the axes upon which effort should be put in order to achieve a complete development of smart cities. These two axes represent two clear links between the two concepts discussed in this chapter: smart cities and open government.

Firstly, as seen in the previous sections, open governments must necessarily count the deep implication of highly motivated and participative citizens that are knocking on the doors of their closest elected officials. Those are the smart citizens, citizens asking for their space in decision-making processes in the city and are equipped and well-prepared to use social technologies to directly connect in real-time with each other and take the pulse of the city.

In addition, smart citizens will be those who are ready to take an active part in the life of the city and are aging to learn more about not only what is being done with public resources but also to take active part and monitor their expenditure. Smart citizens are empowered by a massive use of social information technologies, and will demand for transparency and real-time communication with their city officials and their environment, and are keen on using these tools to improve their quality of life. Furthermore, smart citizens will ask for the publication of public data in open formats that they can reuse to track progress of their city performance (open data). These are the open smart citizens.

Secondly, smart governments will be those that clearly visualize and understand the new paradigm change when talking about the communication between citizens and their city managers; being more direct, without any submission. Smart governments will also be those that understand that information technologies can be of great use to work towards the sustainability and efficiency of public services and the economic progress of cities. Moreover, smart governments will have to be prepared to attend the needs of a new type of active citizen, thirsty of information who claims for a more direct and real contact with its urban space and those who manage it and who will ask for real-time data, to monitor and evaluate the performance of the city in open standards. Smart governments will be and must be open, only in this way they can make easier the data and services interoperability among other governments and, in fact, among anything (Jiménez 2013). Smart governments will be open to increase the return of investment, the efficiency, of governments (Howard 2013). These smart governments are, in fact, open governments.

Hence, if we want to achieve a real smart city we need smart citizens and open governments, it is unattainable without them.

Success Cases

The following cases are examples of initiatives that, in any sense, are involved in smart cities and open government concepts. In each case there is a brief description and the reason that justifies why it is listed here:

Adopt-a-Hydrant http://adoptahydrant.org/

Adopt-a-Hydrant is an initiative of the city of Boston to encourage residents to shovel out snowed-in fire hydrants. Its website allows citizens to "adopt" a fire hydrant, or state that you intend to help shovel that fire hydrant out if it gets covered by snow.

The idea is simple (but powerful): Every year it snows a lot in Boston producing several problems. One of them is that specific emergency tools are inoperative because they have been buried by the snow. The city council had to spend a lot of money to maintain these hydrants in proper conditions, but with this citizen engagement tool the budget of this maintenance has dropped dramatically. Every "adopter" must keep its hydrant in good conditions, without snow, and if a problem is detected, it must be directly reported to the council.

This is another example of a public service whose delivery is based on cooperation between the city council and citizenship with the help of technology.

Awi.net http://www.smartcityviladecans.com

Awi.net is an interesting smart city project that provides several services to its citizens in Viladecans, a large town (60,000 inhabitants) close to Barcelona, Spain.

In this case, young people help elderly people in order to reduce the digital gap. Awi.net is a project promoted by the city council, where the main role is played by youngsters, for the first time in their lives, who become teachers to older generations not so used to manage new technologies as them.

This is a good example of a tech-enabled civic engagement initiative that is co-created by both the local government and their citizens giving solution to a public interest service: improvement of digital education.

iCity Project http://icityproject.eu/

As we mentioned before, nowadays governments need to do more with less. In this sense, governments are focused on providing public services (services that governments are obliged to deliver because they are entitled to by law). However, there are other kinds of services of public interest but the governments are not legally forced to deliver. In an environment of shrinking budgets, governments tend to set these types of services apart.

iCity is a European smart city co-funded project aimed at solving this problem. Its main goal is to empower third parties (private companies, NGOs, neighborhood associations, etc) to deliver services of public interest, following a co-creation approach. To do so, the project will open or grant access to public IT infrastructures at street level in the four participating cities: Barcelona, London, Genoa, and Bologna (and provide an iCity platform to help these third parties in order to develop

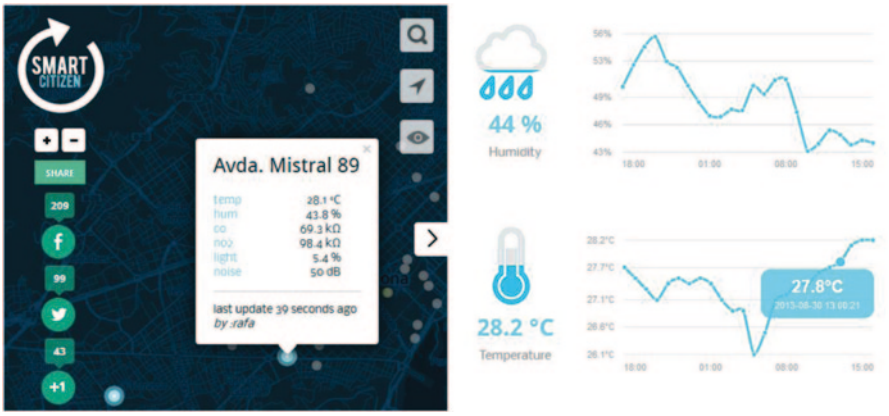

Fig. 2 Snapshot of smart citizens platform

services). Examples of these opened infrastructures could be WiFi Network, Park Register Platform, Complaints Platform, Sensors Platform, etc.

In this project the involved governments in this project (the councils of the four cities mentioned before) have opened their IT infrastructures in order to provide more public interested services made by citizens themselves, therefore, this case is a mix of openness, technology, economic boost, and co-creation.

Lisbon's participated budget http://www.lisboaparticipa.pt/

Lisboa Participa is a platform that gathers all municipal participation initiatives of the city of Lisbon. One of the most prominent crowd-sourcing initiatives is the participated budget through which any citizen can submit online proposals for projects in the city. The proposed projects are voted online by other citizens and the most voted cases are finally included in the municipal annual budget.

This is a good example of citizen's engaging in the decision-making processes traditionally reserved for elected officials only with the help of technology.

Smart Citizen http://smartcitizen.me

Smart citizen is a crowd-funded project started in Fab Lab Barcelona at the Institute for Advanced Architecture of Catalonia that consists on the manufacturing of Arduino-based boards equipped with environmental sensors and connectivity that are placed in citizens' homes. These boards send the real-time information on variables such as humidity, noise, temperature, or pollution to a platform that gathers and visualizes these data through its own website (Fig. 2). Ultimately, its objective is to serve as a node for building productive and open indicators, and distributed tools, and thereafter the collective construction of the city for its own inhabitants.

Smart citizen is a good example of how citizens can directly participate in the creation of a new service from scratch that directly connects people with their environment and city to create more effective and optimized relationships between resources, technology, communities, services, and events in the urban environment.

At the time of writing this chapter, some local governments have expressed their interest in the project to combine the smart citizen data with official public data. Thus, this is another co-creation case made by citizens that are engaged in public affairs (with the help of the technology) and governments with an open vision.

5 Conclusion

Throughout this chapter, we have seen how different tendencies like the open government and the smart city movement, at first sight not sharing a clear connection, have a strong link when it comes to citizens' empowerment and implication in urban management decisions and delivery of the services of public interest.

In the first sections, we have seen how smart city approach is based on a transversal transformational approach that uses technology as an enabler of change. However, the role of IT-empowered citizens in the construction of the smart citizens should not be minimized. The deep economic and social crisis in which we are sinking has brought a new model of smart citizen that claims for transparency and decision capability in the urban space management. Smart citizens happen also to be well equipped with IT tools and savvy in using them to track, collect, visualize, and share urban data in real time, therefore asking for the availability of this public data in open standardized and reusable formats.

Open governments are the solution for local governments to give an accurate and proactive answer to the smart citizens and their demands.

The last section contains some good examples of open-government solutions used in cities that are including their solutions in their smart city approaches. There are, of course, many others that due to space restrictions could not be commented in this chapter.

For all the above, smart city strategies being currently developed in cities are called to introduce open-government elements in their approaches. There will be no smart cities without smart citizens and there will be no smart cities without open, transparent, and collaborative governments.

References

Alusi, A., Eccles, R. G., Edmondson, A. C., Zuzul, T., & Harvard Business School. (2011). *Sustainable cities: Oxymoron or the shape of the future?* Boston: Harvard Business School.

Burkhalter, L., & Castells, M. (2009). "*Beyond the crisis: Towards a new urban paradigm*". Paper presented at the 4th International Conference of the International Forum on Urbanism (IFoU), Amsterdam/Delft.

Calabrese, F., Kloeckl, K. & Ratti, C. (2008). "Wikicity: Real-Time Location-Sensitive Tools for the City". IN Foth, M. (Ed.) *Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City*. Hershey PA, IGI Global.

Castells, M. (2000). *The rise of the network society, the information age: Economy, society and culture*. (2nd ed.). New York: Oxford University Press.

Cottica, A. (2012). Cosa vuol dire "smart" in smart city?. Che futuro!. http://www.chefuturo.it/2012/10/cosa-vuol-dire-smart-in-smart-city. Accessed 31 March 2013.

Cohen, B. (2012). "What exactly is a Smart City?". Fast Company. http://www.fastcoexist.com/1680538/what-exactly-is-a-smart-city. Accessed 30 April 2013.

Garriga, M. (2012). ¿Se está fomentando el Gobierno Abierto desde las instituciones europeas? In R-A. Hofmann & P. Bojórquez (Eds.), *La Promesa del Gobierno Abierto*. http://www.lapromesadelgobiernoabierto.info. Accessed 30 April 2013.

Giffinger, R., Fertner, C., Kramar, H., Kasalek, R., Pichler-Milanovic, N., & Meijers, E. (2007). "Smart cities: Ranking of European medium-sized cities" Vienna Centre of Regional Science. http://www.smart-cities.eu. Accessed 30 April 2013.

Giffinger, R., & Gudrun, H. (2011). Smart cities ranking: An effective instrument for the positioning of the cities? *ACE: Architecture, City and Environment, 4*(12), 7–26. (25 Feb 2010).

Himanen, P. (2002). *The hacker ethic: A radical approach to the philosophy of business*. New York: Random House Trade Paperbacks. (Reprint edition).

Hollands, R. (2008). Will the real smart city please stand up? *City, 12*(3), 303–320.

Hood, C. (1991). A public management for all seasons? *Public Administration, 69,* 3–19.

Howard, A. (2013). What is the return on investment (ROI) of Open Government? http://e-pluribusunum.com/2013/07/19/what-is-the-return-on-investment-roi-of-open-government. Accessed 25 July 2013.

Jiménez, C. E. (2013). De 'Open Government' a 'Smart Governance'. Una perspectiva estratégica desde el Back Office. http://www.slideshare.net/estratic/ieee-open-government-and-smart-cities-jimenez-urv2013. Accessed 20 June 2013.

Komninos, N. (2009). Intelligent cities: Towards interactive and global innovation environments. *International Journal of Innovation and Regional Development, 1*(4), 337–355.

Mitchell, W. J., & Casalegno, F. (Eds.). (2008). Connected sustainable cities. http://connectedsustainablecities.org. Accessed 30 April 2013.

Open Goverment Standards web site. (2013). Draft of Open Government Standards/Principles. http://www.opengovstandards.org/?page_id=60. Accessed 1 May 2013.

Ortiz, I. (2008). Open Government: El concepto. http://eadminblog.net/2008/06/24/open-government-el-concepto/#more-1473. Accessed 30 April 2013.

Osborne, D., & Gaebler, T. (1992). *Reinventing Government*. Boston: Addison-Wesley Publications Co.

Pollitt, C., & Bouckaert, G. (2004). *Public Management Reform, A Comparative Analysis*. (2nd Ed.). New York: Oxford University Press.

Ramírez-Alujas, A. (2011). "Gobierno Abierto, Servicios Públicos 2.0 y Ciudadanía Digital: Notas para una nueva agenda de modernización de la gestión pública en Iberoamérica". Grupo de Investigación en Gobierno, Administración y Políticas Públicas, GIGAPP. Instituto Universitario de Investigación Ortega y Gasset.

Ramírez-Alujas, A., & Villoria, M. (2012). Innovaciones de raíz democrática en la Administración: ¿Recuperando legitimidad ante la crisis? *Ekonomiaz, 80*. http://www1.euskadi.net/ekonomiaz/taula4_c.apl?REG=1211. Accessed 1 May 2013.

Rifkin, J. (2011). *The Third Industrial Revolution*. (1st Ed.). London: Palgrave Macmillan.

Sassen, S. (2009). Cities in today's global age. *SAIS Review, 29*(1), 3–34.

Schaffers, H., Komninos, N., Pallot, M., Trousse, B., Nilsson, M., & Oliveira, A. (2011). Smart cities and the future internet: Towards cooperation frameworks for open innovation. *The Future Internet,* 431–446. Springer Berlin Heidelberg publishers.

United Nations. (2004). World Population to 2300. http://www.un.org/esa/population/publications/longrange2/WorldPop2300final.pdf. Accessed 1 April 2013.

World Economic Forum, WEM. (2011). The Future of Government. http://www.weforum.org/reports/future-government. Accessed 1 May 2013.

Yovanof, G. S., & Hazapis, G. N. (2009). An architectural framework and enabling wireless technologies for digital cities & intelligent urban environments. *Wireless Personal Communications, 49*(3), 445–463.