17 “Open Data and their Impact on Smart Cities”

Georgios KOLOKYTHAS
BSc in Business Administration
Hellenic Open University

17.1 Abstract

As an intelligent being human never ceased seeking for the means that could improve his wellbeing. To this aim his powerful companion was the technology of each era and especially after the industrial revolution, the technological factors were rapidly and endlessly growing. Through the recent years of the economic crisis the term of a smart city became again to the surface as a constant source of improvement of wellbeing. Major contributor in the expansion role of the smart city project is the citizen who is actively engaged via the open data. Therefore the purpose of this paper is to identify the need of this active involvement by gazing upon the characteristics of the smart city and some possible actions that can lead to its development. Furthermore some characteristic examples of applications as well as some cases of successful implementation strategies are going to be examined.

17.2 Introduction

This digital era we live in, is beyond doubt characterized by the excessive use of the available technology in our everyday activities. Especially Information and Communication Technologies, hence ICTs, are the leaders in this field. Main purpose of this paper is to identify the role of ICTs in the development of smart cities while analyzing the most crucial characteristics of such initiatives.

The term smart city is not a new one and in fact there are a lot of theories contributing their knowledge within this context. No matter how different one definition can be from the other they all tend to recognize that a smart city is one that uses effectively its digital technologies so as to enhance performance and wellbeing of its citizens, while reducing costs and resource consumption. Furthermore they stress that it is considered important for the development of a smart city the active engagement of the citizens.

This involvement can be maintained by sharing necessary information about the project of the smart city development and clarifying their role in the whole process. And here comes the term of open data, the second important terminology of this paper. So open data is considered a certain type of data that is freely available to anyone, in order to use and republish as they wish, without any copyright restrictions or any other mechanisms of control.

It becomes clear that the citizens must be among the recipients of the content of the open data, in order to be actively involved in the process of the smart city development. After examining the major characteristics of the smart cities and mentioning some possible actions that can be taken, we are going to analyze a strategic example of such an initiative, identifying at the end the success factors of such projects. Then some aiding applications are going to be studied and a small

classification of the smartest European capital cities is going to be presented. Finally the overall impact and the benefits to the society are going to be presented.

17.3 Smart city characteristics

Many efforts have been done by the researchers of smart city projects in identifying the general attributes that define the term smart city. As it is was obvious a great number of these attributes occurred making difficult the shorting process. Therefore all these attributes were classified into basic groups forming this way the six general categories of the characteristics of smart city initiatives. These categories are smart economy, smart people, smart governance, smart mobility, smart environment and smart living and they all interact with each other as shows the figure below.

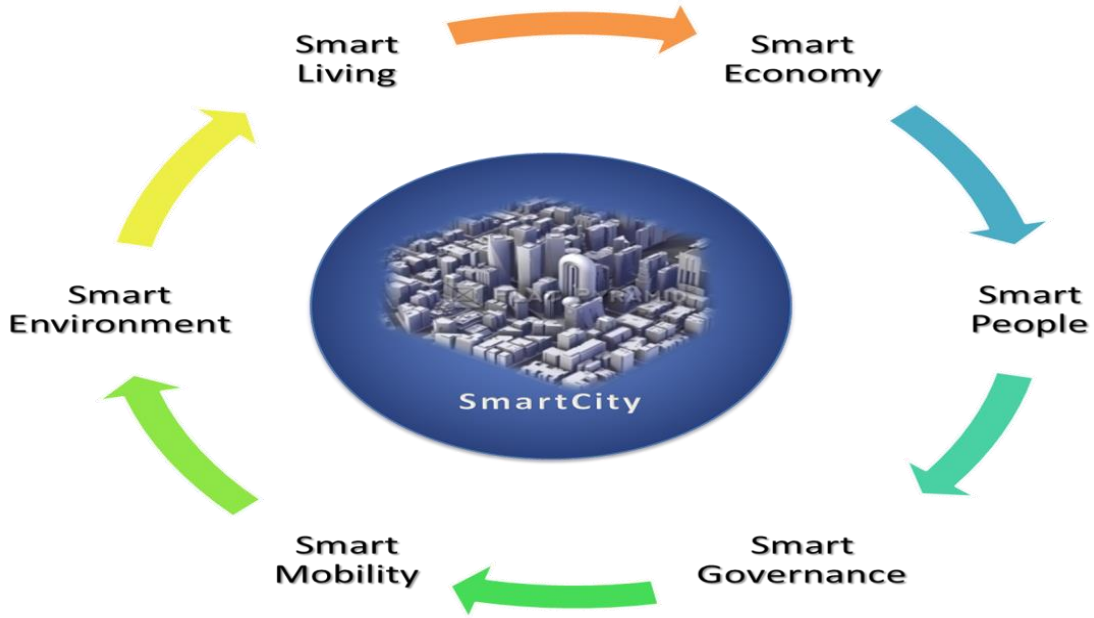

Figure 1: Smart City Characteristics

A smart economy is one with a constant appearance of innovative spirit and entrepreneurship, which leads to the establishment of a strong economic image and trademarks that increase the productivity level. Furthermore the flexibility of the labor market as well as the international embeddedness offer to the city the ability to transform so as to cope with the challenges of the demanding environment.
Smart people are not only characterized by their qualification level, but also by their affinity to lifelong learning without setting any barriers to social and ethnical plurality. Such people are flexible, creative and open minded to any new and innovative ideas, while at the same time they are willing to practice these ideas through their participation in public life.
Smart governance is actually formulated by the level of participation in the smart city development and especially participation in decision-making and the organizing of public and social services. The most important thing is that the governance must be transparent and with clear political strategies and perspectives.
Well planned transport and ICT define the level of smart mobility. The sure thing is that the city must be accessible both locally and internationally and the availability of

proper forms of ICT infrastructure will lead to the formation of sustainable, innovative and safe transport systems.
An environment with attractive natural conditions and minimized pollution factors is characterized as a smart environment. Cities that have such kind of an environment contribute a lot to the environmental protection policies through a proper sustainable resource management system.
Finally well-established cultural facilities and proper housing quality that enhance health conditions and individual safety are the major components of smart living. In additional suitable education and touristic facilities together with social cohesion lead to increased touristic attractivity.
Analyzing a bit more the above-mentioned characteristics someone can easily identify possible actions that can promote the smart identity of a city.

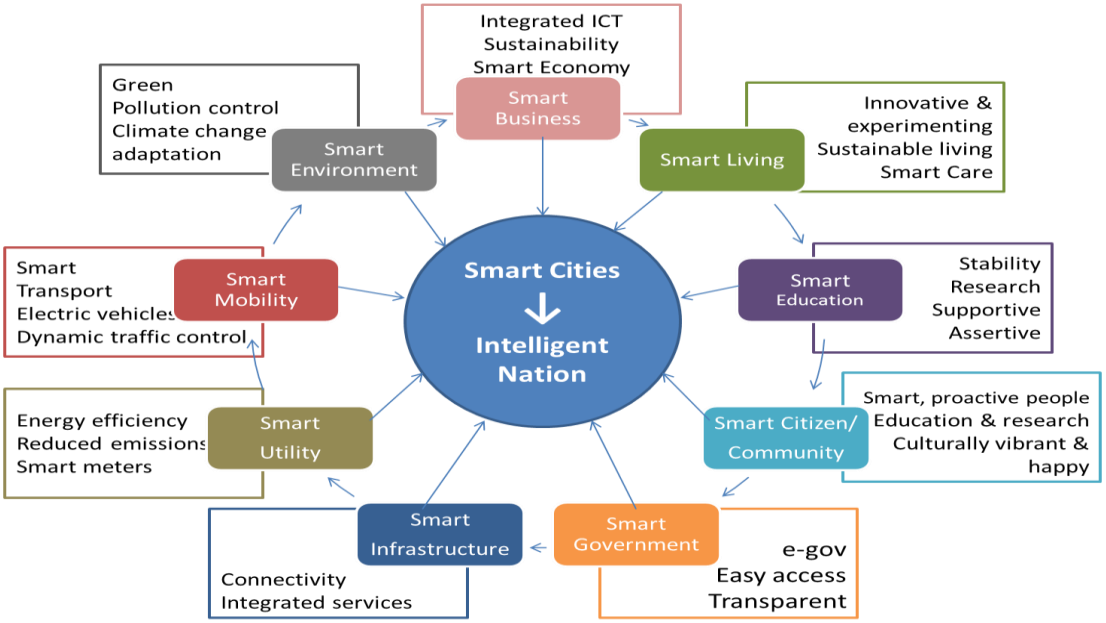

Figure 2: Possible actions that promote the smart identity

For example a city that cares for its citizens and their wellbeing can promote its smart environment by growing the spaces of green and taking measures in order to control pollution as well as being adaptive to the climate change.

17.4 Smart city strategy (Intelligent Thessaloniki)

Smart city initiatives need to increase public awareness in order to be successful. This role has been undertaken by the existing ICTs of the cities. An example of such implementation comes from Thessaloniki in Northern Greece, where a remarkable effort is taking place. The project is called “Intelligent Thessaloniki” and it involves the implementation of ICTs in five major districts of innovation and entrepreneurship. Through these digital points there is a continuous exchange of information and ideas that promote more improvements in the field of entrepreneurship and innovation. For instance wireless broadband networks are being installed within intelligent environments that combined with sensors for real-time information processing and alerts enhance the participation of both businesses and individuals to the network communities. More specifically the implemented ICTs in the harbor area assist to the

competitiveness enhancement of various port operations. The establishments of such technologies within the central business district facilitate accessibility and mobility matters. At the University Campus these environments offer opportunities for further research as well as facilitating the collaboration of academic and private sector. Finally the existence of smart environments within Eastern technology district aid to the broadening of provision of online technology services for any kind of business activity.

17.5 Success factors of smart city initiatives

Smart city initiatives can sometimes increase the jealousness of some cities and therefore promote the competition among them for the more successful strategy. However, conceiving the essence of such projects as means of competition and not as ways of improving wellbeing, guarantees the unsuccessful effort in carrying out such project. Comparing the smart city project to a business will help us understand better the factors that affect the success of this kind of initiatives. So the factors that consist the criteria of a successful smart city implementation are:

- Management and organization: It is considered the spine of the project that takes care to ensure that the ICTs are going to be efficiently and effectively for the improvement of citizens' wellbeing
- Technology: ICTs are considered the key component of such projects and if all the parameters are taken under consideration, like resource availability, capacity and institutional willingness, the route to success is obtained
- Governance: It involves the well-established cooperation of the various stakeholders of the smart city project, an action that is enhanced by the proper use of the ICTs
- Policy context: It is actually a set of rules and directions for the proper use of ICTs in order to assist to the development of the smart character of the city
- People and communities: A critical point of understanding how projects like these should work is not only the individual citizen with his needs, but also the organized community they participate in
- Economy: The better the economy of a city is organized, the best way it will serve to the purpose of development of the smart character of the city
- Built infrastructure: The availability of proper network infrastructure is considered crucial to the successful implementation of ICTs and thus the successful way of the smart city initiative
- Natural environment: The better exploitation of the natural resources of the city as well as their sustainability ensure the improvement of wellbeing and therefore the success of the project.

17.6 European initiative on smart cities

There is a European initiative that supports the development of smart cities and its duration limit is the year 2020 when it will cease to count. The purpose of the initiative is to support cities and regions that wish to apply smart city projects in an effort to decrease greenhouse gas emissions by 40%, through the use of renewable forms of energy. Technology plays a crucial part with the means of lowering the level of

carbon outcomes both in building premises as well as traffic network. The initiative includes possible actions in three major fields, buildings, energy networks and transport.
To accompany and reinforce this initiative the European Commission draw a directorate that supports the development of smart city initiatives within the European Union. The directorate is entitled “Mapping Smart Cities in the EU” and it covers aspects from the fields of economic and monetary affairs, employment and social affairs, environment, public health and food safety, industry, research and energy and finally internal market and consumer protection. Within this context it offers a series of possible solutions to any aspect of the European countries, so as to encourage any initiative with purpose to promote the smart character of the cities.
In addition it outlines a number of recommendations that assist such initiatives as the above mentioned ones. The list of recommendations includes five thematic categories related to:

- Understanding Smart Cities: research and evaluation
- Designing smart city initiatives and strategies
- Smart City governance
- Supporting the development of Smart Cities
- From Smart Cities to a Smarter Europe: replication, scaling and ecosystem seeding

All the recommendations that are included in the five above mentioned pathways are considered of equal importance to the formulation and growth of smart city projects around Europe. However, the ones that really motivate cities to engage to the chase of the smart character, are these described in the section “supporting the development of smart cities”, where initially public authorities at all levels are instructed to use demand-side measures to stimulate demand for city-based smart solutions and also regulatory and procurement authorities are directed to encourage Smart City initiatives by selective use of regulatory forbearance.

17.7 Smart City platforms

Synchronized with the directorate of the European initiative on smart cities the European Agenda contains a digital platform able to support any initiative that is generated within European Union. It is actually an application that offers policies and projects for the proper utilization of ICTs for the environment, mobility, health, public services, trust and reliance. In reality it works as an aiding tool for smart cities initiatives around Europe.
Another characteristic application of a European city, which actually is providing the open data to its stakeholders, is “Amsterdam Smart City” that operates as an innovation platform and it motivates businesses, residents, the municipality and knowledge institutions to suggest and apply innovative ideas and solutions for urban issues.
Also from the other side of the Atlantic Ocean a leading company in the computing technology sector IBM has introduced a series of applications that can be used as guiding tools for various actions that enhance the smart character of a city, with the most characteristic ones being IBM water management center, energy optimization and IBM transportation management center.

All these applications aim to transform the attributes that promote the smartness of a city to open data, in order to be shared among the major stakeholders of such initiatives, so as for the project of smart city development to be successful. In this way public awareness is achieved and makes the citizens main contributors and components of this development process, something that makes these applications a constant source of ideas and innovation.

17.8 Smart European cities classification

Before we proceed with any form of shortage of smart city initiatives we should note that there is no ultimate classification list for the smart city projects. And this is happening because cities can be characterized as smart if only they fulfill some of the criteria, as criteria being the smart city characteristics, with the cases fulfilling the full list of criteria containing only some exceptional few examples. For instance some cities may have constructed an extensive network of bicycle routes, so as to cope with the mobility section, others may have exploited in the best way the renewable forms of energy, while others may have developed a combination of these criteria. Within this context a kind of classification list edited by Boyd Cohen, which consists mainly of European capital cities, is analyzed below:

1. Copenhagen:
The capital of Denmark has been awarded as European Green Capital for the year 2014, due to its lowest carbon footprint per capita achieved through energy efficiency and renewable sources projects combined with the impressive cycling rates at the approximate percentage of 40%

2. Amsterdam:
This city does not only have amazing cycling rates with more than 10.000 bicycles moving daily around the city, but it also has developed the Amsterdam Smart City collaboration that has supported more than 40 smart city projects until now

3. Vienna:
Vienna is well known as a provider of high quality of life for many years mainly through some innovative projects as the “Citizen Solar Power Plant”, as well as the testing of a range of electric mobility solutions and the forbiddance of residents of specific areas to own a personal vehicle. But the most impressive project is the renovation of a former slaughterhouse district into an innovation district focused on media science and technology

4. Barcelona:
Barcelona is a respectively newly-constructed city which combines modern architecture with lively streets and it is supporting not only its own initiatives but also international ones, like the Smart Cities Expo World Congress held in its premises. Furthermore it was the first city exploiting e-mobility in a huge innovation district consisting a mixture of smart urban planning and entrepreneurial innovation

5. Paris:
The city has invested a lot on shared mobility with the Velib bikesharing network that extends throughout the whole city leading to a 5% decrease of vehicle congestion. In addition the Autolib carsharing project is an example to be followed by other cities as

well. Also Paris's entrepreneurial ecosystem was characterized as the 11th best in the world

6. Stockholm:
With the 40% of its land mass dedicated to green space, Stockholm was rated second in Siemens Green City Index and it was awarded in 2010 as EU Green Capital. The city's extensive metro network figures the highest per capita users leading to air pollution decrease and meeting the viable levels of air quality being set by the World Health Organization.

7. London:
The British capital holds the 7th best position in the world in entrepreneurial ecosystems, while with its congestion zone gains income and less traffic. Also the Olympic Games was the perfect opportunity for London to dedicate more to the greener character, with the characteristic example of the Royal Docks one of the greenest and smartest buildings in Europe

8. Hamburg:
Besides the award as a European Green Capital in 2011 the city has undertaken the largest urban regeneration project of Europe HafenCity

9. Berlin:
The city attracts and retains the creative class leading to urban renewal and economic growth through innovation and entrepreneurship and by supporting a vibrant cultural scene.

10. Helsinki:
An exceptional position among the cities thriving in the Smart Government arena is Helsinki with its more than 1.000 open datasets enabling active citizens' engagement through hackathons. Besides hosting Open Knowledge Festival in 2012, the city also employs its own smart city project Forum Virium Smart City Project hopping to improve quality of life.

17.9 Expected impacts

All the initiatives on smart cities as projects are supposed to have a number of outcomes, where in this as an outcome is considered the impact that this project will have.
Generally three are the sectors who are affected the most, science, technology and competitiveness as well as society. In the matter of science a whole new field is generated with the best exploitation of the digital means, while applying urban simulation leads to the evolution of smart city models.
And especially through the developments in data mining techniques new approaches to mobility and communication are discovered. Through research cities have the chance to evolve their technological skills and therefore become more competitive and desire to achieve a better position in the smartness scale.
And of course all of the above appeal to the society making it stronger with the feedback that it receives and able to cope with actions that promote the smart character of the city.

17.10 Conclusion

It is important for the smart city projects to engage actively their citizens, who are among the major stakeholders of the smart city development process, in order to be considered successful. And this active engagement involves the sharing of information through open data. In this way citizens feel that they truly contribute to the development process of the smart city and they are able to enjoy the benefits deriving from this. Some of the most characteristic benefits are:

- Increase of energy efficiency and acceptance of renewable forms of energy
- Smart police services generate a crime decrease rate by 25%
- Smart environment systems provide better natural resource management
- Implementation of smart traffic systems improve air quality, reduce traffic jams and increase the use of public transport
- Availability of smart governance and smart living services improve residents' community participation and quality of life.

17.11 References

http://en.wikipedia.org/wiki/Smart_city

http://en.wikipedia.org/wiki/Open_data

http://amsterdamsmartcity.com/?lang=en

http://setis.ec.europa.eu/set-plan-implementation/technology-roadmaps/european-initiative-smart-cities

http://www.ibm.com/smarterplanet/us/en/smarter_cities/overview/

http://www.urenio.org/2015/02/02/smart-city-strategy-intelligent-thessaloniki-greece/

http://www.fastcoexist.com/3024721/the-10-smartest-cities-in-europe

https://ec.europa.eu/digital-agenda/en/life-and-work

http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf

http://www.powerhousegrowers.com/smart-cities-urban-planning-meets-technology/

Michael Batty et al, Smart Cities of the Future, UCL Center for Advanced Spatial Analysis, October 2012

Hafedh Chourabi et al, Understanding Smart Cities: An Integrative Framework, 45th Hawaii International Conference on System Sciences, 2012