Smart City or Smurfs City

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Abstract. Very often the concept of smart city is strongly related to the widespread of mobile applications, completely forgetting the essence of a city with its connected problems. The real challenge in future years will be the huge population migration from rural areas to cities. It is fundamental to manage this phenomenon with clever approaches in order to save money and environment. This paper develops some considerations on these aspects trying to lead the discussion in a correct direction.

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

1 Introduction

Nowadays an approach combining in a narrow way the concept of Smart City to the sudden spread of electronic devices is very common. There is a deep conviction that the implementation of a Smart City is simply an exasperated use of applications for Smartphone or tablet.

Often the attention is exclusively focused on mobile applications forgetting that there is also a city. These approaches, despite having a certain degree of usefulness, when completely disconnected from the context, especially from the city in its essence, can produce a waste of resources. When complex computer systems are proposed it is crucial to ask "are they really useful to the city?".

This common belief evokes urban scenarios inspired by Ridley Scott's movie "Blade Runner". The idea of a city with many vendors should lead to a vision of cities similar to a Pioneer advertisement[1] of late '80s, very popular in Italy, where each person was "wearing" one or more televisions that constituted a barrier to the outside world determining a robot behaviour. This approach to smart cities will lead to a "flood" of electronic devices in our cities connected to improbable goals to be achieved.

If a city has a structural mobility problem it is quite impossible to solve it only by means of a smartphone. The term "smart" is today very popular and is adopted also in common language and in all kind of advertisement. In order to describe the adoption

[1] Pioneer advertisement Pioneer Blue velvet.mpg http://youtu.be/5rMI_aVYtR0

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of this term in everyday speaking it could be useful to adopt a parallelism with Smurfs cartoons.

Everything is smart such as in the Smurf world we have Smurf-Forest, Smurf-berry Smurf-strawberries, etc. It is very common in participation processes, smart participation, to find an interview to the major of a city or to the director of a journal called smart interview or to find the term smart questionnaire for paper form distributed to a sample of citizens.

Very often the concept of smart city is strongly related to the widespread of mobile applications, completely forgetting the essence of a city with its connected problems. In order to bring the smartness concept in a correct approach it is important to highlight the challenges that cities will face in the next years.

2 The Real Challenges of Cities

A study developed by "the Economist" [1] highlights that despite the United States and the European Union have a comparable total population, in the U.S. 164 million people live in 50 major metropolitan areas, while in Europe there are only 102 million metropolitan areas inhabitants. This difference leads to surprising consequences in terms of productivity and incomes. Gross Domestic Product of European metropolitan areas is 72% of GDP of the 50 largest American cities.

An article on "Wall Street Journal" [2] shows how major metropolitan areas of United States produce a higher GDP than the economies of entire nations.

Another article on "Washington Post" [3] emphasizes how in 31 American states one or two metropolitan areas account for the vast majority of the nation's economical production and in 15 other states, a large metropolitan area alone produces the most part of GDP. The seventeen major metropolitan areas generate 50% of United States Gross Domestic Product.

Urbanization is also different in terms of city size classes in the two areas. In Europe 67% of urban inhabitants live in medium size urban centres, smaller than 500,000 inhabitants; while just 9.6% are located in cities bigger than 5 millions inhabitants. In the U.S.A. one upon five urban inhabitants lives in major cities of more than 5 millions people.

From these statistics it is very easy to understand that, despite common opinions against big cities quality of life, in most cases living in large cities becomes a necessity. Glaeser [4] defines the city as the greatest invention of mankind. Using the advantages of agglomeration principle, a city emphasizes strengths of a society. Despite the evolution of modern and contemporary cities has led to disadvantages resulting from congestion, urban poverty and security, today living in an urban context, even of not high quality, involves more benefits than living in remote areas. Consequently, cities play a central role for humanity, offering the opportunity to learn from each other, face to face. Despite economic contexts and production patterns have been radically changed, a city always represents the most vital element of the economy of a nation. Generally, in every developed country, cities are the economic heart and the most densely populated places, very attractive for people who want to exchange

knowledge. While in the past advantages were closely related to the reduction of transportation and distribution costs, today cities have got huge benefits in economic terms due to exchange of ideas, therefore there is the transition from an idea of a city founded on the concept of location to a city based on interaction [5].

In the next few years an increase in world population of 2.3 billion people will occur, with an average increase of population in urban areas by 30% [6].

These scenarios can be inserted in a larger picture, in which cities already host the majority of world urban population. Western and industrialized countries already host nearly 80% of urban population, while developing countries to-date set at 47%. Asia and Africa are expected to overcome 50% of urban people by 2020 and 2035, respectively. Urban population is forecasted to increase of 72 per cent by 2050, changing from 3.6 billion people in 2011 to 6.3 billion in 2050 [9].

Within 2020 urban population of China will reach 60% of the total and more than 100 million people will migrate to metropolitan areas or contribute to the creation of new urban centres.

This phenomenon is not only limited to countries where a rapid economic development is occurring, such as China [7] and India [8], but also in Europe, as highlighted by "World Urbanization Prospects" United Nations report [9], where in 2050 almost 90% of the population will live in urban areas.

Obviously, an "urban" lifestyle implies a lower level of sustainability, more energy consumption, more pollution, more waste production, etc.. In China 45 airports will be realized within the next five years, cities will produce 80% of carbon emissions, urban areas will consume 75% of energy and 50% of water supply losses will take place in cities.

Some alarming predictions highlighted at the Rio de Janeiro conference of 1992 are taking place. The planet's resources are used by 20% of the population, but with the economic growth of countries such as China, India, Russia and Brazil, with an elevated number of inhabitants could completely blow up the environmental balance of the planet. Therefore, clever approaches to save money and environment are needed. We cannot reproduce an urban development based on the same model that has governed the process of urbanization occurred since the Industrial Revolution until today. It is necessary to move from an approach based on pure physical growth of the city, to one founded on the ability to use in a correct and efficient way energy, water and other resources and to provide a good quality of life. In practice, Cities should become smarter in programming and planning management and use of existing resources.

3 From Location to Interaction

As far as the world is getting more and more urbanized, cities are becoming the most visible footprint of humans on the planet. However, defining what is urban and what is not, or finding a unique definition of city does not represent an easy task.

Many of the characters of cities can be found in other human made artificial landscapes but, taken alone, they are not sufficient to discriminate between cities and other environments.

From a geographical point of view different principles can be followed to define a city. A demographic point of view deals with population and its concentration in a given area. However, how many citizens are required for differentiating a city from a village or a minor settlement is not uniform in different countries or areas of the world.

Another principle is based on quantity, shape and concentration of buildings, but here also the concept varies from area to area, and a same concentration of building could define an industrial area as well as other kinds of settlements.

A third principle deals with the concentration of activities in cities, and particular with the fact that activities are various and different from agriculture, as well as serving an extra-urban demand.

Furthermore, cities can be defined as places where some activities and functions are located and concentrated. In such way a city is not only characterized from demographic and infrastructural points of view but rather by the functions played in that particular environment, holding a concentration of buildings, infrastructure and people.

Functions in cities are of particular type as they are generally different from agriculture and serving a wider range than that of the proper physical coverage of the city.

The consideration is also that, although more than 50 % of human population live in cities, actually they are quite rare on the Earth's surface and play their functions over a wider range that is served.

So functions played by a city are both dedicated to those people that live in the city in their day by day needs (i.e., schools, retail, etc.), or city serving, and those activities that are the essence of the city and make it special, like university, specialized medical doctors, etc., that work for both the strictly defined inhabitants of the city but in particular call people from outside the city to benefit by such activities, defined as city forming. A wider surrounding area of the city is therefore served, that implying a gravitation towards the city and an interaction, thought as flows, movements of people from outside the city towards the city itself.

So a city is not just based on steady, fixed elements as buildings, infrastructure and localized economic activities, but on movements, too. Typically commuting is identifying metropolitan areas defining the range of a city in terms of its (physical) attractiveness over a certain geographical distance.

A key element in doing that is the distance decay function, stating that the amount of interaction among people and places tend to decrease - with different slopes and speeds - as distance from the place increases.

Interaction and distance decay is applicable at different scales and in different contexts: in the already mentioned commuting case, the amount of people heading to a city for working activities from the surrounding settlements tends to decrease as the distance of neighbouring settlements decreases. Similarly in analyses made on telecommunication traffic, interaction decreases with distance.

In such sense, usually cities are seen as nodes in a network system, characterized by linear elements linking nodes and flows on such links.

However, in general the attention in geographical terms is dedicated to cities and their physical and functional features, at the urban scale, while at the extra-urban scale

the focus is on how different cities are organized and linked in comparison with other ones, with whom they maintain a relationship in terms of commuting, political presence, economic environment, etc.

The same network metaphor can however be moved in the internal part of a city, identifying places where people gather and interact more, like squares, shopping malls and high streets, public offices, etc.

So geographers consider cities and their regions as systems of nodes, networks and flows, organized in a network or hierarchical system. However, the attention is generally focused on places and on the interaction between people and places. Recently, cities are more and more seen as complex systems, needing an even more integrated approach. In particular, then, the huge availability of data, often coming from users of portable devices and ICT social networks, provides suggestions and data sources to go more in depth on the issue, and moving the attention on interaction between people and happening in places.

Mike Batty [5] suggests that "to understand cities we must view them not simply as places in space but as systems of networks and flows".

According to Bettencourt [17], a city is a complex system characterized by a twofold soul: it " works like a star, attracting people and accelerating social interaction and social outputs in a way that is analogous to how stars compress matter and burn brighter and faster the bigger they are." Also, "Cities are massive social networks, made not so much of people but more precisely of their contacts and interactions. These social interactions happen, in turn, inside other networks – social, spatial, and infrastructural – which together allow people, things, and information to meet across urban space."

4 Smart City, Smart Cities, Smartness or Dumbness

One of the challenges lays in the definition of 'Smart City', or trying to understand the level of smartness that a city can have. Although a certain agreement on elements and indicators defining a Smart City is set, not such optimism can be directed towards their meaning and transformation into active practices.

Six axes represent the backbone of a Smart City, with smartness translated into economy, society, mobility, people, governance and environment. In all of them attention is given to the opportunity promised by modern ICT to boost such axes, optimizing and making cities more efficient. The philosophy behind the Smart City is strongly related to the Sustainable City, in which environmental, social and economic dimensions are considered as part of the development to be pursued, to allow present and future generations equity in living conditions. The difference lays mainly in the role played by technology, and ICT in particular, in allowing a more efficient management and organization of the different parts of life in cities.

However, how is that translated into the real world? Sustainability in urban contexts involves public participation. Possibly the Local Agenda 21 has been one of the first cases in which a bottom up approach was suggested into political action at local level, in such sense anticipating – and putting the basis for – to-date public

participation in planning, also helped and speeded up by social networks and media. In Smart Cities public participation is central and, of course, is boosted by new technologies, as social networks and media and it must therefore rely on a consistent network and infrastructure, allowing data and information flowing and sharing. However, the bottom up approach is possible in the Smart City also by means of citizens and urban users building and realizing their own services and activities, therefore meeting needs they do know and feel, often better than the final decision and policy makers.

Nevertheless, and as a paradox, the Smart City concept is often translated into a 'techy' top down approach and consequent solution, with a single (set of) decision maker(s) preparing supposed valuable solutions for citizens. This is the case of new investments towards 'Smart Cities' in which hi-tech tools are proposed and realized as centralized systems to control several aspects related to energy efficiency, transport, house access, etc.. In such a big infrastructure, projects are implemented, coupling hardware network infrastructure and control systems, as well as more traditional, although generally technologically advanced, real estate investments.

Rio de Janeiro and Song-Do Smart City are among these examples. In the former case a control system was sold to Rio De Janeiro to monitor traffic in real time, in the second one a brand new 'Smart City' or 'Smart Suburb' was built from a blueprint in a greenfield area, off Seoul and close to the new South Corean international airport, having in mind energy efficiency and saving, quality of life, a planned environment for business, living, working, etc.. These examples are the offspring of a planned centralized system, often not so flexible to incorporate innovation: as an example, Song-Do was based on RFID technology and not ready to adapt to new communication tools as smartphones and tablets – whose role in locating sensors and devices helping us in automatizing activities was completely unconsidered or underestimated.

On the other hand, the bottom up approach is based on how citizens or city-users live and interact with the city, and develop their own applications and solutions for the different uses of a city. Similarly to what happened in the past, with new utilities and infrastructure both serving cities' expansion and also shaping it, technology is influencing how we live and set our relations with other people and places. As a trivial example, on one side new devices and tools induce us clustering close to free wi-fi hotspots; on the other hand people usually gathering in popular places induce authorities or private activities to set and reinforce wireless sensors.

Therefore a similarity with other physical infrastructures (roads, electricity cables, fresh water pipes) arises, but how we use now what flows on such infrastructure is quite different – and often unexpected – if compared with what we used to. So it risks or tends to be for the physical infrastructure of the smart city, or the hardware composing the digital layer superimposed over the city. And that suggests that the bottom up approach in a very 'open' way should be based on the setting of an infrastructure (and a set of rules) and should allow people to 'flow', interact and develop their own activities.

Another issue related to 'smartness' can be put onto the international differences the smart city concept has got. Asia, and particularly South East of Asia, are working on housing and on expanding cities and the issue is related to the urban model to be adopted for brand new cities or neighbourhoods, while other geographical areas, as

Europe and the US, hold older urban structures and heritage. A Smart City in an urbanizing world means building brand new settlements from scratch, often in greenfields and from a blueprint. On the other hand, a Smart City based on an existing urban fabric, stratified in years of history – as in Europe or even in some US cities – requires optimization and reuse. In the former case a Smart City appears as a 'new town', a planned city in which functions and activities are organized. Often this is also translated into new suburbs or mid-size cities to be realized, in such sense following a suburbanized scheme already seen in other contexts, with the difference that smartness is put primarily onto energy efficiency and technological devices. On a more traditional urban fabric, smartness is more related to the challenge of rethinking a city in a smarter way, therefore optimizing it particularly in terms of interaction existing between citizens or city-users and the 'hard', infrastructural component of the city, not just building brand new settlements or suburbs that, in a non sustainable way, would consume soil and space.

5 The Pillars of a Smart City

The risks today are in focusing on just the technological side of "smartness", maybe without a tight connection neither among techy initiatives, nor –what is even worse- with spatial and urban planning activities. We do not deny ICT is central in setting a technological infrastructure as the backbone of the growing flow of data and information. The role of infrastructure of both serving and boosting urban growth and expansion was already mentioned, having a heritage, since their shape and fabric remain in time and influence different periods and generations.

So a focused planning is needed, but not to be limited to the short term but to persist.

In such terms a true Smart City acts 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 just on applications but on the possibility that citizens realize them" [10]. Doing so is possible by thinking about it in terms of [14] three main pillars:

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 [11] [12] [13] able to actively participate in a bottom up way to city activities.

Such pillars need to be accompanied by an urban governance able to harmonize them and particularly to represent a set of minimum 'driving rules', regulating a smart city in a neutral way, without entering too much into details concerning contents and applications developed by citizens, urban users, private companies, etc..

In such sense, a correct approach to Smart Cities should in some way try to resolve problems typical of urban areas and not just those of niches of users. As an example, our urban areas are often profiled on a category of users: generally male, in his

productive age, driving a car, therefore cutting out other important parts of urban population, as young and elderly people, as well as the female component. [15]. So, a purely 'techy' Smart approach risks to approach just those people actively using ICT (mainly mobile) technologies. Therefore the technological layer needs to be linked to the spatial context where it is applied, as cities are different from each other. One of the key elements in planning is verifying the compatibility and complementarity of a plan with other ones just ended or to be licensed in a short time, other than considering the possible overlapping with similar initiatives [16].

It is important to use the big impact of technologies on new forms of policy and planning. The six axes of smartness not only need to be connected to technology, but also to be connected to the added value that innovation can lead to programs and plans already issued.

6 City and Open Data

As mentioned above connections, sensors and Open-Data are the *smart cities* pillars adopting an approach based on the transition from the concept of *government* to the concept of *governance*. The essence is a background vision of the city able to transform the "impulse" resulting from the pillars activities to be performed into the individual application domains, the six *smart city* axes*, Economy*, *Governance*, *Living*, *People*, *Environment* and *Mobility*.

A lot of people everyday talk about Open Data, in the same way of smart cities, without getting more in the detail of the real meaning and the great opportunities that could arise from their correct use.

In most of the cases the concept of Open Data is based on uploading a file in portable document format (pdf) on a website allowing the download to everybody. When a public agency share a file in pdf format a monitoring authority should take action and if necessary sanctioning it, because a public employee spends his time to put constraints to data and in another government agency another public employee will waste much more time to use that data just because of these constraints. The PDF format was created to allow documents or drawings printouts, often in printing services, without using the software that produced these data, but simply employing a pdf file reader.

Tim Berners-Lee proposed an Open Data classification scheme associating the stars to the level of quality [18]. The lowest level is based on providing an open license, making the data available on a web site without defining the specific type of format (usually the files are in pdf format). The only purpose of this type of data is to inform, it is only possible to read or print them. The second level aim is to provide data preserving the original structure, allowing also to manipulate them. It is a small improvement even if data remain in a proprietary format. Three stars Open Data allow manipulation and management of data and adopt a non-proprietary format ensuring a better interoperability. The upper level maintains interoperability properties of data and improves availability on the network through the use of semantic web standards [19] (W3C (RDF, OWL, SKOS, SPARQL, ecc.). Five-stars Open data are Linked Open Data.

The limit of this classification is that spatial aspects are not considered at all.

In the introduction to the book "Geocomputation and urban planning" [22], the authors cite the famous paper by Franklin [21], who in 1992 quoted that 80% of all organisational information contain some references to geography. After the publication of this book, a lot of discussions started on social networks and blogs [20] on how was it possible that in 1992 80% of information contained a spatial component. This book was published in 2009 and up to date, after only few years, the situation is completely changed: each mobile phone has a GPS and Google OpenStreetMap transformed geographical information from a specialist interest to a mass phenomenon and probably 100% of data have a spatial relation. Consequently ignoring spatial aspects as an intrinsic component of data is a big mistake.

The spatial component has always been underestimated, sometimes intentionally sometimes for ignorance. In the first experiences of implementing master plans in spatial information system, data were deliberately shifted from the original coordinates in a lot of cases and the values of the translation were jealously guarded as access codes of a bank account. The main aim was to avoid overlapping of planning tools with other layers, allowing to discover the level of subjectivity of some decisions. In Italy, for instance, there is a great tradition in creating barriers to the immediate overlapping of information layers: cartographical maps and cadastral maps have always been produced at different scales to allow a certain subjectivity to technical bureaus of municipalities.

A comprehensive approach to open data should consider Open Geospatial Consortium (OGC) standards and INSPIRE directive.

Nowadays, data represent an unused big economic potential, because if they were available to everybody, collective imagination could create new companies and produce additional business to existing companies. The great part of these possible business initiatives should be based on applications for smartphones and tablets, which in 100% of the cases require a spatial component.

Considering the classic application for parking, there is a great difference if the application allows only ticket purchase, or if it indicates also where the nearest free parking is located. Consequently, open data for this type of application should be distributed at least as Web Feature Service (WFS) OGC Standard.

It is crucial to radically change public authorities approach: very often the term service is synonymous of contract.

A municipality does not have to pursue a contract for parking application, but it has to make *Open Data* available in Web Feature Service OGC Standard, allowing to local start-ups to produce an application ot to re-use an application produced for other municipalities. The municipality receives a free service and the enterprise gains with advertisements and if someone does not like the advertisement can delete it by paying one euro. Local authorities save money and contribute to create or consolidate enterprises in the field of innovation.

To achieve this goal it is essential that authorities produce and distribute high quality data.

7 Smart Citizens or Devices?

What about portable and mobile devices when talking of smart cities? How smart are we in using smartphones, tablets and all the family of portable devices? How we work, navigate, spend our free time is mainly based on mobile devices, todate smartphones and tablets, which diffusion has widely overcome that of more traditional desktop and laptop pcs.

How we use such devices is however still very limited to some kinds of uses and applications and quite far to exploit their potential. Figures help us, reminding that accessing the web is the main use of such devices, together with social networks and media (facebook, instagram, twitter, google+ just to cite a few of them), or with downloading apps dedicated to information retrieval, sport, games, meteo, maps, etc. Professional uses have been on top of the ranking from the beginning, so emailing, live meeting and calendars were features differentiating smart phones from more traditional mobile phones. That made the initial fortune of a company like R.I.M. – *Research In Motion* which actually created the smartphone concept and the popular BlackBerry platform, now suffering – and actually losing – the competition of giant ICT players as Apple and Android. Such a competition is also a symptom of a blurring of personal and professional uses, creating a generation of users whose activities have no more a marked spatial and temporal separation. So a question arises: is the use we make of smart devices really smart? When we talk about Smart Cities and Communities is the use of such devices really helping us in reaching such targets?

Fig. 1. What is in your Smartphone?

Probably, we are far from reaching a really smart and complete use of such devices, similarly with what happened with standard pcs and the software running on them: spreadsheets or database management systems, as a matter of example, are generally designed for a wealth of uses the most of users would not probably rely on in their all life, and so probably will happen with smartphones and their apps. We are facing a very wide and extensive coverage of mobile devices that however appear as Formula 1 or NASCAR racing cars driven in a peak time urban traffic jam, queuing at crossroads.

As in Figure 1, Smartphones and portable devices in general can be viewed in different ways as tools to connect accounts to social media or to check emails and contacts, but capable of hosting several tools and applications actually enhancing our capacity to act as real mobile sensors [5] . Our smartness as citizens should therefore be that of using the potential of such devices to exploit our interaction with the city to monitor it and highlight both positive and negative aspects and help its better management. Private companies and public bodies already use data we in a more or less aware way share, as positional and movement data, which allow estimating traffic jams, public transport time, etc. Also, our preferences in checking-in and doing particular activities in certain places is already monitored and both allow private companies to target marketing campaigns and products, as well as would – and hopefully will – allow planners and scholars to better understand how cities shape themselves from a social – not only in the ICT way! - point of view.

8 Conclusions

There is a widespread belief that the realization of a Smart City is based on an extreme use of applications for smart phones and tablets. Very often the attention has been focused exclusively on device applications forgetting that there is a city.
Whenever automation through mobile applications is proposed it is important to consider its effects on the city. When someone proposes a complex technological system it is important to ask "is it really useful for the city?".

In a lot of cases programs, which declared objectives mainly related to urban aspects, have been purely transformed in programs, based on ICT improvement. It is evident that in these experiences, the program has lost sight of its main original goal during implementation. In the first lesson of strategic planning course, it is usually explained that when building, a correct program it is important, as a first step, to identify who are the beneficiaries. In most "technology driven" programs, often this principle is not taken into account or is forgotten during the implementation. Technologies can represent a fundamental support in improving the efficiency and the effectiveness of cities planning and management, but it is important to have more clearly in mind that technologies are the means and not the target.

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