

HUMAN DIMENSION AND THE FUTURE OF SMART CITIES

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Resumo

Cidades inteligentes são ecossistemas urbanos inovadores caracterizados por uma utilização generalizada de tecnologia na gestão de seus recursos. É um modelo onde a conectividade é fonte de desenvolvimento a partir da utilização da infraestrutura de redes para melhorar a eficiência econômica e política e permitir o desenvolvimento social, cultural e urbano. Soluções baseadas em tecnologia são apenas um dos vários recursos para o planejamento urbano que têm como objetivo melhorar a sustentabilidade econômica, social, humana e ambiental de uma cidade. De forma que, cidades melhor equipadas com sistemas de TICs não são necessariamente melhores cidades ou cidades em que as pessoas querem viver.. As cidades devem ser locais onde as pessoas possam aproveitar a vida e o trabalho cotidiano explorando todo seu potencial e criatividade. Nesse sentido, cidades humanas inteligentes são a nova geração de cidades inteligentes, a qual equilibra a infraestrutura tecnológica com fatores soft como: engajamento social, empoderamento do cidadão e a interação das pessoas em ambientes físicos e virtuais. A visão de cidade humana inteligente é concebida como um ecossistema onde infraestrutura física e digital coexistem em uma relação sistêmica com o capital humano da cidade. As pessoas deveriam ser as verdadeiras protagonistas em uma cidade e, nesse sentido, a transformação de uma cidade que busca ser mais inteligente deve partir da premissa de integração aos desejos, interesses e necessidades - atuais e potenciais - dos seus cidadãos. O objetivo desta pesquisa é analisar a dimensão humana em smart cities, alicerçando-se para isso na análise de literatura e de projetos desenvolvidos com base no protagonismo cidadão. Como resultados considera-se que papel dos cidadãos toma proporções cada vez maiores na transformação em andamento, mas que ainda é necessário investir e melhorar alguns aspectos do protagonismo cidadão, como: inclusão digital, formas de engajamento e aumento da abrangência dos projetos.

PALAVRAS CHAVE

Smart cities, Human smart cities, Empoderamento do cidadão.

Abstract

Smart cities are innovative urban ecosystems characterized by widespread use of technology in the management of their resources. It is a model where connectivity is a source of development from the use of network infrastructure to improve economic and political efficiency and enable social, cultural and urban development. Technology-based solutions are just one of several resources for urban planning that aim to improve the economic, social, human, and environmental sustainability of a city. So, cities better equipped with ICT systems are not necessarily better cities or cities where people want to live. Cities should be places where people can enjoy life and daily work by exploiting their full potential and creativity. Thus, human smart cities are the new generation of smart cities, which balances the technological infrastructure with soft factors such as social engagement, citizen empowerment and the interaction of people in physical and virtual environments. The human smart city view is conceived as an ecosystem where physical and digital infrastructure coexist in a systemic relationship with the human capital of the city. People should be the real protagonists in a city and in this sense, the transformation of a city that seeks to be smarter must start from the premise of integration with the wishes, interests and needs - current and potential - of its citizens. This research aims to analyze the human dimension in smart cities, supported by the analysis of literature and of projects developed based on the citizen protagonism. As a result, it is considered that the role of citizens is increasing in the transformation in progress, but that it is still necessary to invest and improve some aspects of citizenship, such as: digital inclusion, ways of engagement and a wider scope of projects.

KEYWORDS

Smart cities, Human smart cities, Citizen empowerment.

Introduction

It is estimated that more than half of the world's population lives in urban areas today, concentrating mainly on regions of North America and Latin America. While in 1950 only 30% of the world's population was identified as urban, the projection for 2050 reaches 66%, representing its doubling in just a hundred years. Although there is substantial variability in the degree of urbanization in different countries, the upcoming decades will bring profound changes in the size and spatial distribution of the world's population (United Nations, 2014).

According to the most recent revision in the United Nations official report for population estimates and projections, called World Population Prospects, the current population of 7.3 billion is projected to reach 10.3 billion in fifty years, an increase of 41% in the world population. This growth should be higher in developing countries, especially in Africa and Asia, but it will hit the whole world (United Nations, 2015).

Unplanned rapid urban growth threatens sustainable development, and with increasing urbanization, the challenges increasingly focus on cities, which centralize much of national economic activity, government, trade and transport, higher levels of education and health, greater access to social services and opportunities for political participation (United Nations, 2014).

Population growth is accompanied by more and more challenges in urban management in several aspects, such as: food supply, long-distance water supply, waste disposal, urban traffic, social inequality, among other technical problems that compromise economic and environmental viability of cities (Caragliu, Del Bo, Nijkamp, 2011; Neirotti et al, 2014). As the planet becomes more urban, cities need to find smarter ways of managing the increasing complexity of urban life (Rizzo, Deserti, Cobanli, 2015).

In this sense, with the technological advance several ideas and initiatives aiming to improve the functioning of the cities began to use information and communication technologies, ICTs. Cities that have adopted such initiatives were called smart cities (Batty et al, 2012). A smart city is an innovative urban ecosystem characterized by the widespread use of ICT in the management of its resources (Zygiaris, 2013, Neirotti et al, 2014), from which economic, political, social and cultural urban efficiency is promoted (Caragliu, Del Bo, Nijkamp, 2011). For Komninos (2006), what distinguishes a smart city from other cities is its better performance in innovation.

This paper seeks to analyze the human dimension included in the concept of smart cities. Thus, it is organized as follows: in the first section, the definitions of the traditional / first generation concept of smart cities are presented; the second section follows the concept of human smart cities, the second generation of smart cities; and in the third section, some aspects of the human dimension are discussed in the construction of future cities.



Aim of the research

This research aims to analyze the human dimension in smart cities, based in the analysis of literature and of two projects developed based on the citizen protagonism.

Methodology

The method used for its development was the inductive one, based on the literature review on the constructs smart cities and human smart cities, using mainly the examples of the *Periphèria* project and the *MyNeighbourhood* project.

1. Smart Cities: first generation

Cities are complex systems that are characterized by the interconnection between citizens, companies, networks and infrastructure of services and urban utilities (Neirotti, 2014). A smarter city is an organic whole, where its central systems are interrelated (Nam, Pardo, 2011).

The convergence of technological advancement in the area of information and communication is transforming the urban environment, so that new technologies can be used not only to automate routine systems and functions, but also to monitor, understand, analyze and plan the city through management of information (Batty et al, 2012). The concept of smart cities has gained strength in academia, business, and government to describe cities that are monitored by systems and technology platforms, but are also driven by smart people (Kitchin, 2014). At present, not only smart cities, but also smart houses, smart transport, smart security, smart systems, among others, are being discussed, thus demonstrating that there is a strong tendency to use technological solutions to improve aspects of contemporary urban life.

So smart cities are innovative urban ecosystems characterized by the widespread use of technology in the management of their resources and from which urban efficiency is promoted in all dimensions (Zygiaris, 2013, Neagliari et al., 2014, Caragliu et al, 2009). They are cities that use all available resources, from people to energy, to overcome local and global challenges, maximize overall well-being and promote sustainable growth (Caragliu et al, 2015).

Neirotti et al (2014) summarizes that, in part, the smart city is based on the use of ICT systems to obtain data from various sources related to urban life, such as sanitation, security cameras, traffic lights, availability of parking spaces, among others. Data which, combined, generate information about the reality of the city, allow interventions in real time and also contribute to the decision making of public managers. On the other hand, technology cannot transform the city without human capital, making it necessary to invest in this dimension through the population's capacity of learning, education, attraction and retention of talented people from other



locations (Neirotti et al, 2014).

The advances have also transformed public participation in the planning and conception of the city, as citizens have greater access to information about what is happening in their communities and virtual space for sharing and discussion, and can play a more active role in urban management (Batty et al, 2012). ICTs have facilitated the empowerment of citizens as platforms for disseminating information and spaces for equal participation opportunities (Alathur, Ilavarasan, Gupta, 2011).

The components of a smart city can be simplified into three main categories: technology (hardware and software infrastructure), people (creativity, diversity and education) and institutions (governance and politics) (Nam, Pardo, 2011). Caragliu et al (2015), from literature review, present the four main contextual elements that contribute to the understanding of the intelligence of a city. They are: good performance in six main dimensions, combined (people, economy, environment, governance, mobility and lifestyle); Urban intelligence as a precondition for economic performance and an intermediary for sustainable urban growth; Interaction between technology and its users based on real-time sensors of everyday life; and projection through collaborative governance.

A project developed in partnership by the Vienna University of Technology, the University of Ljubljana and the Delft University of Technology defined six main axes to make a city smarter: smart economy, smart people, smart governance, smart mobility, smart environment and smart lifestyle. Each of these axes or dimensions has its own characteristics that can be developed from the combination of activities and conscious citizens, but are considered equal and important axes, necessitating joint development. This model is based mainly on the development of a competitive economy, improvement of transport and ICTs, protection of natural resources, investment in human and social capital, and society's participation (Giffinger et al., 2007).

The first generation of smart cities was promoted by the world's largest software and hardware companies, such as IBM and Siemens, in order to explore new market opportunities (Rizzo et al, 2015; Kitchen, 2014; Harrison, Donnelly, 2011). Although the technological evolution has contributed to the improvement of the urban management from the application of information systems to the operation and integration of its infrastructure and services, the cities still demand a greater participation of the community in this transformation.

With this emerged the second generation of smart cities, which considers the human element as the most important dimension in its formation - the human smart cities. Cities are human and smart when the whole community participates in urban transformation in an ecosystem of innovation, through interaction, collaboration and co-design (Oliveira, Campolargo, 2015). The concept of human smart cities does not contradict the traditional concept of smart cities, but proposes their development in greater coherence with the interests and real needs of the citizens.

2. Smart Cities: second generation

Urban transformation is a consequence of the interaction between top-down and bottom-up forces, urban resources (spatial, social, political, economic, infrastructural and cognitive) and transformation opportunities (Concilio, Deserti, Rizzo, 2014). Deeper changes require greater participation and use of the various resources available in the ecosystem.

Although smart cities are an important step in the right direction, they are still insufficient in the most important dimension of the cities, the human dimension. On the other hand, in human smart cities people are the main protagonists, not technology (Oliveira, Campolargo, Martins, 2015). Human smart cities are those in which the entire community participates in the transformation of the urban environment into an ecosystem of innovation, through interaction, collaboration and co-design (Oliveira, Campolargo, 2015).

The transformation of a city that seeks to become smarter must start from the premise of integrating the current or potential wishes, interests and needs of its citizens, which may or may not involve technological infrastructure (Rizzo et al, 2013). Several solutions may require only frugal technology, or even present simple and creative opportunities that are independent of technology.

Technology should be a facilitator for connecting and engaging government and citizens, informing, motivating communities, encouraging and supporting collaborative activities that lead to increased social well-being. This approach balances technology deployments with softer features such as social dialogue, collective vision building, people empowerment, and government-to-citizen interaction (G2C) in physical and virtual community environments (Oliveira, Campolargo, Martins, 2015).

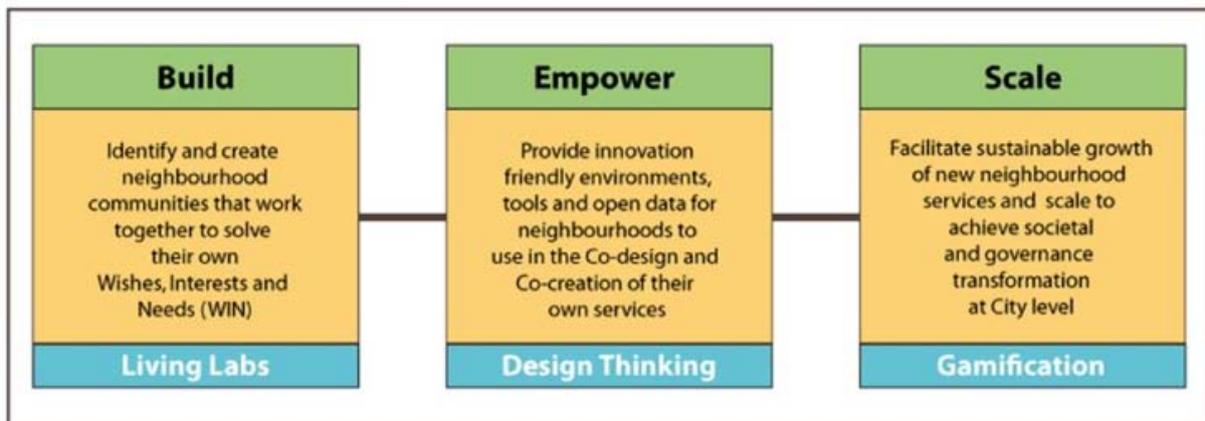
The approach of human smart cities seeks to introduce and implement physical and digital infrastructures in a systemic relationship with their human capital. In addition, they are systematic and anthropocentric, with a focus on social innovations at the micro or macro level of society (Rizzo et al, 2015). Human smart cities establish a promising bridge between micro-scale decision-making and governance mechanisms, through collaborative and creative environments where there is interaction among citizens (Concilio, Deserti, Rizzo, 2014). The key force for its development is the creation of a participatory innovation ecosystem, where all urban actors can interact (Oliveira, Campolargo, Martins, 2015).

The operationalization behind the vision of human smart city is a design approach which starts from micro-experiments to the solution of problems, that eventually develop towards macro-transformations. Such small local and social innovations and their prototypes can be expanded, consolidated, replicated, and integrated through Urban Living Labs (Rizzo et al, 2015). Based on the vision of human smart cities the European Union invested in two innovative projects: *Periphèria* and *MyNeighbourhood*. Both involve living labs proposals for experimenting with new forms of urban governance, public participation, and co-design activities

that have resulted in creative partnerships, public challenges, and unprecedented institutional and citizen interaction (Concilio, Deserti, Rizzo, 2014).

The implementation of the *MyNeighbourhood* project is based on three phases: rebuilding neighborhoods, empowering neighborhoods, scaling up neighborhood value. The first phase is characterized by the connection between citizens and the available resources, through a living lab. The second phase raises and consults the needs and interests of citizens, establishing a database. The third phase aims to make ideas and applications widely available both online and offline (Oliveira, Campolargo, Martins, 2015). Below is the methodology of human smart cities used in *MyNeighbourhood*:

Figure 1 - Human Smart Cities Methodology



Source: Oliveira, Campolargo & Martins (2015).

Periphèria's actions, which aim to develop the next generation of smart cities, demonstrated that the participation of citizens and other actors in the ideas, creation and management of services facilitates access to the creativity of communities, but also provides new skills to people, new job opportunities and creates service options that are more coherent with real needs of citizens, thereby improving their long-term quality of life (Concilio, Deserti, Rizzo, 2014).

Periphèria and *MyNeighbourhood* projects, albeit with different approaches to implementation, have in common the consideration of citizens as the main protagonists in the search for solutions to urban problems or to reducing the threats to the community quality of life. Neither propose prior problem agendas or approaches to projects, but invite citizens and all actors involved (although also identified as citizens, but then representing other roles) to discuss and explain what are those needs, in their perspective.

Such projects create real and virtual spaces for the collaborative work between the parties and also for the exchange of information and constructive discussions where everyone has equal voice and opportunities. They are able to use the technologies available in a balanced way with social engagement and inclusion, presenting them at some moments as a facilitator for the empowerment process and in others as part of the solutions created by the community. Technology is used in favor of the citizen and for the sake of intelligent

development.

As a result of the projects, communities have become more participatory, cohesive, creative and have generated innovative services for themselves, for business and government. Such solutions, in addition to solving problems or improving community conditions, have also generated employability, knowledge, opportunities and strengthened relationships among the actors involved, generating benefits for the entire ecosystem. These are the main fruits of citizen empowerment: individual development that is reflected in the development of the entire environment.

3. Citizen participation in the construction of future

With the growing need to find creative solutions to current and foreseeable future urban problems, which the traditional concept of smart cities does not seem to yet satisfy, it has become evident that the role of citizens takes on increasing proportions in the transformation in progress. Not only is there a natural movement for citizen empowerment stemming from cultural and technological advancement, but there is also awareness among other actors in this ecosystem of the importance of the human dimension for the joint development of all urban dimensions.

However, some aspects of this dimension need to be better evaluated so that citizen participation in building the future is not compromised. The first of these is digital inclusion, which is a key point for empowerment through technology. By 2015 the number of people with internet access has reached 7 billion worldwide, but it is estimated that 57% of the world's population remains disconnected (UNESCO, 2015). In May 2011, the United Nations declared that access to the Internet should be considered a human right, because of its transformative nature through which individuals can exercise their right to freedom of opinion and expression, but can also promote the progress of society as a whole by disseminating information quickly and economically (United Nations, 2011). In 2016, the council once again discussed the use of the Internet, this time from the perspective of human rights protection on the Internet and on other information and communication technologies, once again reinforcing its importance as a space for citizen participation in the development of their communities and in the promotion of human rights (United Nations, 2016).

This shows that ICTs play a key role in building the future that citizens want and need, but there is still a long way to go to achieve digital inclusion at the global level, not only in more developed countries. There is a need to improve the infrastructure of networks and access, but also to educate people for their use and better use.

Another essential aspect for the human dimension in cities is the engagement of individuals. Citizen engagement is defined by individual and collective actions on issues of public interest and refers to how citizens participate in community life in order to improve their conditions or help shape their future (Cegarra-Navarro,

Garcia Perez, Moreno-Cegarra, 2014). One of the biggest challenges, however, is to engage people in these actions or even to encourage and support community initiatives so that they effectively manage results with or beyond other actors in the urban ecosystem, such as government institutions and business organizations.

In addition, communities have different groups which may or may not share the same goal or motivation, often making their interests and demands different or even opposing. Heterogeneity and lack of cohesion are barriers to participation, which is a basic component of empowerment. This way, communities need to develop a sense of identity so that all members feel part of it and engage in public participation (Sardu et al, 2012).

Finally, an aspect that still seems to be developing with human smart cities stands out. To date, the initiatives generated with projects of human smart cities have focused on neighborhoods and communities, but have not demonstrated their impact on the city as a whole. One of the challenges seems to be still how to scale up the solutions or scope beyond the community in which they arose. In any case, the projects are still in progress and therefore there is no evaluation of all the results or even the complete data displayed for consultation and analysis.

Conclusions

The contemporary context shows that the transformation brought about by the technological revolution has had positive effects in terms of democratic participation, collaborative processes and access to information. One of these effects is the greater possibility of citizen empowerment, which has been reinforced in actions developed by the community itself and also in actions created by the government and public institutions.

Initiatives and projects developed and executed so far have shown good results in the advance of human smart cities based on the empowerment of the citizen, generating outcomes and effects in all their surroundings. Nevertheless, further research is needed to evaluate the results obtained in each initiative and to monitor their development, given the continuity of each one.

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