TECHNOLOGY, INFORMATION AND ACTORS: CONNECTING THE SMART CITY PARTS

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Abstract:

Smart City is the sum of the parts that involve technologies, information and actors. Information and Communication Technologies (ICTs) are given great prominence, but are only one of the parties to the smart cities development (non-exclusive, nor the most relevant). The information needs to be dynamic, available, with quality and organized, to be better offered and demanded. Finally, the actors, whether government, private or civil society are extremely importance for the realization of smart city.

ICTs are essential, but the investment in human capital must occur for the smart city success. Perhaps this is a gap in the literature (and in practice) of smart cities, since, for the actor to act properly, this should be trained and encouraged in the actors relationship, with trust a unpreparedness, ignorance and discouraging of the actors involved can lead to a negative scenario of disinterest, discontinuity and, finally, make every project "smart city" lose its ability to integrate, to act and to contribute.

The aim of this study is to analyze the smart cities as the result of the group from different parts: technology, information and actors, because, above all, the latter is often "placed in the background" when talking about smart city.

Keywords: smart city, technology, actors.

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1) Introduction

Characterized as complex, heterogeneous, with predominantly unplanned infrastructure and, in general, with short-term public policies, cities attended the worsening of their urban problems in mobility, pollution and public safety, resulting in reduced quality of life.

The challenges in urbe involve both governments, who are under pressure by increasing demands (versus tight budgets), as the society, that need to learn to live in the fiercest urban areas, whose public services are far from adequate.

Taurion (2011) points out that the expansion of urban problems requires a new attitude of the public administration, both in planning and acting, as in partnerships (between different government levels and with the private sector) and in the citizen empowerment.

The cities are dynamic, offer and demand information, and the adoption of technology for their management is not something new. Concepts such as Informational City (CASTELLS, 2003), Augmented City (FIRMINO, 2004), Cybercity (LEMOS, 2005) are already established in the literature.

Against the backdrop of urban difficulties, the relationship between city and technology can be a way to improve the cities responsiveness and resilience. This relationship materializes in the phenomenon "informational city", whose emphasis is on the use of Information and Communications Technology (ICTs) for urban management.

Currently seeking to expand the use of these technologies in urbe, in an attempt to improve the decision making process. Therefore, it is vital to be fast, accurate and be connected. Thus, the discourse of "smart city", which involves more than just the adoption of digital technologies, arises, but the perception of "smart" as vigilant, snapshot, efficient, connected, integrated, etc.

In the smart city each part is relevant and interferes with each other. Technology should be modern, connected and interconnected; information needs to be available, with quality and organized. Finally, the man, whether governmental actor, private or connected to the society (offering or demanding information and services) should be included in the process, getting attention for improving their integration and their role in the set. Thus, all parts are extremely importance for the realization of intelligence in the city.

The aim of this work is to show the smart cities as the result of a set of different parts: technology, information and actors. However, these actors are often left in the background when i about smart cities.

Besides this introduction, the paper presents four items: the second part details the smart city; the third text component addresses the technology and information; the fourth item highlights the actors and the relevance of their activities in this context. The fifth text component characterizes the relationship of parts to the whole in smart city and finally presents the conclusions.

2) Smart City

The term smart city is comprehensive and abstract, and in the literature presents different descriptions for smart city, which often play concepts such as: digital city, information city, connected city, teletopia , cybercity, city knowledge-based, smart communities, electronic community, e-commun space, etc. Smart city is a concept closely connected with technology and information, but there is no single definition that clearly establish what is and what are its characteristics (QUESADA and PULIDO, 2012).

Sometimes the term digital city is used as "first step" in the direction of being a smart city, as part of a new way of flow distribution of people and information on the city. The digital city is not necessarily intelligent, but all the "smart cities" have the digital associated with them (FERNANDES & GAMA, 2005/2006).

In the 2000s, the term "smart city" came to be used widely by private technology companies such as IBM, Cisco and Siemens, associating this product as a solution to the cities. Their packages "pre-drawn" are offered to local governments with the "promise" that "technology will solve their problems" and it is sold as the 'future of the city' (LAZAROIU & ROSCIA, 2002) e (CÂMARA et al., 2012).

Under private influence (and in attempt to minimize their problems), various cities around the world have adopted the discourse of informational city, specifically the "smart city" as something by itself "solve" all the problems of the city (mobility, connection information, monitoring and surveillance, public safety, among others). There is a wide range of characterizations in the literature about smart city projects, can be found projects who call themselves smart cities, with approaches such as: governance, environmental, economics, citizenship, Wi-Fi, smart energy, information and services on the Internet, monitoring and surveillance, etc.

To facilitate the understanding, adopts the concept of smart city :

> "... The city is smart when investments in human and social capital (smart people), transport (smart mobility), digital infrastructure (ICTs), sustainable economy (smart economy) and a high quality of life (intelligent life), adding the sound management of natural resources (intelligent environment), through a participatory governance (intelligent governance)" (STEENBRUGGEN, 2014, pp. 3).

The smart city should be viewed as a system where the parties (transport, energy, education, health, water, public safety, etc.) are inseparable, forming an interconnected system. In practice, attempts to generate a balance to improve the efficiency of the systems that make up the city, and the planning can

be based on information separated by sectors (problematic or not) or by geographical area (QUESADA & PULIDO, 2012).

The literature is imprecise, but commonly stands as relevant points for the smart cities organization the integration of different systems and public policies, as well as factors related to (CÂMARA et al, 2012, pp. 6; LAZAROIU & ROSCIA, 2012):

- Smart economy**:** innovative spirit, entrepreneurship, productivity and flexibility in the labor market, international insertion, ability to turn, etc.;
- **Smart people:** skills, creativity, participation, social and ethnic pluralism, adaptation to cosmopolitan, participation in the collective, etc.;
- **Smart governance**: encouraging to social participation, quality of public services, government transparency, strategies and long-term planning, etc.;
- **Smart mobility:** accessibility, sustainable transport systems, ICTs available on infrastructure, innovation and safety in sustainable transport system, etc.;
- **Smart environment:** stimulus to urban sustainability, combating pollution, environmental protection, natural resource management, etc.;
- **Smart live:** life quality for citizens, cultural and educational facilities, health, security, tourist attractions, social cohesion, etc.

Taurion (2011) states that two points are needed in order to become a "smart" city. The first is the long-term planning, define how wants the city to in 15 or 20 years in terms of: infrastructure, attractiveness for business, efficient management, quality of life, etc.

The second point is the organization of the stages of implementation of the smart city project: I) determine the most relevant systems; identify the most problematic and the most impact; II) quantify the inefficiencies; III) analyze the inefficiencies causes and who are the stakeholders for the solutions definition; IV) identify and estimate the benefits and the role of each actor; and, finally, V) implement the solution, and the vast majority of the solutions involve more than one actor. For this, the empowerment, trust and cooperation should be seen as essential.

A smart city can be designed as an environment that integrates ICTs, information, physical infrastructure, government and society, seeking to improve the efficiency in the management of the urbe, and the city can be considered smart when ICTs become "invisible" (as these are embedded in the physical artifacts and day to day environments). Thus, the society shall not see the technology in their daily lives, just feel your benefit.

3) Technology and the information on the Smart City

The technology now allows to measure and control things previously unimaginable, as well as providing connections between different objects (eg, the Internet of Things), enabling the exchange of information with each other and may result in autonomous, preventive and corrective actions.

Data are relevant to the development of diagnosis and prognosis. These, when aggregates value are transformed into information which, in turn, can result in knowledge benefiting urban management faster, accurate and appropriate (KLAUSER & ALBRECHTSLUND, 2014; KANASHIRO, 2013).

Modern cities offer many data: people, mobile, public and private vehicles, displacements, offered and demanded public services, etc. Mostly, are available data, but their collection and organization are not simple. However, with the available technology it is extremely feasible and accessible. The `information s analysis` can help municipal urban management to know more and to identify patterns and relationships that help in the search for solutions to urban problems.

Lemos (2013 & 2010) emphasizes that people produce and use information. With Big Data, people can offer and have access to information more broadly, which, by the government side, improves the management of the city, and, on the citizen side, not only improves the use of urban structure, but its empowerment on the urbe.

Remember that "knowledge is power" and not all actors are willing to share their power. Thus, often ends up predominating the individual rather than the collective (STRAUHS, 2012).

4) An actor prepared for a smart city

Smart city is more than just the sum of technologies to the available information, but involves decision making, which must be fast and accurate, based on information. Therefore, this circuit is complete only with people (governmental, private and society).

Strauhs (2012) corroborates the argument that smart city necessarily involves the actors in the organization of information and training of knowledge, because it is generated by people and the human being plays a key role, since the most important inputs are not the tangible elements, but intangible. Cardoso (2013, pp. 15) points out that people are not only essential to the functioning of the systems (be "smart" or not), but are, in imbricated form, the elements of the system itself.

Here is possible observe a gap in the literature (and practice) of smart cities, regarding the actors training to act in a more appropriate manner, including by, encouraging trust and cooperation.

4.1) Human capital

Anderle and Freitas Jr. (2013) highlighted that ICTs are important to the existence of the smartest cities, but the investment in human capital is essential. Fernandes and Gamma (2005/2006) argues that to a location being intelligent, beyond physical infrastructure that must go in this direction, the human and intellectual capital by education and culture systems are essential to encourage the "intelligence" of the actors and institutions, facilitating the adjustments facing the challenges.

Strauhs (2012) points out that in the knowledge society, education and social relations acquire great importance, because institutions require much more than technology, require people in permanent sharing ideas.

4.2) Trust

Another important point connected to the actors relationship is trust, which involves processes mutually developed face positive signs, the interactions, relationships and engagement between them. These positive signs encourage better attitudes and these, in turn, tend to favor better results (a virtuous cycle). Nascimento and Labiak Jr. (2011) argues that trust involves a set of actions established by actors, aiming gains and mutual security, in the present and for the future.

The trust can originate the relationship between ordinary people or professional relationships based on contracts. It is worth noting that confidence is influenced by three groups: 1) processes (long time relationship that proved to be stable, which is done in belief that the other will keep their usual behavior); 2) characteristics in common (family, religion, ethnicity); 3) institutional: the existence of formal structures in society (legal system, government, organizations) (NASCIMENTO & LABIAK, 2011).

Regardless of the nature and context, the decision of an actor trust the other requires a positive assessment of points, such as: interpretation of the intention and the possible behavior of the other actor; the belief that the other will act to improve the current situation of those involved (and not deteriorate it); and, finally, the most important, which is to know the other's behavior front of situations is expected from it acceptable behavior in unforeseen circumstances.

Trust relates to cooperation (virtuous circle), since before "positive signs" the actor engages more and it raises the relations level. In a second moment, ensures better attitudes that will end up favoring better results (NASCIMENTO & LABIAK, 2011, pp. 18).

4.3) Cooperation and collaboration

Trust exists as a function of the sum of institutional factors, skills, cultural proximity and favorable assessment of the intention of the different actors, and may result in the establishment of cooperation.

Thus, every actor (individual or organization, consciously or not), is a node of a cooperation network which, to a greater or lesser degree, has an impact or is impacted by other (NASCIMENTO & LABIAK, 2011).

Komninos (2007, pp. 1) extends the argument about the smart cities regarding people:

> [ ] the smart city must be the result of combinations of human capacities, educational institutions and digital technology (this sum results in new city functions, such as strategic intelligence, technology transfer, obtaining innovation through collaboration and the provision of digital services).

Cooperation involves actions established by actors who have a common interest and, therefore, trust each other, aim at some future gain (shared or individual), which strengthens cooperation as a dynamic and interactive process, because it cooperates to survive, to win, to overcome. The cooperation involves interest and this may be based on: need (alone do not get what I want or the law does not allow me); safety (lowers the risk, increases control, reduces the failures possibility); ease (cooperating is easier); and, finally, cooperates for pleasure (alone is not pleasant) (NASCIMENTO & LABIAK, 2011).

5) Connecting smart parts of town

Worth emphasizing the difficulty of conceptualizing what is a smart city in a "single recipe". But, in this scenario it is clear that technology is just one of the catalysts tools that solves (or softens) some points of urban problems, impacting positively on the citizens life quality.

Of the parties to the smart city, the man is one of the most relevant points and perhaps the least worked, because it gives great prominence to the millions spent on the purchase of a given technology, but little emphasis to training, involvement, and to man motivation in this process. The unpreparedness, ignorance and discouraging can lead to disinterest, the discontinuity and, finally, make all "smart city" coming down soon.

Specifically, considering management of Brazilian cities, is even clearer that relevance of actors, due to problems with the public low-quality services (and the lack of capacity to reverse this scenario), because public institutions have chronic cases of inefficiency, legal rigidity, excessive bureaucracy, credibility issues, limited budgets, meager investment capacity and absence of long-term planning, which reflects in fall of citizens' well-being (BATISTA, 2013).

The human capital involved in the management of Brazilian cities, in addition to presenting quality difficulties, has shortage in professional s number, training problems, func institutional overlapping (two or more institutions provide the same public service), creating power and resources contention problems for investments (BATISTA, 2013).

The prevailing view in the smart cities literature is that the technology and information are the smart city supporting components and this view is reinforced by Mitchell (2007), whose emphasis is given on the new intelligence of cities, supported on the combination of telecommunication, sensors and software:

> [ ] digital telecommunication networks (nerves), integrated intellige
> (brains), sensors and indicators (are the sensory organs) and the
> knowledge and cognitive competence) (MITCHELL, 2007, pp. 4).

Make even smarter cities through new uses of information and communication technologies, can lead to offer more knowledge for and by the people. Technological development is only part of the smart city process. Still must take into account that actors are the key parts, which must be trained and receive due attention and encouragement, to no longer be the faint rings of the smart city system.

6) Conclusion

The text ventures out in getting the idea that the discourse of smart cities is relevant to the cities towards their problems and challenges. Governments have stepped in order to understand that investment in technology and information can generate increasing scale gains before the deficiencies and, in turn, the society is already realizing that with the technology can even live better.

Technology presents a far from simple linear relationship with the municipal administration: the technology evolves and changes very fast, which requires public administration afford dynamic and streamlined way. However, the widespread practice of public management is to be slow and bureaucratic, hindering the city s relationship with what is latest in technolo good projects are implemented incompletely, if not reduced (cutting some parts initially planned) or simply abandoned.

The information must not only be fast, accurate and affordable, as should feed the communication channel between the government (among actors) and society. ICTs are a reality that help empower the society to be more present in public administration and assist in the inspection, as in the case of mobile application (APP for mobile) COLAB.RE (http://www.colab.re/), which allows citizens to post city's problems and track the resolution thereof.

Smart cities are a mix of human capital, technology and information and their practice involves cities with very different realities to each other, which prevents think of standards or rigid models. In developing countries is stark and urgent need to improve the training of actors, because the inefficiency, lack of long-term planning and the discontinuity of public policies prevail in everyday life of cities. Strengthen training, collaboration and cooperation between actors is vital to improve the engagement of them, the continuity and increasing efficiency of projects and their public policies.

A smart city project without attention to the actors can result in very expensive technological tools of city management, which will be underutilized or even abandoned by political pressure, economic,

institutional or impossibility of building partnerships, resulting in a large expenditure of scarce resources public and little or no benefit being created for citizens.

After visiting smart cities experiences in Brazil, the author of this paper would like to leave as text contribution some points not found in the literature, but widely discussed among actors in charge of projects:

1) Need for good protocols: the creation of detailed work protocols helps determine who does what and what should be done in each action, taking into account the specific features of each reality. Having good described protocols help in the performance of the institutions and actors, reduces conflict and even is a developer factor of trust and cooperation. But, in practice, have these good protocols is not the rule, is the exception

2) Training and education: the actors should receive training, good and proper, but sometimes the training is flawed. For example, in the case of an institution that operates in conjunction with other institutions at a given smart city project. This institution receives training by their professional A, but for some reason, the department has just selecting another professional to act on the spot, i.e, this new professional B will act in smart city, but did not receive adequate information and will have to interact, often unprepared, generating delays, losses and wear.

3) How to reconcile on the smart city the use of tacit knowledge (experience, habits and customs). Despite the tacit knowledge escape the formal knowledge, its use should be recognized as an important point in the management of smart cities

4) In places that have public services provided by private companies (concession or public private partnership - PPP), private institutions often are afraid to expose their data and information for fear of prejudice or punishment. However, when private institutions collaborate offering their data, it helps to increase the management capacity of the actors. The partnership process between the public and private should be one focus-base to strengthen the smart city.

5) The governance of large cities in developing countries (eg, São Paulo - Brazil) is a great challenge because the public structures doesn t realize the problems, and the actors face diff from the point of view of the ability of reversal of urban problems. In this scenario, the smart city can be a hope because it costs much less to invest in technology than destroy and rebuild the whole city.

6) Smart city projects can be opportunity for a common cultural change in the Brazilian public management: is traditional Brazilian public management "deny the problem" or "postpone the problem." It should pass to go against the problem, confront and seek ways and alternatives to solve it.

7) Finally, it is important to make a placement of an employee of the Rio de Janeiro City Hall (involved in the smart city project), when asked about the use of technology in urban management: "... the city has the equipment, Big Data, employees and projects, but it all depends

on the citizen! Both in behavior, "no littering", as in "participate". Every citizen today has a cell phone pocket, then must close the gap between the government and society (by technology that's possible). We must participate in the problem and take part of the solution! By technology, the solution of the city is the citizen 'hand', which is a major player in this system!

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References:

Anderle, D.; Freitas Jr., V., 2013. A utilização da Tecnologia da Informação nas Smart Cities um estudo bibliométrico . Anais do III Congresso Internacional de Conhecimento e Inova ªo (ciKi). pp. 20.

Batista, M. de M., 2013. Muito Além da Vigilância Eletrônica: um estudo acerca do discurso governamental do Centro de Comando de Controle Integrado de Pernambuco. In Dissertação de Mestrado em Administração; UFPE, Recife - Brazil, pp. 144.

Câmara, S.; Carvalho, H. e Alves Jr., F., 2012. É possível o Nordeste brasileiro ter cidades Inteligentes e Inovadoras? A proposta de um Framework. In ENAPG 2012, Salvador BA - Brazil, pp. 16.

Cardoso, B. V., 2013. Comandando e controlando à distância: modernização tecnológica, integração institucional e segurança pública. IGE UNICAMP,
Availabe at: http://www.ige.unicamp.br/ojs/index.php/react/article/view/1209
[Accessed 09 September 2014].

Castells, M., 2003. A sociedade em rede. São Paulo: Paz e Terra, pp. 698.

Fernandes, R. e Gama, R., 2005/2006. Do digital ao inteligente: os territórios do conhecimento como estratégias de desenvolvimento e/ou de marketing territorial. Cadernos de Geografia, 25/26, pp. 25.

Firmino, R. J., 2004. Building the virtual city: the dilemmas of integrating strategies for urban and electronic spaces. PhD. Thesis at University of Newcastle upon Tyne, UK, pp. 364.

Kanashiro, M. M.; Bruno, F. G.; Evangelista, R. A.; Firmino, R. J., 2013. Maquinaria da privacidade . Revista do Laboratório de Estudos Urbanos do Núcleo de Desenvolvimento da Criatividade, 19 (2), pp. 40.

Klauser, F.R. and Albrechtslund, A., 2014. From self-tracking to smart urban infrastructures: towards an interdisciplinary research agenda on Big Data. Surveillance & Society, 12 (2), pp. 273-286.

Komninos, N., 2007. Cidades Inteligentes: Sistemas de Inovação e Tecnologias da Informação ao serviço do Desenvolvimento das Cidades. Interface Administração Pública Local e Regional, Anuário 2007, pp. 5-9.
Availabe at: http://www.urenio.org/komninos/publications/
[Accessed 05 April 2014].

Lazaroiu, G. C. e Roscia, M., 2012. Definition methodology for the smart cities model. In. Energy, 47, pp. 326 - 332.

Lemos, A.; 2013. Cidades inteligentes - de que forma as novas tecnologias como a computação em nuvem, o Big Data e a Internet das Coisas podem melhorar a condi ªo de vida nos espa os urbanos? . In: Re Executivo, 12 (2), Jul./Dez., pp. 46 - 49.

Lemos, A., 2010. Celulares, funções pós-midiáticas, cidade e mobilidade. In Revista URBE - Revista Brasileira de Gestão Urbana, 2 (2), Jul./Dez., pp. 155-166.

Lemos, A., 2005. Cibercidades II: cidade na sociedade da informa ªo (volume 2) . Rio de J papers, pp. 374

Mitchell, W., 2007. Ciudades inteligentes. Revista Sobre La Sociedad Del Conocimiento, n. 5, Oct., p. 8.

Nascimento, D. e Labiak Jr., S., 2011. Ambientes e dinâmicas de cooperação para inovação. Curitiba: Editora Aymara, pp. 119.

Quesada; S. e Pulido, A. L., 2012. Smart city: hacia un nuevo paradigma en el modelo de ciudad. In Greencities & Sostentabilidad, Nov., pp. 11.

Steenbruggen, J.; Tranos, E. & Nijkamp, P., 2015. Data from mobile phone operators: A tool for smarter cities?. Telecommunications Policy, v. 39, Mai., pp. 335 - 346.

Strauhs, F. do R.; Pietrovski, E. F.; Santos, G. D.; Carvalho H. G. de; Pimenta; R. B.; Penteado R. S., 2012. Gestão do Conhecimento nas organizações. Curitiba: Editora Aymará, pp. 122.

Taurion, C. 2011., Cidades Inteligentes: o desafio de preparar as cidades para as próximas décadas. Available at: http://www.hiria.com.br/static/files/central-de-downloads/03.pdf
[Accessed: 20 December 2013]