

PROJECT “SMART CITIES”: SOME REMARKS
ABOUT EFFICIENCY AND SUSTAINABILITY

*Proyecto “Smart Cities”: unas observaciones sobre la eficiencia
y sostenibilidad*

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RESUMEN: Suponiendo que en 2050 las ciudades se concentrarán más del 70% de la población mundial, el presente trabajo tiene como objetivo analizar el concepto de “Smart Cities” según lo definido por IBM y ya implementado en algunas de las principales ciudades de todo el mundo. El objetivo principal de estos proyectos es lograr una mayor eficiencia y sostenibilidad en la gestión de las ciudades, tratándolos como un sistema complejo. Discutir el concepto de eficiencia y sostenibilidad, las principales conclusiones son que a pesar de que es posible aumentar el nivel de gestión eficiente y sistemas de control, en términos de sostenibilidad, “Smart Cities” puede ser solamente una manera para prolongar la supervivencia de este modelo de sociedad.

PALABRAS CLAVE: Ciudades Inteligentes (*Smart Cities*), eficiencia, desarrollo sostenible.

ABSTRACT: Assuming that by 2050 cities will concentrate more than 70% of the world population, this paper aims to analyse the concept of “Smart Cities” as defined by IBM and already implemented in some major cities all over the world. The main goal of these projects is to achieve more efficiency and sustainability in managing the cities, treating them as a complex system. Discussing the concept of *efficiency* and *sustainability*, the main conclusions are that although it is possible to increase the level of efficient management and systems of control, in terms of sustainability, considering the thesis of Gilding, this may be a way only to prolong the survival of this model of society.

KEYWORDS: Smart City, efficiency, sustainable development.

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INTRODUCTION

This paper aims to analyse the project “Smart Cities” developed by IBM (Institute for Business Value) and implemented in some major cities (Madrid, Washington, Singapore and recently a plan for Rio de Janeiro), highlighting potential issues to be considered and discussed on the conceptual and operational program.

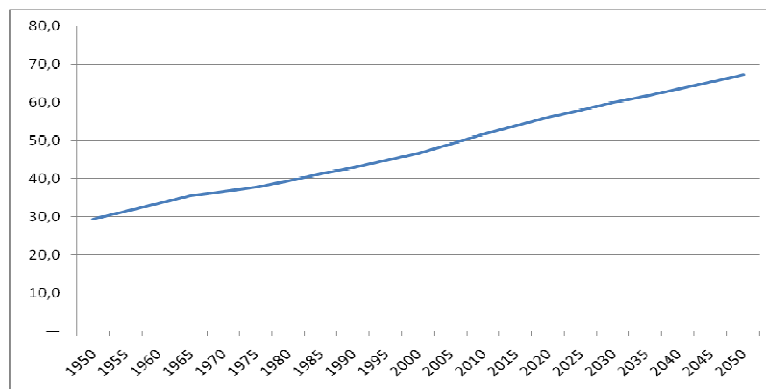
In this sense, according to the philosophy of the project, the key terms that come out are *efficiency* (especially in management capacity for complex cities) and *sustainability* (which refers to the idea of sustainable development). As a concept, the project “Smart Cities” is also shared by other major companies such as Odebrecht Group and Oracle, although in terms of design and operation IBM can be considered the pioneer.

In the next section, the concept of “Smart Cities” developed by IBM is summarized. Then, in the third section, we present the basic requirements of those projects for typically complex cities with functions and activities clearly interconnected and interdependent, thus working as systems. In the fourth section, the conceptual foundations of sustainable development are briefly analysed. Finally, the last section presents some concluding remarks.

THE CONCEPT OF “SMART CITIES”

The basic assumption for the idea of the project “Smart Cities”, headed by the IBM Institute for Business Value is that by 2050 cities will concentrate more than 70% of the world population. Despite the effective accuracy of this projection, especially in the big cities, this assumption is shared by various studies in different parts of the planet – see Graph 1. In the case of emerging countries, such as Brazil, this situation can be even more problematic, considering that there is much higher concentration of population in a small number of cities (for instance: São Paulo, Rio de Janeiro and a few other big cities).

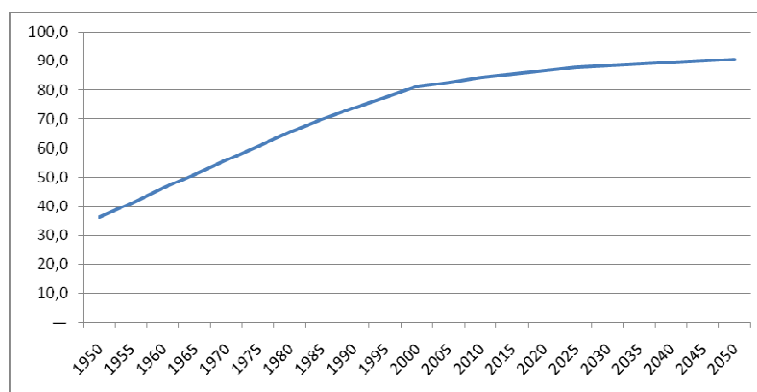
GRAPH 1. Expectation of Urban Share of World Population, 1950-2050



Source: United Nations (Department of Economic and Social Affairs), 2012.

In Brazil, it is expected that this proportion would be even higher – the resident population proportion of cities could reach more than 90% in 2050 – see Graph 2.

GRAPH 2. Evolution of Projected Urban Share of the Brazilian Population, 1950-2050



Source: United Nations (Department of Economic and Social Affairs), 2012.

Thus, the “Smart Cities” project is designed as a platform business, whose main objective is the rationalization of services of the key cities involved in order to ensure greater ability to control and therefore more efficient adminis-

trative management of these places. One of the main advantages of the program, according to its developers, is that there is no need for major findings or the creation of futuristic design for its implementation. According to Antunes²:

considering technology as a primary function, IBM believes that when a city grows, the demands caused by this growth are not only due to replace existing infrastructure (...). Thus, IBM proposes to use technologies in conjunction with the current structure, capturing, analysing and integrating data in order to respond intelligently to the demands of citizens.

The project design considers, in essence, the following stages³:

- A. The development of a long term strategy for cities with immediate goals to achieve the improvements;
- B. Setting priorities in sectors or systems, whose impact will be more relevant to the target cities;
- C. Mechanisms for integration of systems to be created to allow greater efficiency and facilitation for the people involved;
- D. Optimization of these systems and better opportunities for growth of cities.

In order to clearly define these systems (infrastructure, networks and different kinds of environment considered), it is necessary to outline the focus of operation of cities, especially in the services provided, the population involved, the business areas and the systems of transportation, communication, water and energy⁴. The performance of this set of systems determines the efficiency of the functioning of the city. Thus, a city will be strengthened in terms of management and capacity to offer efficient services, if it could deal properly with its future and sustainability.

² Antunes, Julianna (2011), *Sustentabilidade nas cidades – IBM Smart Cities*, www.sustentabilidadecorporativa.com/2011/01/sustentabilidade-nas-cidades-ibm-smart.html, p. 1.

³ Dirks, Susanne; Keeling, Mary; Dencik, Jacob (2009a), *How Smart is Your City? Helping Cities Measure Progress*, IBM Institute for Business Value, IBM Global Business Services, New York.

⁴ Dirks, Susanne; Keeling, Mary (2009), *A Vision of Smarter Cities: How Cities Can Lead the Way into a Prosperous and Sustainable Future*, IBM Institute for Business Value, IBM Global Business Services, New York.

REQUIREMENTS FOR THE “SMART CITIES”

- A. Necessary teamwork and thus the architecture of an administrative body with a collaborative profile – the success of one depends on the success of others, considering the holistic vision that makes the idea of the project;
- B. Think “revolution”, not “evolution” – challenges and transformations are the hallmarks of an organizational standpoint and control, although there are no radical changes (for example in infrastructure, which would require time and probably a very high cost of implementation). Systems must be interconnected and instrumented (especially in terms of technological dynamics) and intelligent in the sense of having responsive and quick action (almost immediate in certain situations).

In summary, the project involves the notion of a city as a complex system and interactive in terms of acquaintanceship and management. It is not possible to achieve an efficient outcome (in order to use in a better way, dynamically, resources and capabilities) without a broad and general vision of the elements considered for the functioning of a city. To make it smart in the way they propose, it is necessary to create holistic forms of control of the cities in the various dimensions involved (people, infrastructure, knowledge, etc.).

The plan for Rio de Janeiro follows, in general, this perception of smart city. Ordered by the current Mayor, the project is considered by IBM one of the most important challenges to test and implement the idea. Some aspects contribute to this feeling:

- A. from geographical point of view, Rio de Janeiro is characterized as a city with a short horizontal land between the sea (Atlantic Ocean) and the hills (Tijuca and Pedra Branca), which hinders its expansion;
- B. a city characterized by an important share of the population living in slums, imposing problems for the government to exert official power and management because that kind of disorderly occupation of those territories allows easily the installation of criminal networks associated to drug dealers. The recent intervention in the slums by special police forces (Pacifying Police Units – UPP), related to the needs of public safety to host the World Cup in 2014 and Olympic Games in 2016, created a further element of complexity in managing the city;

- C. that disorganized occupation causes also serious problems for the infrastructure (both investments needed and maintenance), such as illegal installations of electrical networks, water and other essential public services;
- D. this process of occupation also determines, historically, an expected sequence of natural disasters, especially during periods of storms in the summer.

According to IBM, if it is indeed possible to transform Rio de Janeiro into a smart city, the task can be performed in most cities in the world. It is intended to create initially a management centre to collect and process public information on the city and then start the basis of the “Smart Cities” project⁵. In this context, Antunes notes that:

this centre will function as consolidating information from multiple systems of the city, facilitating the visualization, monitoring and analysing in real time. The system developed by IBM to make the centre works, allows the prevention of flowing problems in the city, like the exit of fans at Maracanã and the traffic control (and prevention of accidents) in rush hours⁶.

SUSTAINABLE DEVELOPMENT

Sustainable development is a term that comes up in the 80’s during the work of the Brundtland Commission (as established by the UN World Commission on Environment and Development) in an attempt to integrate other key di-

⁵According to Singer: “I.B.M. also installed a virtual operations platform that acts as a Web-based clearinghouse, integrating information that comes in via phone, radio, e-mail and text message. When city employees log on, they can enter information from, say, an accident scene, or see how many ambulances have been dispatched. They can also analyze historical information to determine, for instance, where car accidents tend to occur. In addition, I.B.M. developed a custom flood forecast system for the city. (...) At the operations center, employees alerted the fire and civil defense departments and then asked the gas and electric companies to shut down service around the scene. Others temporarily closed the subway underneath the site, blocked off the street, dispatched ambulances, alerted hospitals, sent in heavy equipment to remove the rubble and activated civil guards to evacuate nearby buildings and secure the accident site” (Singer, Natasha (2012), *I.B.M. Takes “Smarter Cities” Concept to Rio de Janeiro*, *NYTimes.com*, www.nytimes.com/2012/03/04/business/ibm-takes-smarter-cities-concept-to-rio-de-janeiro.html?_r... 1/8, p. 4).

⁶ Antunes, Julianna, op. cit., p. 1.

mensions of the traditional idea of economic development: more than the economic pillar, it is crucial to consider the social and environmental issues⁷. In this sense, Camargo states that:

In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are harmonic and enhance the present and future potential in order to meet the human needs and aspirations⁸.

Lustosa and Young⁹, highlighting the importance of incorporating social justice and environmental preservation to a more precise notion of development, adopt the concept of “centre-periphery” (developed for ECLAC researchers) to emphasize specific points of developing economies with respect to sustainability. Thus, they question the basic notion initially developed by Raúl Prebisch on ECLAC, arguing that “it is not «just» that the periphery should recover trajectories of growth above the world average, it is also necessary to answer deeper questions: Where to grow? (...) Why grow up? How to grow?”¹⁰.

The questioning is present both in terms of production and consumption dimensions. The industrialization model adopted in the periphery, based on the dynamics of import substitution, also determined the “import” of the pattern of production initially developed in the centre countries, heavily concentrated on the use of natural energy (with a substantial share of fossil fuels). As a consequence, one can see the rapid degradation of environmental conditions. Moreover, the adoption of this model was defined as a necessary step for a subsequent period of socioeconomic prosperity of developing countries, something like a “bill needed to be paid to get to Haven”. In this sense, the centre countries, pressured by social movements to adopt cleaner technologies, could improve this aspect of its productive structure (peripheral countries would be responsible for the dirty production).

With regard to consumption, however, the problem is even more complex. As Young and Lustosa point out:

⁷ Estender, Antonio Carlos; Pitta, Tercia de Tasso Moreira (2008), “O conceito do desenvolvimento sustentável”, *Revista Terceiro Setor*, UNG, Vol. 2, No. 1, 2008, Guarulhos (SP).

⁸ Camargo, Ana Luiza de Brasil (2003), *Desenvolvimento sustentável: dimensões e desafios* Papirus, Campinas, p. 43.

⁹ Young, Carlos Eduardo Frickmann; Lustosa, Maria Cecília Junqueira (2003), *A questão ambiental no esquema centro-periferia*, *ECONOMIA*, Niterói (RJ), v.4, n. 2, p.201-221, jul./dez. 2003.

¹⁰ *Ibidem*, p. 203.

The environmental issue is also related to the consumption patterns adopted by the periphery and similar to the centre. The pattern of intensive use of energy and environmental resources was widespread (...). Moreover, this pattern of consumption follows the same logic of exclusion, in which the richest are those who consume more goods intensive in emissions and the poorest are restricted to the consumption of subsistence products, which generally impose lower emissions per unit produced. If the centre found relatively successful to deal with the problem of industrial pollution, pollution derived of consumption is far from being resolved. The increasing need for energy (...) can only be overpassed with changes in energy basis. Even the adoption of alternative energy, healthier for the environment, can result in environmental damage if it does not give attention to the negative externalities they generate¹¹.

A key point emerges in the discussion. While the issue of environmental damage and inequality are more strongly felt in the peripheral countries, considering the history of insertion of these countries in the international labour division, the consumption pattern, in general, even in developed countries, is worse in terms of degrading environmental conditions. Even taking into account technological advances that have occurred, as the productive potential of electric cars, the use of natural resources is still a huge problem for the environment. In this case, it is not possible to simply “transfer” the problem of sustainability of central countries to peripheral countries directly – all countries are still hostages to this consumption pattern.

The current crisis experienced by most of the developed countries seems to further highlight this potential dilemma and therefore the viability of an effective basis of sustainable development. First, because the possible way out of the crisis is increasingly associated with consistent recovery of economic growth – even considering the “obduracy” of the orthodox economists preaching austerity as a means of overcoming the crisis. As Lara Resende points out:

There are only three ways to eliminate excess of debt. The first is a recession deep enough to break debtors and creditors and reset the stone. This is what happened in the 30's. The costs, as we learned, are unacceptable. The second is the monetization of debt. Taking time, while inflation reduces the real value of debt, but there is a risk of loss of control. As in the case of Germany of the 30s, the result can be a hyperinflation, even more devastating than the worst of the recessions. The third is the resumption of growth. As depression and inflation have unacceptable costs, only to return to growth is the solution, because it reduces the relative size of the debt. Growth is the only remedy, but before the indebtedness, as Keynes taught, to grow

¹¹ *Ibíd.*, p. 209.

again depends on the artificial stimulus to demand, via increased spending and public debt¹².

Decisions to stimulate growth as an alternative to overcome the crisis, however, do not represent, in this context, any change in production patterns and specifically consumption patterns. Thus, in reference to the work of Paul Gilding, "The Great Disruption" (2011), Lara Resende indicates that "it is quite possible that today, 80 years later, the Keynesian remedy can no longer be applied"¹³.

This is the hook for a second argument. If growth is fundamental, but its current basis is virtually exhausted, as supposed by Gilding's argument, what is possible to be done? As explained by Lara Resende:

Gilding's thesis is that the world economy will be forced to stop growing. As there was a transition early, not as we prepare for a stationary economy, we will have to face a sudden stop, deeply traumatic. The moment of awareness of the end of growth and the need for a profound reorganization of the economy is not far away. (...) Transition period will be long, hard and troubled. The reorganization of the economy will be compulsory and deep. Entire industries will disappear. The coal, oil and gas, quite before the end of the known reserves, will be the first. The Stone Age did not end because of the lack of stones. Gilding's optimism is about the end result of this procedure. The end of self-deception, the recognition of the limits of possibility cause extraordinary technological innovations (...). A population 40 times greater than that of all times, until the beginning of the Industrial Revolution, is only possible, however, with the end of economic growth as we know it. Growth based on increased consumption of material goods is in its final chapter¹⁴.

It is conceivable, however, that a change may occur in the consumption pattern that increase the weight of technology and more rational use of natural resources, as well as more systematic adoption of alternative energy sources, such as solar energy for residential use, or renewables. These possible paths already exist, but they are certainly far from being dominant and they collide, among other things, with the huge volume of investments still under constitution/depreciation in the dominant model of production/consumption. What seems clear, however, is the fact that the current model is exhausted – rationalization efforts, such as recycling and other procedures already in place, without effective transformation in the pattern of consumption, can temporarily postpone the limits, but do not show viable to ensure a resumption of sustainable growth.

¹² Lara Resende, André (2012), *Os novos limites do possível*, Valor, 20 jan., São Paulo, p. 5.

¹³ Idem.

¹⁴ *Ibidem*, pp. 6, 7.

Even considering the existing concerns about the physical limits of the environment (and actions implemented to detain this process), one can conclude that without structural change it is not possible to see a better future for the system.

CONCLUDING REMARKS

As discussed in this paper, considering the large and rapid advancement of urbanization and consequent swelling of the cities, the IBM “Smart Cities” objectives are to create a model of control and more efficient management, which contributes to the sustainability of these geographic spaces. To achieve these objectives, it is supposed that it is necessary to build a strategic plan for the cities that prioritizes and integrates systems and the operational mechanisms in order to optimize their functioning. The key requirement for that is to create a holistic view of the system components of the cities for their control and management.

However, although the idea of revolution is put in evidence, rather than evolution *sensu stricto*, it is clear that the model, in general, is not associated with necessary major structural changes in target areas. The maintenance of the infrastructure, for instance, appears as an essential feature of the program in order to turn it economically feasible (because of the costs of adopting the projects). Furthermore, the significant change in the patterns of production/consumption of the cities involved which expands the levels of use of public goods (such as energy, water, etc.) and natural resources it is not contemplated in any respect. This is true even when considering the importance given to the dimensions of knowledge and innovation in the conceptual foundations of the project. As an example, Dirks *et al.* briefly highlight this aspect, evaluating the importance of “Smart cities” to a “smart growth”:

growth, economic value and competitive differentiation of cities will increasingly be derived from people and their skills, creativity and knowledge, as well as the capacity of the economy to create and absorb innovation. To compete in this new economic environment, cities will need to better apply advanced information technology, analytics and systems thinking to develop a more citizen-centric approach to services. By doing so, they can better attract, create, enable and retain their citizens’ skills, knowledge and creativity¹⁵.

¹⁵ Dirks, Susanne; Gurdgiev, Constantin; Keeling, Mary (2009b), *Smarter Cities for Smarter*

Clearly, however, there is no vision of “transformation of the production function”, but a concept (not explicit) of possible increased levels of productivity due to higher levels of education and knowledge. If we consider the basis of the thesis of Gilding, even without accepting all the assumptions, as seen in the previous section, this may be a way (perhaps good and very efficient) only to prolong the survival of this model of society.

The ability to raise levels of efficiency in the management and control of complex systems in big cities is visible in the “Smart Cities” projects, as demonstrated by the success stories in large (and highly complex and sophisticated) cities (Singapore, Barcelona), and the possible implementation of these ideas in very complicated cities like Rio de Janeiro. That is already a high-profile role for the “Smart Cities” project.

BIBLIOGRAPHY

- Antunes, Julianna (2011), *Sustentabilidade nas cidades – IBM Smart Cities*, www.sustentabilidadecorporativa.com/2011/01/sustentabilidade-nas-cidades-ibm-smart.html.
- Brundtland, Gro Harlem (1991), *Nosso futuro comum: Comissão Mundial sobre Meio Ambiente e Desenvolvimento*, 2^a ed., FGV, Rio de Janeiro.
- Camargo, Ana Luiza de Brasil (2003), *Desenvolvimento sustentável: dimensões e desafios*, Papirus, Campinas.
- Dirks, Susanne; Keeling, Mary (2009), *A Vision of Smarter Cities: How Cities Can Lead the Way into a Prosperous and Sustainable Future*, IBM Institute for Business Value, IBM Global Business Services, New York.
- Dirks, Susanne; Keeling, Mary; Dencik, Jacob (2009a), *How Smart is Your City? Helping Cities Measure Progress*, IBM Institute for Business Value, IBM Global Business Services, New York.
- Dirks, Susanne; Gurdgiev, Constantin; Keeling, Mary (2009b), *Smarter Cities for Smarter Growth: How Cities Can Optimize Their Systems for the Talent-Based Economy*, IBM Institute for Business Value, IBM Global Business Services, New York.

Growth: How Cities Can Optimize Their Systems for the Talent-Based Economy, IBM Institute for Business Value, IBM Global Business Services, New York, p. 1.

- Estender, Antonio Carlos; Pitta, Tercia de Tasso Moreira (2008), “O conceito do desenvolvimento sustentável”, *Revista Terceiro Setor*, UNG, Vol. 2, No. 1, 2008, Guarulhos (SP).
- Guilding, Paul (2012), *O GLOBO* (04/02/2012), <http://oglobo.globo.com/economia/e-fim-da-economia-como-conhecemos-diz-paul-gilding-3882689>.
- Lara Resende, André (2012), *Os novos limites do possível*, Valor, 20 jan., São Paulo.
- Singer, Natasha (2012), *I.B.M. Takes “Smarter Cities” Concept to Rio de Janeiro*, *NYTimes.com*, www.nytimes.com/2012/03/04/business/ibm-takes-smarter-cities-concept-to-rio-de-janeiro.html?_r... 1/8.
- Young, Carlos Eduardo Frickmann; Lustosa, Maria Cecília Junqueira (2003), *A questão ambiental no esquema centro-periferia*, *ECONOMIA*, Vol. 4, No. 2, pp. 201-221, jul./dez. 2003, Niterói (RJ).