BARCELONA'S SMART CITY VISION: an opportunity for transformation

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KEYWORDS

- BARCELONA
- INFORMATION REVOLUTION
- TRANSFORMATION
- GOVERNANCE
- CITIZENS

Based on Josep-Ramon Ferrer's experience as director of Barcelona's Smart City Program, the article details the ten key factors of success that are essential to successfully transform cities into *smart cities.* The article underlines the unique opportunity that new technologies represent for cities to embark on a more sustainable path, by engaging citizens

INTRODUCTION

With the rapid urbanization of the world, the concept of "smart cities" has been gaining momentum in the international political agenda. The transformation of cities into digital cities brings along an incredible opportunity for improving citizens' welfare and fostering economic progress.

While cities represent more than half of the global GDP and 70% of energy consumption, and considering that over one billion people has moved to urban areas since 2000, it is clear that future urban planning and policy-making will have to focus on the role that digital technologies can play in order to transform cities and guarantee their livability and sustainable growth on the long term.

Undoubtedly, the 21st century will be the most fast-changing century in History. The fact that more data has been created in the last two years than ever before is quite revealing of this very rapid transformation. Of course, the 20th century represented a huge step forward with regards to demographics, industrialization, scientific and technological revolution, etc. Additionally, from an economic point of view, it embodied the acceleration of globalization and the development of capitalism. Yet, it was also characterized by a growing awareness of resource scarcity, an increasing pressure on the environment, the aggravation of wealth differentials, as well as higher concerns about how citizens can impact – positively or negatively – the world they are living in.

The 21st century started out with the UN Millennium Development Goals (MDGs) that sought to tackle the biggest social challenges the world was facing. In 2015, they were replaced by the Sustainable Development Goals (SDGs), which acknowledge that information, technology and Internet can play a significant role in achieving these ambitious goals. This undoubtedly confirms that the 21st century will be the century of knowledge. Every minute,

around the globe, 168 million mails are sent, 6,600 pictures are uploaded on Flikr and 100,000 tweets are posted.

This is a powerful transformation: Internet is actually changing our habits, the way we communicate, how we get together, and even how we see and experience the world. It has, inextricably, changed the way citizens organize their lives. As a direct consequence, Internet will have a radical effect on cities' organization and relationships with their citizens. Indeed, Internet will change the lives of people living in cities because it will change the way productive processes are organized, how economic transactions take place and even how citizens consume culture and leisure services for instance. One can already see some examples of those changes through the development of new services and apps at the city level. Yet, the challenge is still huge for many cities. As the architect Vicente Guallart puts it: "Internet has changed our lives, but it has not changed our cities yet[1]".

The information revolution, based on big data and Internet of Things (IoT), will nurture the development of digital cities: cities will operate as networks - so as to optimize their structure and scale - and information will be turned into knowledge.

1 Guallart, Vicente (2012), The self-sufficient city, Barcelona: RBA Libros S.A

1. THE INFORMATION REVOLUTION: AN UNPRECEDENTED OPPORTUNITY FOR DIGITAL CITIES

Contrary to common belief, what one calls "Smart City" or "Digital City" - or previously "Information Society", or even today "Internet of Things" - is neither a fashion, a project, a brand, nor a marketing concept, but a way to define, under the same concept, the outcomes of the information revolution. The Internet revolution - that has begun at the end of the 20th century - is indeed impacting all parts of the planet and all the dimensions of our lives.

At the same time though, one should understand that this revolution is not only about technology, or, to put it differently, that technology is neither the goal nor the final objective of this revolution. This revolution is about how we can get the most out of the new Internet-based technologies in a distributed knowledge and globalized network model, and build the cities of the future, taking all areas into consideration: economic, social, cultural and political.

The technology of the 21st century and its potential applications enable us to consider ambitious goals for digital cities. The information revolution indeed represents a unique opportunity to build more livable and socially fair cities, where citizens' lives can constantly be improved and where economic growth is created through innovation and new business-models. Hence, it will put our economies towards a more sustainable path, generating opportunities for all, and getting the most out of existing resources, in a self-sufficiency perspective. Again, this is not simply about technology: this is about politics, strategy and transformation.

If we do it well, digital cities represent a unique opportunity for us to transform the urban world we are living in.

We had this intuition in Barcelona, some years ago. We understood that Internet and new technologies were a unique and incredible opportunity to transform the city and to rethink every single aspect of it: logistics, energy, education, healthcare, infrastructure, city management, public space, housing, security, mobility, etc. in a holistic approach.

2. BARCELONA'S SMART CITY STRATEGY

In 2011, the City Council of Barcelona launched a new IT strategy to encompass a global transformational plan aimed at introducing the use of new technologies in an innovative way in order to improve the overall operation and management of the city, fostering economic growth and strengthening citizens' welfare.

This strategy was strongly aligned with the targets of the Horizon 2020, the European Union's strategy to improve its growth model for the next decade, and create a more sustainable, smart and inclusive path for development. Barcelona's strategy also responded to the challenges the city was facing regarding its own organization (Place), the integration of citizens (People), private companies (Private) and the local administration (Public).

The project indeed focused on replicable processes that bring the city closer to citizens through open data initiatives which offer valuable information to individuals and private companies. The City Operating System (City OS) for instance is a decoupling layer between data sources and

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smart cities solutions, within which different open source add-on modules can be added and connected with each other. The open data platform, Smart Citizen, is another example of replicable process implemented in Barcelona that can bring the city closer to its citizens. It is an open data platform designed to generate participatory processes in the city. By connecting data, people and knowledge, it serves as a node for building productive, open and distributed indicators and tools - hence enabling inhabitants to collectively build their own city. The purpose of Barcelona's smart city strategy was also to generate a sustainable city growth, by encouraging initiatives related to smart lighting, mobility (e.g. e-vehicle) or residual energy (e.g. heating and cooling networks) but also related to social innovation With the «Social Innovation for Communities» project for instance, the Barcelona City Council catalyzed the efforts of organizations, entrepreneurs and investors for the implementation of proven and successful international solutions to Barcelona's local context.

The implementation and promotion of alliances between private and public partners was also within the scope of Barcelona's smart city strategy. In fact, we facilitated alliances between companies like CISCO, IBM, Philips, SAP, Schneider and GDF Suez/ Engie amongst others, and research centres and universities such as i2CAT, CESCA, the Dublin Institute of Technology, business schools such as IESE and ESADE, and international organizations like the World Bank, the European Commission (through our participation at the European Innovation Partnership on Smart Cities and Communities) and the United Nations (UN Habitat).

The strength of Barcelona's smart city strategy relied on its cross-cutting approach. Indeed, the objective of the Barcelona City Council was to engage and keep all stakeholders connected, in order to ensure strong support from everyone and to foster innovation in a continuous way. Additionally, the city started working through a cyclic and cross-cutting innovation model, with all the departments of the City Council, in order to provide innovative and useful services to citizens - that they have progressively integrated into their daily habits in a flexible, continuous and agile way.

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3. LEARNINGS FROM BARCELONA'S EXPERIENCE: THE SMART CITY *DECALOGUE*

Based on the model and experience of Barcelona's smart city strategy, ten key concepts can help to improve, and perhaps simplify, the way smart cities will have to be designed in the future.

This "*decalogue*" summarizes the ten key success factors of tomorrow's digital cities:

1. Anticipate the 21st century's main challenge: fast-growing urbanization
2. Consider technology as a facilitator, not a goal in itself
3. Anchor the strategy into an ambitious transformational city project
4. Define a long-term vision
5. Define a clear action plan responding to local challenges
6. Define the action plan through a holistic and cross-cutting approach
7. Align the strategy with existing frameworks and funding schemes
8. Engage citizens in the process
9. Ensure an efficient governance model, integrating all key stakeholders
10. Build alliances: industry partnerships and ecosystem

3.1. ANTICIPATE THE 21ST CENTURY'S MAIN CHALLENGE: FAST-GROWING URBANIZATION

By 2050, 70% of the global population will live in cities. This growing urban population will put more pressure on cities, inducing more energy consumption (cities consume around 70% of global energy today), more resources to be allocated, etc. Cities will also face a growing concentration of economic activities. Currently, large cities alone make up 55% of economic output. In this new context, smart city management means ensuring citizens' quality of life, with new and more complex needs, and allocating resources efficiently. This is a big challenge but also a great opportunity to rethink the system and the type of cities we want to build in the future. Undoubtedly, technology plays a key role in it.

3.2. CONSIDER TECHNOLOGY AS A FACILITATOR, NOT A GOAL IN ITSELF

Smart city is strongly associated with technology. Indeed, technology plays a key role to rethink the way our cities are organized: it helps to gather information, to deploy efficient solutions and policies and to enable new communication channels relying upon big data, mobile technology, applications, cloud services, sensors, hyperconnectivity, 3D printing, etc.

However, technology should not be seen as a goal in itself. Technology is simply a *facilitator.* The purpose of data analysis is not to generate big amount of data. The ultimate goal – in fact, the only one that matters - is to help better decision and policy-making at the city level. Technology is at the core of the current smart city revolution, but most importantly, it represents a *tool* to govern and

organize our cities in a smarter way - particularly because it enables to engage and empower citizens, and make them participate in the policy-making process. All this results in more open, transparent and participatory urban systems.

3.3. ANCHOR THE STRATEGY INTO AN AMBITIOUS TRANSFORMATIONAL CITY PROJECT

Smart city should be consider as an opportunity to transform a city (like what happened in Barcelona with the 1992 Olympic Games for instance). Therefore, a smart city strategy should really be embedded into an ambitious "transformation" plan.

In this perspective, the current revolution that Barcelona is experiencing could be described as "*Barcelona 5.0*".

This revolution started with "*Barcelona 1.0*", which pretty much relates to the Roman period. Then came the medieval period – or "*Barcelona 2.0*" – with the building of the city walls, off to the 19th century's "*Barcelona 3.0*" with the Cerda Plan (current urban grid). Then, the post-Olympic "*Barcelona 4.0*" was about the expansion of the city center to the sea, the building of new infrastructures (ring roads, airport, etc.), and the inclusion of the city into a larger metropolitan area.

The last stage of this evolution is the new Barcelona that we are currently designing: "*Barcelona 5.0*" will be an inclusive, productive, self-sufficient, smart and innovative city, favoring communities and public spaces.

3.4. DEFINE A LONG-TERM VISION

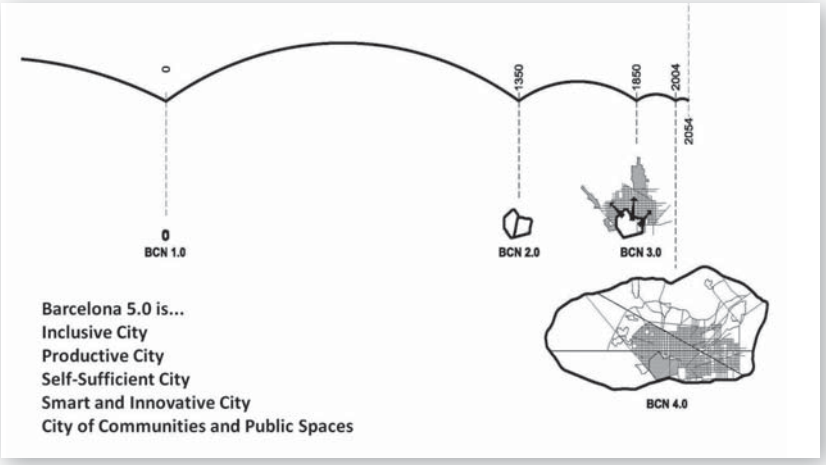
When designing a smart city, a long-term and ambitious vision is highly valuable. It must address the central question that is: what do we want to become, as a city, in 20 or 30 years from now?

In Barcelona, we defined the city's mantra as following:

> "*To become a self-sufficient city of*
> *productive neighborhoods at human speed,*
> *inside a hyper-connected zero emissions Metropolitan Area*".

3.5. DEFINE A CLEAR ACTION PLAN RESPONDING TO LOCAL CHALLENGES

At local level, all cities have specific idiosyncrasies. But at a more macro-level, all cities face more or less the three same challenges: citizens' welfare, economic growth and sustainability.



Barcelona Smart City's 22 programs

In this context, cities must advocate for a long-term vision that guarantees resources (in the present and the future), fair redistribution among people and welfare policies, relevant urban planning, and solutions to the environmental challenges. But then, the big question is how will cities be able to guarantee a balance between growth and sustainability in the long run?

In this context, it is important for cities to define overarching, ambitious long-term goals. But it is also very important to define local and specific short-term objectives and actions that will contribute to improve urban strategic planning, and, in the end, to achieve the longer-term vision. After identifying big challenges and opportunities for growth, job creation, activity development and welfare, cities have to design a clear action plan, with priorities and locally-customized solutions.

3.6. DECLINE THE ACTION PLAN THROUGH A HOLISTIC AND CROSS-CUTTING APPROACH

In Barcelona, our transformational city vision embraces all areas and corners of the city. Our smart city strategy proposed a holistic approach and vision of the city. This holistic approach has been declined into 22 programs (each one of them including different initiatives, projects and strategies), engaging all types of stakeholders: the public sector, the private sector and, of course, citizens. In our opinion, the sum of these 22 programs should be the basis of any digital city in the future.

3.7. ALIGN THE STRATEGY WITH EXISTING FRAMEWORKS AND FUNDING SCHEMES

In Europe, and more generally in the world, the use of Information and Communication Technologies (ICTs) has been widely stated as a way to improve policy-making. All major institutions agree on the fact that ICTs can help to overcome the challenges that current urbanization processes raise for cities. Therefore, many strategic policy frameworks, plans and even funding schemes have been implemented by different institutions (e.g. European Commission, European Investment Bank, Generalitat de Catalunya, Inter-American Development Bank, etc.) in order to help cities to address these challenges by relying upon ICTs and digital solutions.

Therefore, cities should try to get the most out of these existing funding schemes, policy frameworks and regulatory programs in order to facilitate and accelerate the execution of their projects. Thanks to these mechanisms, they can indeed have access to funding and many useful tools – particularly to measure and report their performance (economic and social returns on investment), which is very valuable, both in terms of continuous improvement of practices and communication.

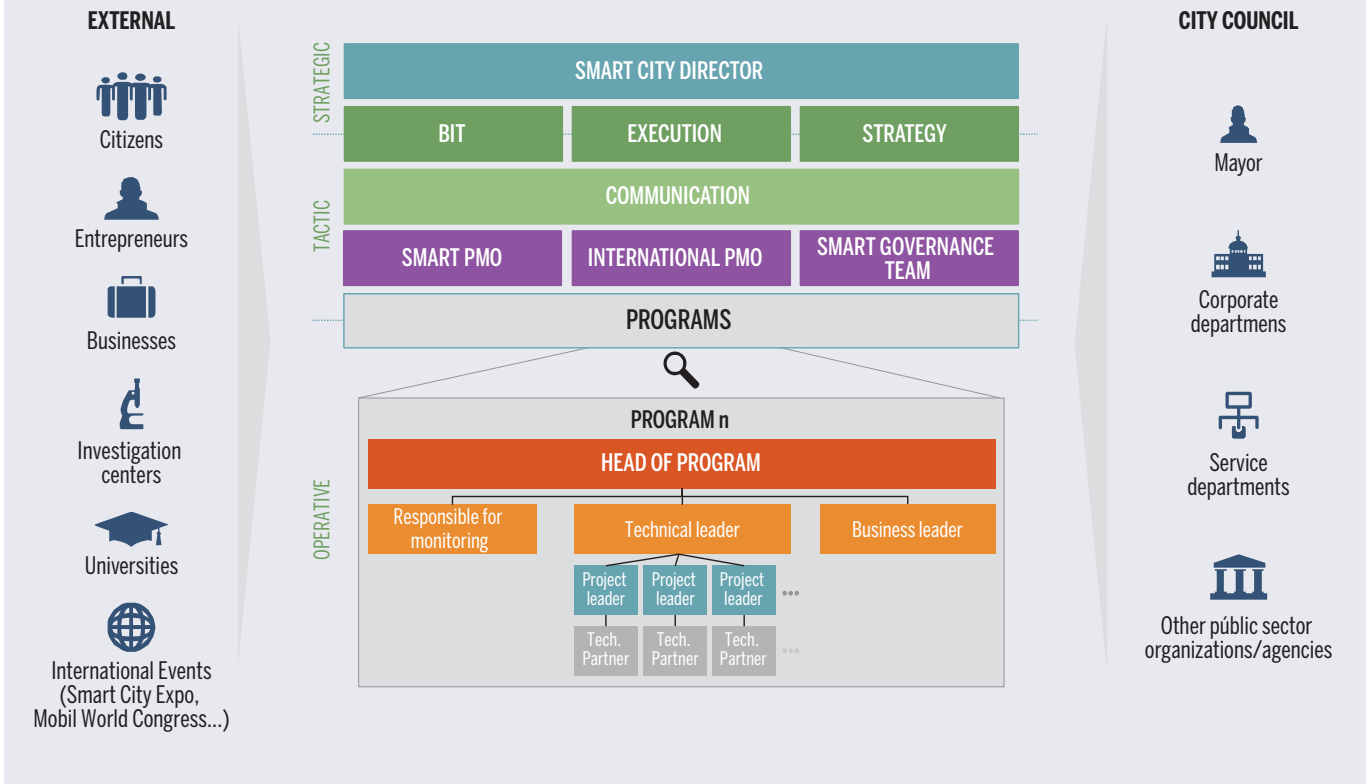
3.8. ENGAGE CITIZENS IN THE PROCESS

The premise is simple: "*no smart city without smart citizens*". Citizens play a key role in the development of smart cities. In Barcelona, we developed specific programs to encourage the adoption of citizen-driven innovation policies (e.g. implementation of "*Barcelona in your pocket*", a program that promote the development of mobile-supported apps and services related to Barcelona, or the development of municipal Fab Labs). In fact, this is thanks to this set of policies that we won the "*European Capital of Innovation Award*" by the European Commission in 2014.

Engaging citizens means doing everything in an open, inclusive and participatory way. It means engaging citizens in the definition of programs and making them participate in the execution and in the evaluation afterwards.

Smart government is about citizen participation and even more about citizen engagement.

Barcelona Smart City's governance model



"BARCELONA'S MANTRA: TO BECOME A SELF-SUFFICIENT CITY OF PRODUCTIVE NEIGHBORHOODS AT HUMAN SPEED, INSIDE A HYPER-CONNECTED ZERO EMISSIONS METROPOLITAN AREA."

3.9. ENSURE AN EFFICIENT GOVERNANCE MODEL, INTEGRATING ALL KEY STAKEHOLDERS

Identifying all stakeholders concerned by the implementation of the smart city policy's programs – be they public or private – and defining a model that integrates all of them, from citizens and other external stakeholders, to the different municipal management layers (strategic, tactical and operational) will result in a more efficient governance model and, in the end, in the generation of efficient and synergy-based ecosystems that will be able to develop relevant solutions.

The definition of a clear governance model will also result in a better coordination of the different "internal" players involved (e.g. municipality's departments), as well as external players. Finally, it will help to structure a model that will enable to define and manage priorities, to follow the achievement of the different objectives as well as the allocation of resources, and to integrate everyone's perspectives and actions.

3.10. BUILD ALLIANCES: INDUSTRY PARTNERSHIPS AND ECOSYSTEM

Cities, regions, and even countries are increasingly in competition in our globalized world. Cities in particular compete for the attraction of capital flows, investments, talents, etc. as well as on the quality of life and leisure activities offered to their citizens. Nevertheless, they all face similar challenges. Therefore, public-public and public-private collaboration should be strengthened.

In particular, we believe that standards should be developed in order to encourage industrial players to invest in the development of innovative services and products that can gain critical mass.

Additionally, the development of spaces dedicated to innovation (e.g. urban innovation labs), aimed at testing urban solutions developed by companies seems to be critical. Beyond playing a key role in encouraging companies to launch new products and services, these innovation labs also represent a way to engage citizens in the innovation process. Smart cities are mainly about lively spaces in constant evolution where anyone should be able to propose innovations to improve the organization of cities. In order to overcome the growing complexities of city management, cities will have to take advantage of every talent, and rely upon citizens' creativity. In this perspective, Barcelona has succeeded in becoming a neuralgic knowledge hub, where innovation has turned the city into a creativity center – encouraging entrepreneurship at every level.

CONCLUSION

Barcelona appears to be one of the most advanced cities in terms of digital transformation. The Barcelona City Council's experience provides key insights and learnings on how a smart city policy should be designed and implemented. The above Decalogue, which has been jointly developed by the City Council and the consulting company Doxa Innova&Smart, can help other cities to integrate digital technologies in order to transform and enhance the way they are organized and the way they engage citizens in order to respond to their needs and concerns.