BARCELONA’S SMART CITY:
The Frontrunner in Digital Transformation

Authors:
Viyasa Rahyaputra, Nabeel Khawarizmy Muna,
Nitya Saputri Rizal
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Introduction

Smart cities have paved the way for new methods of city management, by harnessing the potential of the Internet of Things (IoT) through the utilization of information and communication technologies throughout the city. By deploying responsive technologies across urban systems such as public transit, street lighting, parking, and waste management, it aims to increase the life quality of the inhabitants while providing sustainable development for the city.

Various cities around the world have undertaken smart city projects, with a few making notable success. In its four-year development, Barcelona has managed to turn the smart city concept into reality, making it one of the best performers globally. It boasts 122
projects classified into 22 programmes covering all areas of the city management, from public space and mobility to open government. This comes as an interesting achievement for the second largest city in Spain, since it was severely hit by the 2008 global financial crisis and the following Great Spanish Recession. So how, in the face of these challenges, has Barcelona developed its smart city programs?

**Development of Barcelona's Smart City**

Initial development began in 2012 when mayor Xavier Trias formed a team responsible for structuring the abundant smart city projects into a single coordinated system, called the *Smart City Barcelona*. This was a policy realization of his argument in the 2011 election campaign that Barcelona’s economic future would increasingly depend on digitalizing its public services. However at the time, Spain was at one if its worst recessions after failing to bailout its financial sector and having to apply for a €100 billion rescue package from the European Union.

The financial crisis was not a significant setback for Barcelona’s smart city programs, since the government already had the essentials needed to create a thriving startup environment. With millions of public funds after the 1992 Summer Olympics in Barcelona, the government had rebuilt one of its industrial areas and turned it into the city’s technological and innovation district called the *22@Barcelona*. This tech hub serves as a home for local, innovative tech companies that contributes in the development of Barcelona’s smart city projects.

Barcelona also has more than 310 sq miles of fiber-optic cables running throughout the city, when it networked two municipal buildings more than 30 years ago. These two existing tools eased the government in starting connectivity projects under *Smart City Barcelona*. The existing fiber-optics alone managed to cut the costs of the smart city programs heavily from what could have been €300 million to €30 million.

Investment towards Barcelona's grand smart city project began in 2011, when the
giant tech and networking company Cisco became one of the city’s technology provider. Cisco invested $30 million on a new center focusing on the Internet of Everything (IoE) for urban systems. Previously, the fiber-optic cables underneath the city was not used on optimal capacity, so the wireless telecommunication company Cellnex Telecom won the bid to integrate the services into one system under the company and have run the city-wide network ever since. Now, these two companies are the key technology providers of Barcelona’s smart city program.

**Barcelona’s Smart City Objectives**

Barcelona’s smart city is aimed at connecting people, information and city elements using new technologies to create a sustainable city, competitive and innovative commerce, and a better life quality with an accountable administration and good maintenance system (Bakici, 2012). It also aims at boosting cooperation between the government, people, and business area in order to create a knowledge society. Among the drivers of Barcelona’s smart city model are to foster the competitiveness of the city by promoting innovation, creating new channels of communication, facilitating access to information, and improving the efficiency of public services.
Barcelona's Strategy in Smart City Project

Barcelona was able to develop its grand smart city project thanks to successful implementation of its strategies. According to Julia Lopez, Coordinator of Barcelona’s Smart City Strategy team, the strategies were:

- Establishment of the Smart City Strategy team
  This team led Barcelona’s grand smart city project by promoting and coordinating smart city application development throughout the city organization and departments, with a select few officials in charge.

- Increased government transparency
  This component was one of the most vital in implementing smart city projects successfully. In a difficult economic crisis, transparency helped city officials communicate and explain their development of smart applications to its citizens. Transparency was important because it had increased public support, thus the government was able to address publicly sensitive issues and solutions.

- Political desire
  A top-down political desire to make the smart city work was crucial too. The strong desire held by the mayor and the Smart City Strategy team led to coordination across various city departments that was previously long and bureaucratic. It even managed to transform five different departments with its own network into a single IT department for greater efficiency and coordination.

- Partnership with other key stakeholders.
  Companies are needed to be involved in local smart city projects, since development cannot be done by the city government alone. A clear and carefully planned public/private partnership framework is necessary for this matter. This core strategy taken by the government of Barcelona mirrors the Public Private Partnership strategy in development (Leung and Hui, 2005). Barcelona teams up
with tech giants in bolstering the foundational IT infrastructures in the city, investing in sensors development, for example. Educational institutions, especially universities, also contribute to the formulation and execution of the smart city project, being consulted by the government in core aspects of smart city development.

- Use of open data (Open Data Project)

The Open Data Project has strengthened interaction between citizens and government officials of Barcelona, as it has provided transparency on government operations. It allows citizens to access real-time data collected by the city and see what are being accomplished. This strategy was also vital for communicating projects and initiatives to the public, and it can serve as a smart city training and engagement for the citizens.

**Smart City Features in Barcelona**

Barcelona is notably known as the hometown of prominent football club FC Barcelona. However, probably only few people would notice that Barcelona has also developed its reputation as World's Smartest City 2015, that followed by New York, London, Nice, and Singapore.
Barcelona has created a Smart City Personal Management Office (PMO) in which the projects belong, which coordinates all the projects in the city that are classified under the smart city tag. This has meant transitioning from isolated work to “transversal” work. Actions developed under Barcelona Smart City strategy lie on three axes: international promotion, international collaboration and local projects. This city has developed various outstanding smart city projects ranging from transportation to education.

1. **Apps4BCN**

   The first project called Apps4 BCN portal. It is an application that provides a virtual meeting point portal for people to look for apps and improve their experience of the city. This portal has created a network of experts coming from a range of different areas, from sports, art and culture to business and financial experts. This app certainly allows you to have Barcelona in your pocket, to live and enjoy the virtual mobile experience in Barcelona 365 days a year and also help to improve citizen's quality of life.

2. **Smart Transportation**

   The next project is developed to support Barcelona's city council program on sustainable transport. As the world's leading smart city, Barcelona aims at showing its commitment in becoming the frontrunner in the utilization of renewable energy, particularly on transportation. This commitment has materialized in the implementation of the Electric Vehicles to minimize the environmental impact of public transportations and to improve citizens’ quality of life by providing clean and high quality air, water and sunlight. Barcelona city council intends to transform its mode of transportation from conventional vehicles into electric vehicles which have more energy efficiency and produce less pollution.

   In practice, Barcelona has built several infrastructures to support its smart transportation project. In order to support the citizen on using Electric
Vehicles, Barcelona has built 300 free, public charge points and 180 additional points in municipal car parks distributed across the city. Barcelona has also installed smart parking technology as well as smart streetlights, and sensors for monitoring air quality and noise. Nevertheless, this Smart City has also developed smart traffic light system designed to help the blinds to use the zebra cross. The system involves a remote control device which activates the audio mode to emit a sound to give a signal when the light turns green. In addition, this system has developed further to help the fire department controlling the traffic lights system in order for them to reach their destination as quickly as possible.

The next outstanding smart transport infrastructure is Smartquesina or the interactive bus stop. This is not an ordinary bus stop, in fact this is a sustainable bus stop designed with the new smart technologies. This bus stop has everything you need while waiting for a bus. It has WiFi connection, USB ports allowing people to charge their mobile devices, and an interactive touchscreen device using solar panel that provides the information on bus schedule and other additional city informations.

3. Smart Education

Barcelona not only developed smart transport system, this city also developed a smart education system that focused on the development of the Smart City Project. The project called Smart City Campus enabling supportive environment for business companies, research centers, and universities to promote synergies and generate urban laboratory. In this project, Barcelona establish a cooperation with some high innovative companies such as Cisco, Telefonica, Abertis, Agbar, and Schneider Electric to promote Smart City Campus, which located in an area called 22@ central park, in a district of Poblenou of Barcelona. This project aims to convert Barcelona into a laboratory of innovation and experimentation of Smart City. In addition, this collaborative project will focus on
the development of businesses, universities, entrepreneurship, ICT Research Center, ecology and urban planning. In the future, this project collaboration would be expected to make Barcelona as a leader in exploring new technological possibilities for serving the city and its people. On the other hand, the smart city campus represents a magnet of attraction and generation of knowledge in the new urban development model. It aims to create a favorable environment to foster relations between companies, institutions, universities, technology research centers, and business incubators.

4. Smart Governance

It is important to notice that Barcelona would like to share their experiences in developing smart city projects with other cities across the world, along with business companies, university, and industry. Barcelona perceive dialogue as an important tool in spreading learning process and maximizing the benefit and value of their work. The next important thing that people need to know about Barcelona Smart city is their e-government program. Barcelona has an open data portal called Open Data BCN. Its main function is to open up city database to the public. The open data not only aimed to increase transparency of this city governance. It also aimed to provide and universalize open data access in order to reach all of the players in society, from its citizen, business, institutions, and universities. With this access, these players can utilize the data to create services and develop applications. It also helps the players to analyze society's needs, reinforce the open data initiative and promote the reuse of these public data and as a tool to improve economic growth.

Lessons Learned for Indonesia

There is no “one-size-fits-all” blueprint for cities to create a well-developed smart city. However, we can look at specific countries and their cities, and suggest what can be done
by looking back at the lessons learned from Barcelona's outstanding smart city implementation. Several derivatives can be obtained as a reflection for Indonesia's very own smart city agenda. Such things may be compressed into these two major points.

1. **Strong Political Commitment**

   If we take a closer look, Barcelona has achieved significant success in paratining their political commitment, and translating them into actionable strategies. This is what Indonesia's cities need to take into account, as most of smart city development projects only end as expendable agenda, thrown into wastes. With strong commitment, resources gathering might be a lot smoother, as the country essentially possess what it takes to start constructing our own smart cities.

2. **Continuous Engagement of Relevant Stakeholders**

   One important lesson that can be taken from the case of smart city agenda development everywhere in the world is that smart city is not a government-only agenda. Involvement of other parties, especially educational institutions (universities, higher institutions) and business players, mirror the concept of triple helix cooperation in development; and this seems to remain as a core element in the smart city development agenda. Inputs from these two institutions may result in a more tangible development and future implementation of smart city for the improved quality of life of the citizens. Indonesia certainly has a lot to work on this sector, as smart city projects are oftenly transformed into a gold mine for corruptive bureaucrats. Increased engagement from external parties in relevant involvement may re-nourish the check and balance system in the whole smart city agenda; significantly paramount for the future of Indonesia's smart cities.

### Conclusion

The success of Barcelona in developing their own smart city is the result of valuable cooperations forged by relevant stakeholders; the government, private, and academic
institutions. Besides, the political commitment of the government to take into account the necessary precautions on smart city is also a determining factor leading to its success. Coupled with resourceful ecosystem, the city is able to generate significant and evident change in the delivery of services to its citizens, especially in the attempt to improve the life quality of its citizens; as what a smart city is supposed to offer.

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Center for Digital Society
Faculty of Social and Political Sciences
Universitas Gadjah Mada
Room BC 202, BC Building 2nd Floor,
Jalan Socio Yustisia 1
Bulaksumur, Yogyakarta, 55281, Indonesia

Telepon : (0274) 563362, Ext. 116
Email : cfds.fisipol@ugm.ac.id
Website : cfds.fisipol.ugm.ac.id