

# THE ANALYSIS OF SMART CITY CONCEPT IMPLEMENTATION AND ITS INFLUENCE ON CITY DEVELOPMENT

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## Abstract

We live in a world where every second individual is a city resident. The cities play a significant role in the worldwide economy. According to the report of the United Nations Organization, in 2050 about 67 per cent of the world population will live in the urban territories that is 15 per cent more than in 2014. In order to respond to this tendency, the focus on smart and sustainable urban planning is increased amongst the scientists, urban planners and policy makers. The growing demand for smart cities and smart urban planning appears from the steady increase of the information technologies and is caused by the following factors: global financial crisis, climate change, urban areas growth, population growth, cultural globalization. Obviously, that smart and sustainable planning makes cities and regions more favorable for a living and more competitive. Each city that decides to implement smart approaches are implement them in different ways and the outcomes are different as well. At the same time, there are controversial opinions about “smartness” and the most common is that smart technologies are penetrates in city dwellers private life. Thus, debates on smart and sustainable cities and regional planning must, first of all, give the direction to those who are involved in city managing: academics, researchers, managers, public officers, city planners, politicians - to develop cities and make them more sustainable and comfortable by applying innovative technologies by excluding negative influences on people.

**Key words:** Smart city, city development, socioeconomic development, city management, urban planning, sustainability.

**JEL Code:** O21, O22, O57.

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## Introduction

Nowadays, the Smart city still seems to be one of the main city strategy focuses of the governments all over the world. This is the most apparent in the advanced countries, which

faced a huge amount of complex infrastructural and social problems. Smart cities are being implemented in Europe, Asia, and America. In order to improve the quality of life, all over the world people require their city governments to provide the comfortable and modern urban environment. An additional factor that has an influence on the citizens' quality of life is the ecological impact of the rising, more technologically induced cities, which can only be solved by decreasing level of environmental pollution and with the prudent managing of natural resources. Moreover, a Smart city becomes more economically effective, competitive and attractive, i.e. according to the Cisco report, "Barcelona annually saves \$58 million through water management technology, and the parking management system brings the city \$50 million. The Barcelona city council reported that 47,000 new jobs were created through the work of the "Smart City" program" (Cisco, 2017). The huge interest in the Smart city concept has grown since 2009 due to crisis and the need in economic development. "At that moment, many cities understood and felt a high competition with the other cities, regions, and countries for investments, and human capital" (Harrison, Donnelly, 2017). As R. Florida (Florida, 2007) wrote in his book "The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community, and Everyday Life ": "The idea that the world is flat, that is, there are equal opportunities for all people, regardless of where they live, is a beautiful dream. In fact, our world is sharp, and it is more and more characteristic for people to be divided according to economic opportunities and geographical location" (Bakici et al., 2012).

Talented people, who create, innovate and develop economy aspire to live and create in places where conditions are conducive to it. The aim of the government is to create such conditions. In recent years, the tag Smart city has been spreading all over the world, and affect considerably on cities strategies and regions. There are many definitions of "Smart city" considered by many authors. According to the definition used by C. Harrison et al. (Harrison, 2010), a Smarter city means the city in which "connecting the physical infrastructure, the IT infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city ". Bakici et al. (Bakici, 2012) offered the following definition: "Smart city as a high-tech intensive and advanced city that connects people, information and city elements using new technologies in order to create a sustainable, greener city, competitive and innovative commerce, and an increased life quality".

Based on the research, the authors propose a definition of the Smart city as follows: a Smart city is the synergy of a comfortable urban environment which allows using stakeholders' resources (i.e. time, money) effectively, making life in a city more comfortable, safer and ecological, as well as its development more sustainable and economically efficient.

## **1 The practice of Smart city concept implementation in European cities**

This research includes the investigation of case studies of three European cities with the different levels of economic development and dimensions, which have implemented a Smart city project and analysis of influence Smart city agenda on city performance. The research is based on the secondary data review (i.e. articles, reports) related to the practices of Smart city concept implementation in European cities as Amsterdam, Barcelona, and Vilnius. We also used primary data collected via online contacts with the project teams. These cities are chosen as they are the most famous samples of Smart city concept implementation practices and are the pioneers in the concept implementation. We have chosen these three cities as they are the most relevant for the aim of our research.

In order to assess the results of the Smart city concept approaches, the research provides a comparative assessment based on CIMI Ranking developed by IESE Center for Globalization and Strategy (Citiesinmotion, 2017). Authors chose this method as it is the most comprehensive and relevant to the aim of the research.

### **1.1 Amsterdam, Netherlands**

The Amsterdam Smart city project called “Amsterdam Smart City programme” started in 2007 and it focuses on 7 dimensions: smart mobility, smart living, smart society, big and open data, smart areas, smart economy and smart infrastructure. Brokaw (2016) noticed that "Amsterdam is the earliest and the most successful example of Smart city concept implementation. This success is demonstrated with the multiple awards that the city has received during recent years".

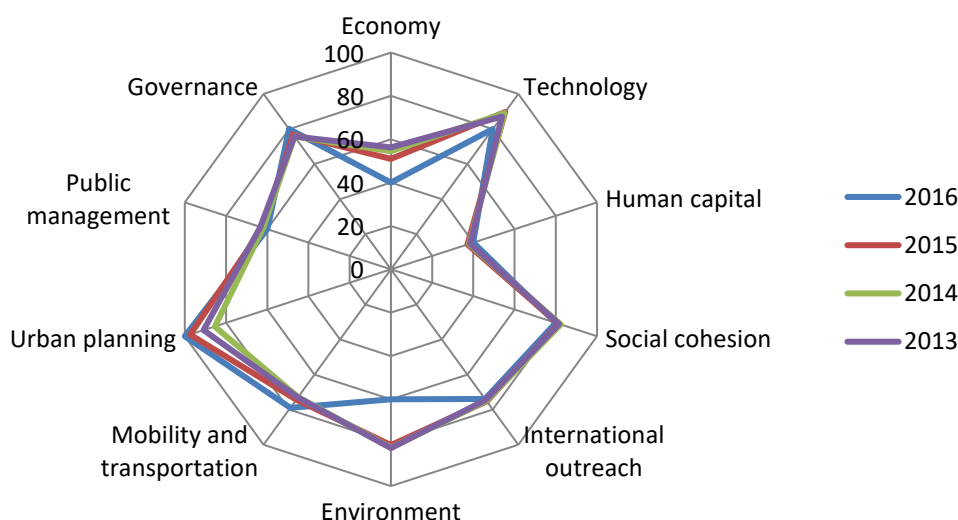
The project creation started with the collaboration of three organizations: the Amsterdam Innovation Motor (AIM) that was created one year before in order to defend and develop Amsterdam as "a knowledge-based economy" (Lawrence, 2016); the energy-network operator Liander, and the City government. Bisello noticed that "their initiative has been supported by both political commitment and a clear motivation: "to use ICT for helping the city to solve its environmental problems and build an urban environment that is “definitely sustainable” (Bisello, 2015). The “Amsterdam Smart City programme” is a strategy that looks forward to 2025 and its ultimate goals are: "(i) to support the reduction of energy wastage and carbon-dioxide emissions in the metropolitan area of Amsterdam; (ii) to promote sustainable economic growth based on technological innovation, taking advantage of the possibilities

offered by ICTs and changing citizens' behaviors to induce more sustainable life styles" (Mora, Bolici, 2016). Technology has been recognized as one of the main opportunities to tackle the ecological problems, and, moreover, the Smart city concept has become an opportunity to attain the strategic aims defined by the city council faster than supposed earlier. (Baron et al., 2012). Moreover, four key parameters have been identified for directing the development of the strategy and individual projects. The first one is the collective effort - public-private-people partnership, where collaboration between the public and private sectors is constantly provided. The second one is the economic feasibility, which means that only the most prospective projects can be offered for the further development. Thirdly, technological market is the parameter, which supposes the activities against the climate change to be supported by technological innovation and to inspire the change of residents' behaviour. Finally, knowledge and experience expansion obtained during the way towards the smart city developing (Mora, Bolici, 2016).

The Amsterdam Smart City Foundation was created for project development and its proper implementation. (Baron et al., 2012). Moreover, it is important to note that the Amsterdam smart city strategy is managed with a dynamic approach. Mora and Bolici (Mora, Bolici, 2016) mentioned that "the various stages are never definitively closed but are subjected to a continuous process of review and adjustment aimed at improving the structure and functioning of the strategy". Finally, the constant communication and knowledge sharing represent a continuous activity proposed by the Smart City concept. "The aim is not only to inform but also to encourage the creation of new collaborations" (Bisello, 2015).

In order to assess the city development performance the City in Motion Index (CIMI) Ranking is used in this research. To determine the index, 79 indicators are used across 10 dimensions: Economy, Technology, Human capital, Social cohesion, International outreach, Environment, Mobility and transportation, Urban planning, Public management, and Governance. According to it, in 2017 Amsterdam has 10 positions amongst 181 cities. The Amsterdam CIMI ranking presented in Figure 1 with the detailed information in Table 1.

**Fig. 1: Amsterdam CIMI Ranking 2013-2016**



Source: IESE Cities in Motion Index, 2017

**Tab. 1: Amsterdam CIMI Ranking 2013-2016**

Indicator	2016	2015	2014	2013
Economy	40	50.9	54.5	56.3
Technology	80	89.7	89.1	87.1
Human capital	40	37.1	37.9	38.3
Social cohesion	80	81.2	82.4	81.6
International outreach	74	75.3	75	74.4
Environment	60	81.1	82.3	82.5
Mobility and transportation	79	74.3	72.8	73.1
Urban planning	100	97.4	85.4	90.9
Public management	60	62.2	62	63.3
Governance	80	76.9	75.7	75.8
<b>CIMI</b>	<b>82.86</b>	<b>90.3</b>	<b>88</b>	<b>89</b>

Source: IESE Cities in Motion Index, 2017

It can be noticed that the Amsterdam CIMI has a fluctuation dynamics from 2013 to 2016, with the maximum level at 90.3 in 2015. The fluctuation was caused by considerable decrease of the economy and the environmental indicators, while transportation, urban planning and governance indicators showed the increasing trend.

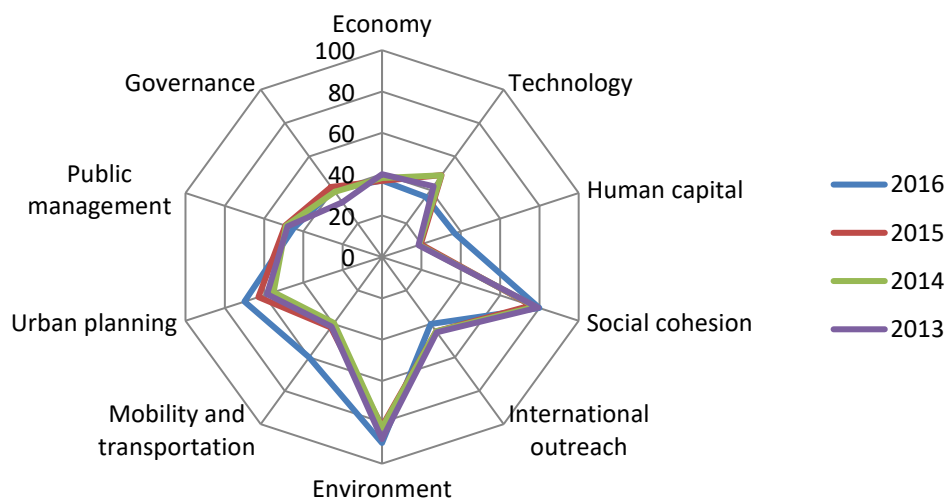
## 1.2 Vilnius, Lithuania

Vilnius Smart city project has started since 2013 and it focuses on smart mobility and smart technology. Three key ministries manage Vilnius' Smart city concept: Ministry of Transport and Communications, Ministry of Energy and Ministry of Environment (Pleckaitis A., Nedzveckas A., 2016). The main responsibility of these ministries is to define the main

criteria and project funding requirements for project selection, evaluation, and monitoring. One of the benefits of Vilnius Smart city concept is the fact that academic institutions are also included in the process of Smart city agenda implementation. In order to establish collaboration with the city stakeholders and involve them into the concept implementation, the communication platform called "Code for Vilnius" was created as well. According to CIMI, Vilnius took the 71 place in 2017 (Figure 2, Table 2).

The increase was caused by the positive trend in human capital, urban planning, transportation, social cohesion, and environmental factors. The Economy index had a fluctuation dynamic with the maximum point at 40 in 2013 and minimum at 36.8 in 2015. The economic instability led to the situation that the city municipality drives its' emphasis on cost effectiveness and the fast economic return of smart city-related and other initiatives.

**Fig. 2: Vilnius CIMI Ranking 2013-2016**



Source: IESE Cities in Motion Index, 2017

Vilnius CIMI showed an increasing trend from 2013 to 2016 with the only drop in 2014.

**Tab. 2: Vilnius CIMI Ranking 2013-2016**

Indicator	2016	2015	2014	2013
Economy	37	36.8	38.2	40
Technology	36	48.9	48.8	42.3
Human capital	37	19.6	18.8	18.5
Social cohesion	80	75.9	77.9	79.4
International outreach	40	44.5	44.5	45
Environment	90	81.9	82.6	88.1
Mobility and transportation	60	42.2	39.6	41.6
Urban planning	70	62.9	55.2	58.5
Public management	45	49.2	48.9	48
Governance	40	41.8	38.9	32.6
CIMI	65.44	64.4	62	63

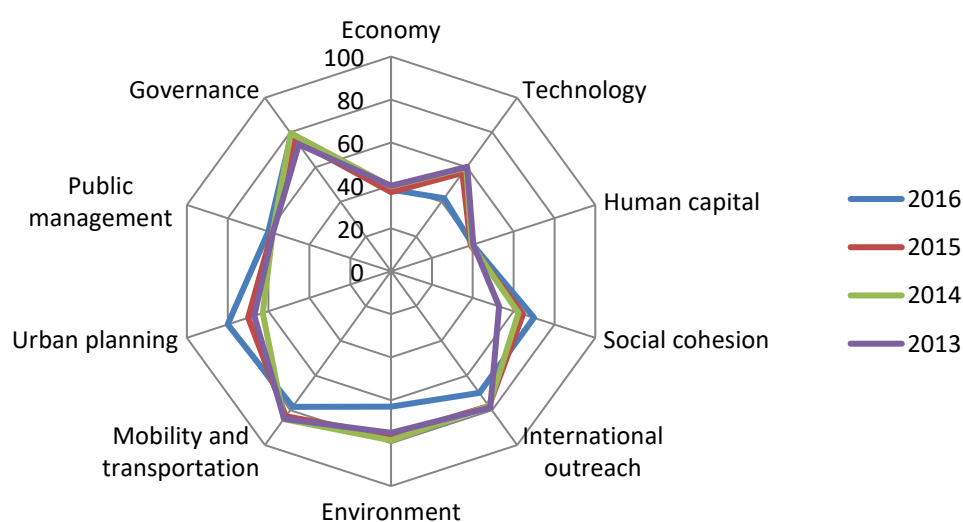
Source: IESE Cities in Motion Index, 2017

### 1.3 Barcelona, Spain

The city of Barcelona is at the forefront of Smart cities. The Smart city project was launched in 2012 and the concept focused on open government and open data. The Barcelona Smart city concept was outlined in the strategy as follows: “a self-sufficient city, made of productive neighborhoods at human speed, inside hyper connected metropolis, of high speed and zero emissions” (GOV.UK, 2013, p.36).

The conceptual model of the Smart city in Barcelona consists of three layers: people, information, city structure. As well, actions developed under the Barcelona Smart city concept lie on three axes: international promotion, international collaboration, and local projects. (GOV.UK, 2013). According to the ranking, Barcelona took the 35 place in 2017 (Figure 3, Table 3).

**Fig. 3: Barcelona CIMI Ranking 2013-2016**



Source: IESE Cities in Motion Index, 2017

Barcelona CIMI had shown the growth before 2016. In 2016 the index decreased by 4 points, from 78.10 in 2015 to 74.10 in 2016. This dynamic was caused by decreasing technology, international outreach, transportation, and environment indexes. Conversely, economy, social cohesion, urban planning, and governance indicators increased in 2016.

**Tab. 3: Barcelona CIMI Ranking 2013-2016**

Indicator	2016	2015	2014	2013
Economy	38	36.9	39.5	39.9
Technology	42	56.6	59.6	60.2
Human capital	40	39	39.5	40.3
Social cohesion	70	64.6	62.4	52.9
International outreach	70	77.6	77.5	78.5
Environment	63	76.5	78.7	75.2
Mobility and transportation	78	83.5	85.1	84.8
Urban planning	80	70	62.8	67
Public management	60	58.4	58.1	57.9
Governance	79	75.6	79.5	73.1
CIMI	74.10	78.10	77	76.2

Source: IESE Cities in Motion Index, 2017

To summarize, the highest CIMI Ranking has Amsterdam, while the lowest one is Vilnius (see Table 4).

**Tab. 4: CIMI Ranking of Amsterdam, Barcelona and Vilnius, 2013-2016**

CIMI	2016	2015	2014	2013
Amsterdam	82.86	90.3	88	89
Vilnius	65.44	64.4	62	63
Barcelona	74.10	78.10	77	76.2

Source: IESE Cities in Motion Index, 2017

However, compared to other two cities Vilnius shows the steadily increasing trend. Collaterally, it could mean, that city management policy in Vilnius is also efficient.

## Conclusion

Based on the research of European cities, it becomes obvious that different cities have different approaches and ways of Smart city concept application. Nevertheless, they declare the identical aims – to make the life in the city more comfortable, make a city safety and environmentally friendly, and economically efficient.



The success of the Smart city concept implementation depends on different factors. By exploring the practice of Barcelona, Amsterdam and Vilnius we can make the following conclusions:

Firstly, the success of the project mostly depends on political willpower and strongly motivated team, as it is the fact that the government is the initiator and major stakeholder of Smart city project.

Secondly, communication has a significant importance. It allows to attract residents in the project implementation, understand their needs and change the behavior and attitudes to the city challenges. Moreover, it allows to share and transform experience to other cities that it is a powerful marketing instrument.

Thirdly, almost all cities have the similar issues, but the scale is different. The success of the project implementation depends on the city's resources, including the political, financial, and technological resources.

Fourthly, the project team, which focuses on the project implementation only, and which is independent from the city government, but working with the close collaboration with them and other stakeholders can provide the success of the project, its flexibility, and efficiency (i.e. Amsterdam case). The progress of the project should be minimally dependent on political situation since the ultimate goal is to create a comfortable environment for citizens.

Finally, careful planning with the development of a road map, which can provide a clear understanding of what the city needs, what to do, which performance indicators to apply is also crucial. Smart people create Smart cities, so it is very important to promote the Smart city concept ideas amongst the residents. The advertising campaign can be used. It is necessary to instill them a desire to make the city beautiful, clean and convenient for life. Each city has their own vision, strategy, needs and the city should choose their own way in the city development. The success depends on the careful goals, resources assessment, and constant concept implementation.

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