

The World's Smartest Cities in the Metropolitan Century

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Abstract

As humanity entered in the so-called "metropolitan century", the smart city has become a topic of interest both for researchers and practitioners worldwide. In the age of globalization, smart cities are in a fierce competition for tourists, companies, technology, and human talent. Smart cities are increasingly seen as complex places that involve a multidimensional approach. Thus, the smart city subject lies at the border of several domains such as urban planning, architecture or business. The paper aims to define the concept of smart city and to present the evolution of the world's smartest city in recent years. It illustrates the way smart cities are assessed according to a specific index, Cities in Motion Index. The paper shows that the world's smartest cities were from Europe and the United States of America in the period 2014-2017.

Key words: smart city, Cities in Motion Index, urbanization

J.E.L. classification: R00

1. Introduction

The past decades have witnessed the emergence and development of smart cities. As humanity entered in the so-called "metropolitan century" (Organisation for Economic Co-operation and Development, 2015), the smart city has become a topic of interest both for researchers and practitioners worldwide. The fast-paced urban growth has increased the demand for intelligent solutions (Olszewski et al., 2018) and favored the implementation of the smart city concept on a global scale, but especially in the advanced countries. It is said that cities have started to embrace this concept "due in part to urbanization growth; an increase in energy and resource demands; a "smart" population with high-technology needs; and an infrastructure desperately in need of repair and renovation" (Galati, 2018, p. 17). In the age of globalization, smart cities are in a fierce competition for tourists, companies, technology, and human talent (Gascó-Hernandez, 2018).

Smart cities are increasingly seen as complex places that involve a multidimensional approach. From a social point of view, they constitute arenas of human and organizational interaction (Smith, 2003). From an economic perspective, smart cities are centers for economic activities, value creators (Dameri et al., 2014) and part of the transition towards a digital economy (Deloitte, 2015). From an environmental point of view, they play a key role in reconciling development with sustainability. From a technological point of view, smart cities use technology in all their activities such as data analytics or cybersecurity (Ernst & Young, 2016).

Thus, the smart city subject lies at the border of several domains such as urban planning, architecture or business. The paper aims to define the concept of smart city and to present the evolution of the world's smartest city in recent years.

2. Theoretical background

The smart city panorama seems to be confused as there is a plethora of definitions (Vidiasova et al., 2017). Within a broad stream of research the concept of smart city is considered as:

- “a city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens“ (Hall, 2000, p. 634).
- “the use of Smart Computing technologies to make the critical infrastructure components and services of a city — which include city administration, education, healthcare, public safety, real estate, transportation, and utilities — more intelligent, interconnected, and efficient” (Washburn et al., 2010, p. 2).
- “a well defined geographical area, in which high technologies such as ICT, logistic, energy production, and so on, cooperate to create benefits for citizens in terms of wellbeing, inclusion and participation, environmental quality, intelligent development; it is governed by a well defined pool of subjects, able to state the rules and policy for the city government and development” (Dameri, 2013, p. 2549).

In other words, smart cities are cities that “have a high quality of life; those that pursue sustainable economic development through investments in human and social capital, and traditional and modern communications infrastructure (transport and information communication technology); and manage natural resources through participatory policies” (Thuzar, 2011, p. 96).

In spite of the heterogeneity of definitions proposed by various researchers, some key characteristics of a smart city can be outlined. First, it embeds and integrates technology in all its processes, operations and activities. Second, a smart city better exploits its resources and makes its critical infrastructure components more interconnected and intelligent. Third, it provides a high quality of life to its citizens and makes significant investments in public services (e.g., education, healthcare, transport). Fourth, a smart city is committed to achieving sustainable development goals.

3. Methodology

The research methodology was based on a quantitative research method. Analysis, synthesis and benchmarking were also used during the research. In order to collect the secondary data the authors carried on a comprehensive literature review. In this respect, they reviewed articles, reports and books from several domains such as human geography, urban planning, computer science and business. The sources were found both in libraries and electronic databases (e.g., Springer, Sage).

4. Findings

In 2014, IESE Business School, University of Navarra, launched the Cities in Motion Index (CIMI) in order to evaluate the performances of the world’s smartest cities. Since then, the Spanish business school has published yearly a report on CIMI, which assesses the cities by taking into account 10 important dimensions (human capital, governance, urban planning, public management, the environment, technology, international outreach, social cohesion, mobility and transportation, and the economy) and 68 indicators (Table no. 1).

Table no. 1 Dimensions and indicators of CIMI

No.	Dimension	Indicators
1.	Human capital	<ul style="list-style-type: none"> - higher education; number of universities - business schools - movement of students - museums; art galleries - expenditure on leisure and recreation
2.	Social cohesion	<ul style="list-style-type: none"> - ratio of deaths - crime rate - health index - unemployment rate - Gini index - price of property - ratio of female workers - peace index
3.	Economy	<ul style="list-style-type: none"> - productivity - time necessary to start a business; ease of starting a business - number of headquarters - percentage of people at early business stage; entrepreneurs - gross domestic product
4.	Public management	<ul style="list-style-type: none"> - total tax rate - reserves; reserves per capita - embassies - Twitter users - sales tax
5.	Governance	<ul style="list-style-type: none"> - strength of legal rights index - corruption perceptions index - functions of the innovation department - range of government Web services - open data platform
6.	Environment	<ul style="list-style-type: none"> - CO₂ emissions; CO₂ emission index - methane emissions - percentage of the population with access to the water supply - PM_{2.5}; PM₁₀ - pollution index - environmental performance index
7.	Mobility and transportation	<ul style="list-style-type: none"> - traffic index; number of road accidents - inefficiency index - metro - flights - means of transportation - index of traffic for commuting to work - bike sharing
8.	Urban planning	<ul style="list-style-type: none"> - percentage of the population with access to sanitation facilities - number of people per household - bicycle shops; cycling - architects
9.	International outreach	<ul style="list-style-type: none"> - number of international tourists - number of passengers of an airline - hotels - sightsmap - number of conferences and meetings
10.	Technology	<ul style="list-style-type: none"> - number of broadband subscribers; broadband - IP addresses - Facebook - mobile phones; smartphones - quality of Web services - innovation index - Wi-Fi hot spot

Source: (Berrone et al., 2017)

In 2014, the CIMI was calculated for 135 cities, representing 55 countries of the world. Tokyo obtained the highest score, followed by London and New York (Table no. 2). From a geographical point of view, Europe held the first position with six cities out of ten.

Table no. 2 The world's smartest cities in 2014

Ranking	City, country	CIMI
1.	Tokyo (Japan)	100.00
2.	London (United Kingdom)	84.36
3.	New York (United States of America- USA)	81.25
4.	Zurich (Switzerland)	79.94
5.	Paris (France)	79.11
6.	Geneva (Switzerland)	75.61
7.	Basel (Switzerland)	70.91
8.	Osaka (Japan)	68.76
9.	Seoul (South Korea)	68.27
10.	Oslo (Norway)	68.00

Source: (Berrone et al., 2014, 17)

In 2015, the CIMI was calculated for 148 cities, representing 57 countries of the world. London obtained the highest score, followed by New York and Seoul (Table no. 3). From a geographical point of view, Europe held the first position with six cities out of ten.

Table no. 3 The world's smartest cities in 2015

Ranking	City, country	CIMI
1.	London (United Kingdom)	100.00
2.	New York (United States of America)	92.24
3.	Seoul (South Korea)	88.47
4.	Paris (France)	87.69
5.	Amsterdam (Netherlands)	85.05
6.	Vienna (Austria)	84.78
7.	Tokyo (Japan)	84.15
8.	Geneva (Switzerland)	83.85
9.	Singapore (Singapore)	83.37
10.	Munich (Germany)	83.21

Source: (Berrone et al., 2015, 21)

In 2016, the CIMI was calculated for 181 cities, representing more than 80 countries of the world. New York obtained the highest score, followed by London and Paris (Table no. 4). From a geographical point of view, Europe and USA held the first position with four cities out of ten each of them.

Table no. 4 The world's smartest cities in 2016

Ranking	City, country	CIMI
1.	New York (United States of America)	100.00
2.	London (United Kingdom)	99.65
3.	Paris (France)	92.89
4.	San Francisco (United States of America)	92.41
5.	Boston (United States of America)	91.68
6.	Amsterdam (Netherlands)	90.32
7.	Chicago (United States of America)	90.23
8.	Seoul (South Korea)	89.60
9.	Geneva (Switzerland)	87.44
10.	Sydney (Australia)	86.06

Source: (Berrone et al., 2016, 23)

In 2017, the CIMI was calculated for 180 cities, representing 80 countries of the world. New York obtained again the highest score, followed by London and Paris (Table no. 5). From a geographical point of view, Europe and USA held the first position with four cities out of ten each of them.

Table no. 5 The world's smartest cities in 2017

Ranking	City, country	CIMI
1.	New York (United States of America)	100.00
2.	London (United Kingdom)	98.71
3.	Paris (France)	91.97
4.	Boston (United States of America)	88.90
5.	San Francisco (United States of America)	88.46
6.	Washington (United States of America)	86.10
7.	Seoul (South Korea)	84.91
8.	Tokyo (Japan)	84.85
9.	Berlin (Germany)	83.40
10.	Amsterdam (Netherlands)	82.86

Source: (Berrone et al., 2017, 25)

The top of the 10 world's smartest cities was dominated by Europe and the USA in the period 2014-2017. London was classified the world's smartest city in 2015 and held the second place in 2014, 2016 and 2017. On its turn, New York was ranked the world's smartest city in 2016 and 2017, and held the second place in 2015 and the third place in 2014.

5. Conclusions

The rapid development of urbanization in the last century led to the emergence of today's metropolitan century. In order to face multiple and difficult challenges cities tried to identify and implement solutions on a long-term horizon. One of them proved to be the smart city concept.

The paper strived to clarify the meaning of a relatively new concept that has become increasingly popular in the recent years: the smart city. An in-depth review of the literature showed that the smart city concept has been analyzed from different perspectives. However, the paper revealed several key characteristics of a smart city such as the use of technology on a large scale.

Also, the paper illustrated the way smart cities are assessed according to a specific index called CIMI. Results proved that the world's smartest cities belonged to Europe and the USA in the period 2014-2017. The limits of the study are given by the number of indicators taken into consideration. This is why further researches may expand this number and deepen the analysis.

6. References

- Berrone, P., Ricart, J. E., Carrasco, C., Ricart, R., 2014. *IESE Cities in Motion 2014*. [online] Available at: < https://www.iese.edu/en/multimedia/ST-0333-E_tcm41-159595.pdf > [Accessed 21 April 2018].
- Berrone, P., Ricart, J. E., Carrasco, C., 2015. *IESE Cities in Motion 2015*. [online] Available at: <<https://www.iese.edu/research/pdfs/ST-0366-E.pdf>> [Accessed 22 April 2018].
- Berrone, P., Ricart, J. E., Carrasco, C., T-Figueras, A. I. D., Volkhausen, N., 2016. *IESE Cities in Motion 2016*. [online] Available at: < <https://www.iese.edu/research/pdfs/ST-0396-E.pdf> > [Accessed 25 April 2018].
- Berrone, P., Ricart, J. E., Carrasco, C., T-Figueras, A. I. D., 2017. *IESE Cities in Motion 2017*. [online] Available at: <<https://www.iese.edu/research/pdfs/ST-0442-E.pdf>> [Accessed 26 April 2018].
- Dameri, R. P., 2013. Searching for Smart City definition: A comprehensive proposal. *International Journal of Computers & Technology*, 11(5), pp. 2544-2551.
- Dameri, R. P., Rosenthal-Sabroux, C. (eds.), 2014. *Smart City: How to Create Public and Economic Value with High Technology in Urban Space*. Heidelberg: Springer International Publishing Switzerland.

- Deloitte, 2015. *Smart Cities: How rapid advances in technology are reshaping our economy and society*. [online] Available at: <<https://www2.deloitte.com/content/dam/Deloitte/tr/Documents/public-sector/deloitte-nl-ps-smart-cities-report.pdf>> [Accessed 22 April 2018].
- Ernst & Young, 2016. *The Power of Three for smarter, more resilient cities*. [online] Available at: <[http://www.ey.com/Publication/vwLUAssets/EY-the-power-of-three-for-smarter-more-resilient-cities/\\$FILE/EY-the-power-of-three-for-smarter-more-resilient-cities.pdf](http://www.ey.com/Publication/vwLUAssets/EY-the-power-of-three-for-smarter-more-resilient-cities/$FILE/EY-the-power-of-three-for-smarter-more-resilient-cities.pdf)> [Accessed 21 April 2018].
- Galati, S. R., 2018. Funding a Smart City: from Concept to Actuality. In: S. McClellan, J. Jimenez, G. Koutitas, eds. 2018. *Smart Cities: Applications, Technologies, Standards, and Driving Factors*. Heidelberg: Springer International Publishing, pp. 17-39.
- Gascó-Hernandez, M., 2018. Building a Smart City: Lessons from Barcelona. *Communications of the ACM*, 61(4), pp. 50-57.
- Hall, P., 2000. Creative cities and economic development. *Urban Studies*, 37(4), pp. 633-649.
- Organisation for Economic Co-operation and Development, 2015. *The Metropolitan Century: Policy Highlights*. [online] Available at: <<https://www.oecd.org/regional/regional-policy/The-Metropolitan-Century-Policy-Highlights%20.pdf>> [Accessed 20 April 2018].
- Olszewski, R., Pałka, P., Turek, A., 2018. Solving "Smart City" Transport Problems by Designing Carpooling Gamification Schemes with Multi-Agent Systems: The Case of the So-Called "Mordor of Warsaw". *Sensors*, 18(1), pp. 1-25.
- Smith, R. G., 2003. World city actor-networks. *Progress in Human Geography*, 27(1), pp. 25-44.
- Thuzar, M., 2011. Urbanization in SouthEast Asia: Developing Smart Cities for the Future? *Regional Outlook*, pp. 96–100.
- Vidasova, L., Kachurina, P., Cronemberger, F., 2017. Smart Cities Prospects from the Results of the World Practice Expert Benchmarking. *Procedia Computer Science*, 119, pp. 269-277.
- Washburn, D., Sindhu, U., Balaouras, S., Dines, R. A., Hayes, N. M., Nelson, L. E., 2010. *Helping CIOs Understand "Smart City" Initiatives: Defining the Smart City, Its Drivers, and the Role of the CIO*. Cambridge: Forrester Research. Cambridge: Forrester Research. [online] Available at: <https://s3-us-west-2.amazonaws.com/itworldcanada/archive/Themes/Hubs/Brainstorm/forrester_help_cios_smart_city.pdf> [Accessed 21 April 2018].