SMART CITY: A CONTEMPORARY CONCEPT OF URBAN SUSTAINABLE DEVELOPMENT

Dejan T. ILIĆ
Faculty of Business Studies and Law, 11070, Republic of Serbia
dejan.ilic@fpsp.edu.rs
Branko M. MARKOVIĆ
IEE, 11000, Republic of Serbia
markovic_m_b@yahoo.com
Nevena KRASULJA
Faculty of Business Studies and Law, 11070, Republic of Serbia
nevena.krasulja@fpsp.edu.rs

Abstract
Migration from rural areas to cities, beside to migration of highly educated labor, are becoming one of the most significant challenges in the contemporary urban environment. Increasingly and extensively influx of population from rural areas into cities, with climate and lifestyle changes, additionally exposed city government to challenges for optimal city functioning and sustainable urban development. These challenges as initiatives to improve the quality of life, higher efficiency and preservation of the environment, with the accelerated development of new technologies, are resulted in the emergence of the Smart City concept. The Smart City concept represents the dominant direction of urban development based on the digital transformation of the city and principles of sustainable development. At its core, the concept involves the digital transformation of the city towards achieving greater efficiency of the city administration, higher quality of life, reducing the exploitation of resources, but also reducing the negative impact on the environment. The importance of digital transformation of cities and the importance of sustainable development are initiated the authors, to present in this paper the basic determinants of the Smart City concept as integral part of the urban sustainable development strategy.

Key words: *Digital transformation, Smart City concept, Sustainable Development, New technologies, Industry 4.0*

JEL Classification: *O18; O2; O31; O44; R41; R58*

I. INTRODUCTION

In the introduction itself we needs to explain more closely the concepts of "Sustainable Development", "Internet of Things (IoT)", "Industry 4.0" and of course the concept of "Smart City". In addition, a brief overview of the literature in this field should be given in the introductory discussion in order to further define and clarify the importance of the topic in the new economic ecosystem.

The starting point that needs to be defined more closely in this paper is "Sustainable Development". According to the definition given by the United Nations, Sustainable Development "is development that meets the needs of the present, without compromising the ability of future generations to meet their own needs." (United Nations, 1987, p.39). According to the Sustainable Development Commission (2019) "Sustainable development is about finding better ways of doing things, both for the future and the present. This means meeting the diverse needs of all people in existing and future communities. According to UNESCO, the distinction between Sustainability and Sustainable Development should be distinguished. According to the above source, the term "Sustainability is a paradigm for thinking about the future in which environmental, social and economic considerations are balanced in pursuit of an improved quality of life, as long as sustainable development addresses many processes and pathways to achieve it"(UNESCO; 2019). According to Dernbach JC and Stoddart, Sustainable development recognizes and incorporates the long-term scale of sustainability in ordering the needs of future generations (Emas, 2015).

According to the above sources, the basic paradigm of sustainable development is based on long-term development and economic growth while improving environmental protection and overall quality of life. The basic principles of sustainable development can be viewed through the following three groups of goals (Ilic, 2018, p.183):

The Economic Group of Sustainable Development Goals refers to continuous economic growth with the technological development of "clean technologies";

The Social Group of Sustainable Development Goals means improving living standards and quality of life;

The environmental group of the Sustainable Development Goals relates to the improvement of the environment, that is, to the reduction of environmental pollution while preserving biodiversity.

In the new global environment, and especially in urban areas, unifying and meeting the above goals has become an imperative, but also an increasing challenge that we face.

Another term that needs to be explained more closely is the term Internet of Things (IoT). The most widely viewed IoT "is a computing concept that describes the idea of everyday physical objects being connected to the Internet and being able to identify themselves to other devices" (Techopedia, 2019). The above actually means that IoT "represents a global network of interconnected devices, mechanical and digital machines, objects, but also people who have the ability to communicate in a standardized manner, that is, a system that provides the ability to transmit data over the Internet without requiring human-to-human interaction and / or the man with the computer "(Ilic, 2018, p.255).

The third term, that is, the concept that needs to be briefly defined, is the concept of Industry 4.0. Germany Trade and Invest (GTAI) defines Industry 4.0 as: "a paradigm shift made possible by technological advances that constitutes a reversal of conventional production process logic. Simply put, this means that industrial production machinery no longer simply "processes" the product, but that the product communicates with the machinery to tell it exactly what to do" (Sniderman et al 2016; Ilić et al 2017, pp.49-59). It represents ecosystem for connecting, via the Internet, things, people and services (Sniderman et al 2016; Ilić et al 2017, pp.49-59).

The three concepts mentioned above: sustainable development, the Internet of Things and Industry 4.0 form the basis, but also the main initiators of the emergence and further development of the Smart City concept. As pointed out in the abstract of this paper, Smart City represents the dominant direction of urban development based on digital transformation and principles of sustainable development. At its core, the concept involves the digital transformation of the city towards achieving greater efficiency of the city administration, higher quality of life, reducing the exploitation of resources, but also reducing the negative impact on the environment. Given that Smart City is a relatively new concept in the scientific and professional literature, there is still no uniquely accepted definition. The authors of Nam & Pardo define Smart City as an organic link between the technological, human and institutional component in cities. Author Caragliu defines Smart City is a city that invests in people and social capital as well as classic and modern ICT infrastructure with the aim of improving quality of life and sustainable development. Michi Kohno, Smart City defines the "process" we use to address sustainable development issues, both regionally, nationally and globally. Thuzar Smart City of the future is one that is based on sustainable development and in which all citizens can live well. In these cities, human capital, as well as traditional and modern infrastructure, but also the management of natural and other resources is a way to achieve the social, political, economic as well as sustainable development goals (Albino et al; Abbas, 2017; Nam and Pardo, 2011; pp.282-291).

We can say that the Smart City Concept Model represents the "Smart integral basis" of sustainable urban development in the future. This comes in particular from the fact that the SCCM implies that the sustainable development of urban environments and the inclination rural and wild, natural environments, must be designed in such a way, that, natural ecosystems that already exist are not disrupted. In this regard, SCCM pays special attention to the urbanization of wild forms of nature through a model of coexistence, for example city parks are seen as oases for feeding and conservation of wild birds (Christine Dell'Amore, 2016; Christine Dell'Amore, 2015).

An increasing number of cities in the world are showing a tendency to acquire the attribute "Smart" by implementing a continuous process of evaluation and improvement of urban sustainable development indicators, starting from economic, social, political and environmental factors (Gvozdenović and Marković, 2014, pp.700 - 705). More broadly, the Smart City concept is an evolving concept of managing and controlling the operations and services that cities and regions provide. According to the Giffinger Smart City concept, it combines the following areas: "smart living; smart people; smart governance, smart economy, smart environment and smart mobility ", Albino et al; Abbas, 2017).

The basic elements and characteristics of the Smart City concept, as stated in the previous sentence, are most often systematized and grouped within the following six segments (Pichler, 2017, p.12; Albino et al; Geospatialword, 2019):

"Smart Economy" includes initiatives for the development of entrepreneurship, that is, creation and wider exploitation of innovations with greater degree of efficiency, but also connectivity and networking of numerous stakeholders;

"Smart Government" includes initiatives to improve transparency in decision-making by city authorities, focus on infrastructure development, integration of ICTs, as well as the development of online services;

"Smart People", includes initiatives to enhance the distinctive capabilities, creativity and innovation of people in an inclusive society with the development of contemporary education to adequately meet the needs and demands of society in the future;

"Smart Living", includes initiatives to improve the lifestyle, education level, culture, but also human health;

"Smart Mobility", includes initiatives to develop "green urban transport". Samrt Mobility represents a commitment to the development of electric and hydrogen powered vehicles, the integration of ICT into the transportation system and the development of various advanced modes of urban transport;

"Smart Environment" includes initiatives for more intensive development and wider exploitation of "smart buildings, an efficient resource and waste management system while improving environmental and biodiversity.

The main goal of the development of the above six smart segments and their synergetic effect is the transformation of "analog urban environments" into "smart cities." The transformation of "analogous to" smart cities "is reflected in a more adequate fulfillment of the needs of modern society and economy, that is, an initiative to principles of functioning of cities as closely as possible to modern principles of sustainable urban development.

II. Smart City concept and new urban trends

One of the most significant urban development trends is the increasing migration of people from rural parts to urban areas. Indicators that support the above trend in urban migration are the figure that in 1950, 751 million people lived in urban areas, 4.2 billion in 2018, while this number is expected to exceed 6 in 2050. 7 billion people living in urban areas (Naden, 2019). Another piece of information that illustrates these trends and points to the problem of urban sustainable development is the following. "Today, 68% of the EU population lives in urban areas with a tendency to grow while it is estimated that by 2050 the urban population in developed EU countries will grow by 18% (Gvozdenović and Marković, 2014, pp.700-705). It is precisely the intensified migration of people to cities, as well as the adverse climate change, that further expose the city government to the challenges of securing all the necessary resources while respecting the basic principles of sustainable development. It is precisely the intensified migration of people to cities, as well as the adverse climate change, that further expose the city government to the challenges of securing all the necessary resources while respecting the basic principles of sustainable development. The above challenges, but also the more intense development of IoT as well as the Industry 4.0 concept. initiate faster development of Smart City concept. The Smart City concept is largely based on IoT and Big Data, but also on the development of artificial intelligence and concepts such as Industry 4.0. which is basically a digital transformation of cities, that is, city government and the services the city provides. In order to properly develop and apply the Smart City concept, it is necessary to establish a network topology and determine all elements, processes and system levels. The most commonly accepted division into system levels is one that monitors the functional readiness of the Smart City system elements and includes the following four levels (Geospatialword, 2019):

Sensor Level - A level that continuously monitors the parameters and indicators of the Smart City environment; provides information about the state, and change of state, of the system. This layer implies a network of dedicated devices, sensors, mostly IoT devices;

Data level - represents the level that collects, stores and processes data and stores them in databases, so that the data collected in this way can make the right decisions and carry out the right activities at the right time;

Business Level - Contains models relevant to analytics, data visualization, business logic, semantics, metadata. At this level, the business of "digitized" companies is conducted;

Application Level - consists of multiple applications specifically designed for citizens, municipal authorities, administrators and public organizations.

Another significant determinant of the Smart City concept relates to the degree of accuracy of the Smart City solution. The term "accuracy of the Smart City solution" means the level of monitoring reliability, both at the measurement level and at the level of all transformations of measurement values. The reliability of the monitoring process depends on several factors, the most important of which are the following:

Reliability of the measuring chain that directly depends on the degree of correctness, sensitivity and correct calibration of the sensor at the measurement point;

The number and character of the measured values and the strength of the system status indicators that show these values;

Measurement signal latencies and required system control speeds, which depends directly on the allowed internal oscillations of the subsystem and the limit values of these oscillations when one of the systems collapses.

The Smart Cities concept takes into account all the complexity of the context of build up smart city and broad urban development, takes into account the current state and limitations of city functions, and relies on the implementation of the most sensible actions of city function management, as shown by current data (curent datasets) of "urban metabolism", or, as recommended by best world practice. In this sense, Smart Cities must base their development in the future on the collection and processing of large numbers of real-time data (BigData model) and the application of artificial intelligence through the implementation of the digital twin concept as envisioned by Industry 4.0 concept.

Considering that we have defined the basic elements and characteristics of the urban system within the Smart City concept, in concluding discussion we will once again address the importance of implementing the concept in the direction of improving urban sustainable development.

III. CONCLUSION

The importance of the Smart City concept in promoting urban sustainable development is clearly highlighted in the paper. It was also made clear that "analog cities", through the use of IoT, BigData, Cloud, Ai, and other inclination technologies, are being digitally transformed, and that the focus is on the "future concept of a city tailored to citizens". It was also emphasized that: "The radical innovation vision of Industry 4.0 is a response to the global competitiveness challenges, which also requires a supporting infrastructural and social environment having urban dimensions as well. The concept of smart cities is an answer to environmental, economic and social issues "(Nick et al 2018, p.54).

At the very end of this paper, it should be reiterated and emphasized that with the implementation of the Smart City concept cities and wider regions are being transformed in the direction of achieving greater efficiency, higher quality of life for citizens, reducing energy consumption and reducing the negative impact on the environment, and moving to towards coexistence with wild life forms. However, for the stated strategic transformation of "classic cities into smart cities" to really produce the desired results in a real environment, that is, to make the Smart City concept truly the main lever of sustainable development, the concept should be "Smart" and "Open". "Smart" represents a comparative advantage achieved by applying modern management modes that include information communication technologies, while "Open" refers to the ability of the system to easily upgrade without fear of technical, legal economic constraints, while respecting all the basic principles of sustainable development.

All that has been stated so far in this paper once again points to the importance but also the need for wider application and further development of the above concept. This concept needs to be further developed as it is currently the most effective way of implementing an urban sustainable development strategy.

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