

Urban environment digitalization and its characteristic features within the framework of the project "Smart City" (through the example of Samara)

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Abstract. The paper considers Russian mega-cities and their development within the framework of the project "Smart city". Moving from classical principles of city management and city development to "Smart City" principles brought up many questions further considered in this research. This study made it possible to reveal indicators and their values for 16 largest cities of the Russian Federation and determine the level of "Smart City" technologies development in the city of Samara. The researchers propose corrective measures designed to improve some of these indicators as well as to increase the level of competitiveness, to build an effective management system and to create safe and comfortable conditions for the life of citizens.

1. Introduction

A modern Russian city is a nerve center of economy and people concentrated in the same space. Its infrastructure is so comprehensive that it makes the city a kind of a living organism. Such a city is often referred to as a "mega-city". There are demanding requirements a mega-city has to meet. These requirements are improved annually.

Urban space is constantly transformed absorbing all new and advanced technologies invented by science, industry and management and adopting to innovations which are capable of changing the city.

Currently, one of the most advanced technologies that can improve all spheres of human activity by raising quality and comfort of living is the system known as "Smart City".

According to M. Zyabkina's view, "Smart City" is "the concept of information and communication technologies integration into city management", designed to "make people's lives better and more convenient, that is to increase the level of comfort, quality and efficiency of service, reduce costs and consumption of resources" [1] and to optimize the entire life of the city. There are several other definitions, similar to the one mentioned above, which seem inadequate to the researchers as they are too superficial and declarative and do not create clear images. Other authors who have studied the diversity of existing smart-city definition are also forced to come to the sad conclusion about the "cacophony of definitions of a smart city" [2]. At the same time, there exist rational approaches linking the definition of a "smart city" with "digital economy" [3, 4, 5]. Navigant Research, a consultancy, defines a smart city as "a complex fusion of several existing markets, as well as a driver for new, emerging solutions that span existing industries, operations, and services" [6, 7].

The purpose of this research is to study the impact of the project "Smart City" and its implementation on Samara competitiveness among other cities of the Russian Federation, as well as



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on formation of an effective system of urban management and on creation of safe and comfortable living conditions for citizens.

The object of the study is the city district of Samara (hereafter referred to as Samara).

The subject of the study is the description of the conditions for the implementation of the project "Smart City".

2. Materials and methods

In this paper the authors mostly resort to various general scientific and special research methods and use the methods of analysis and synthesis as the main ones. These methods were adopted to describe the concepts of the government machinery (in a broad sense), of municipal formation and of local self-government.

The method of formalization allowed making various classifications, the comparative method made it possible to compare different approaches to city management, the quantitative method helped interpret statistical data.

The methodological basis of the study combines the methods of structural and dynamic analysis as well as tabular and other general scientific methods. The research is based on official statistics. Federal state statistics service (Rosstat being the Russian abbreviation for that) is taken as the main source of statistic data. Part of the data is drawn from open Internet sources.

3. Research and Discussion

Moving from classical principles of city management and city development to "Smart City" principles raised such questions as

- use of outdated management methods and principles;
- biased assessment of the current situation in the city due to the lack of sufficient data;
- low efficiency of management;
- unacceptable level of management structures coordination;
- under use of modern technologies and innovations in the field of urban automation;
- insufficient budget;
- old municipal structure.

Therefore, at the moment it is especially important to resolve these problems and change outdated management ways for the "Smart City" model.

The fundamental principles of the project "Smart City" are:

- comfortable and safe environment for the population;
- new approaches to urban infrastructure and its manufacturability;
- digital environment formation;
- improving the quality of city resources management;
- economic efficiency of all activities;
- services in urban environment.

In March 2019, the Ministry of Construction, Housing and Communal Services of the Russian Federation approved a regulatory document that defined a set of measures that should be carried out by the cities participating in "Smart city" project - the Federal project of digitalization of urban economy [8]. The main participant of this project is the city of Samara. The "Smart City" project is implemented within the framework of the national project "Housing and Urban Environment" and the national program "Digital Economy". The authors believe that these activities are designed with account of basic principles of smart cities development, are aimed at their sustainable development and can be implemented through the introduction of information and communication technologies and through interaction between society, government and business.

Successful implementation of "Smart City" technologies requires the use of special software products. The downside here is the slowdown in the development of innovative activities connected with the economic crisis of recent years [9,10]. According to the official data, the share of

organizations using special software amounted to 84.8% in 2015, 84.7% in 2016 and 83.9% in 2017. The share of organizations using the Internet in the Samara region today is 76.8% [11].

According to the results of the research work named "Indicators of smart cities NIITS (*an abbreviation for National Research Institute of technologies and communications)", conducted by JSC "National research Institute of technologies and communications", the values of Samara indicators among 16 largest cities of the Russian Federation (Moscow, St. Petersburg, Kazan, Omsk, Chelyabinsk, Ufa, Krasnoyarsk, Volgograd, Sochi, Nizhny Novgorod, Rostov-on-don, Novosibirsk, Voronezh, Perm, Yekaterinburg) are as follows (see Table 1).

Table 1. Values of Samara indicators [12]

Indicator	Indicator maximum value among the cities in question	Indicator value for the city of Samara
Indicator of technology development relative to the capacity of the budget	1.0	0.35
"Smart management"	0.75	0.08
"Smart technologies"	0.86	0.3
"Smart infrastructure"	0.92	0.32
"Smart economy"	0.74	0.48
"Smart finance"	0.85	0.67
"Smart residents"	0.9	0.55
"Smart environment"	1.0	0.39

Table 2. Activities proposed to improve the level of competitiveness and to build an effective management system of the city of Samara

Indicator	Activities to improve the level of the indicator
"Smart management"	Development of info-communication systems of the city administration; Increasing the citizens' involvement in the management of the city; The growth of information transparency of municipal authorities; Increase in attendance of official web-portals; Improvement of strategic economic development planning.
"Smart technologies"	Development of free wireless access networks; Development of mobile broadband networks; Development of communication networks for telemetry services; Introduction of intelligent accounting systems for municipal resources; Implementation of automated control of consumer applications and elimination of emergency situations, fixing breaks in the provision of public services or provision of services of inadequate quality; Use of new energy efficient technologies in outdoor street and advertising lighting;
"Smart infrastructure"	Development of free wireless access in public transport. Development of car sharing services in the city; Development of networks of filling stations for electric vehicles; Development of information systems of urban planning management; Development of services for online monitoring of public transport

Thus, it can be seen from the table that the level of the "Smart City" technologies in Samara as compared to other Russian cities is low. To increase the level of competitiveness, to build an effective system of city management and to create safe and comfortable living conditions for citizens, it is

necessary to focus primarily on such indicators as "Smart management", "Smart technologies" and "Smart infrastructure".

The researchers believe that it is necessary to develop certain system components in order to increase the indicators values (Table 2).

Thus, using the proposed measures, it is possible to adapt to the current needs that face a particular city as well as to consider promising areas of development with account of regional and territorial specifics.

4. Conclusions

Currently, some elements of the "Smart City" model are being introduced in various cities of Russia. When implemented the "Smart City" project it is expected that the costs in the sphere of housing and communal services will decrease by about 80%, for street lighting - by 40%; the efficiency of public transport will increase by about 50%.

This research is of practical importance, because it is necessary to timely assess the current state of the urban environment to understand what areas of administration require special attention. This gives a development thrust for the city administration. "Smart City" system is an important tool for achieving strategic goals of socio-economic development of Samara.

References

- [1] Zyabkin M 2017 *Technologies of "smart" cities and forecasts of their development*, available at: <https://vc.ru/26713-smart-city>
- [2] Drozhzhinov V I, Kupriyanovsky V P, Namiot D E, Sinyagov S A and Kharitonov A A 2017 *Journal of Open Information Technologies* **5** (3) 19-48
- [3] *The 3^d Generations of Smart Cities: Inside the development of the technology driven city*, available at: <https://www.fastcompany.com/3047795/the-3-generations-of-smart-cities>
- [4] Mokrushina K 2017 *Smart cities: developing concept and practice, Russian position on the way to evolution*, available at: https://urbc.skolkovo.ru/downloads/documents/SURbC/Events_Reports/SKOLKOVO_UrbC_Novosibirsk_2017-04.pdf
- [5] Eremia M, Toma L and Sanduleac M 2017 *Procedia Engineering* **181** 12-19
- [6] Shakhramanyan M A and P Kapanowsky V P 2018 *Science. Technologies* **2**(4) 37-48
- [7] Smart Cities: Smart Technologies and Infrastructure for Energy, Water, Transportation, Buildings, and Government: Business Drivers, City and Supplier Profiles *Market Analysis, and Forecasts Research Report: Executive Summary Boulder* (CO, USA: Navigant Consulting, Inc)
- [8] Order of the Ministry of Construction 2019 No. 235 "Concerning approval of methodological recommendations on urban economy digitalization"
- [9] Domnina S V, Guzhova O A, Tokarev Yu A and Kozhukhova N V 2019 *Sustainable Growth and Development of Economic Systems* 183-194
- [10] Kornilova A D, Knyazkina E V, Acri E P and Suslova N V 2019 *European Proceedings of Social & EpSBSFuture* 720-729
- [11] *Federal State Statistics Service: Official website*, available at: <http://www.gks.ru>
- [12] *Indicators of smart cities NIITS 2017*, available at: <http://niitc.ru/publications/SmartCities.pdf>