

The Study on the Readiness of Russian Municipalities for Implementation of the “Smart City” Concept

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Abstract—This article deals with the government system of “smart cities” in the Russian Federation. The hypothesis is that the result of the digital transformation of urban settlements depends on the effectiveness of managing the digital transition at the municipal level. Presented empirical data proves that the availability of formalized markers in the operation of management systems (state and municipal authorities), characterizing digital rate and indicating integration of goals, objectives, organizational and budget resources as a part of digital agenda determines the country's readiness for practical implementation of the smart cities concept. Building on the carried out research, a number of recommendations are proposed that can contribute to a greater degree of readiness for the implementation of the concept at the municipal level. The research results may be used by technology firms, experts of audit and consulting companies and analytical groups, state and municipal authorities.

Keywords—smart city, digital economy, public and municipal governance, urban environment, digitalization.

I. INTRODUCTION

From the standpoint of public administration, the implementation of the concept of “smart cities” provides evidence of the involvement of a country, a region or a municipality in the global competition for talented and professional people, for those who will determine its growth and future look [1] [2]. “The war for talent” forces city administrations to adopt strategies for attracting and retaining citizens who have a constructive life agenda, striving to develop themselves and the world around them.

Basically “smart cities” is the concept of adapting the urban environment, social, engineering and economic conditions for an “ideal citizen” [3]. This is the technologically saturated cradle of the man of the future [4] [5].

Yet there is no universally accepted concept of “smart city” in the scientific community. As part of our study, more than 40 open source definitions were analyzed. These concepts have a wide conceptual range: the definitional framework covers technology and innovation, the environment (institutions, society, infrastructure), and also focuses on the tasks of improving the welfare of a citizen. Diagram 1 illustrates the existing variability of interpretations. The largest part of the sample is made up by definitions related to the “environment”, which reflects the current trend among most providers who are actively trying to explore the potential of cities for the adaptation of new

technological solutions and management techniques of various aspects of the urban environment.

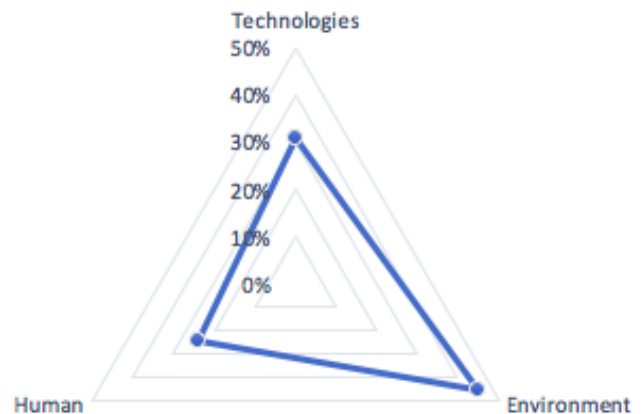


Fig. 1. Interpretations of the “Smart City” concept

In Russia a formalized form of the “smart cities” concept is approved and is being implemented as a departmental project of the Russian Ministry of Construction called “Smart City” [6]. This approach is aimed at solving a multifaceted range of tasks: competitiveness, efficiency, safety, comfort, technology effectiveness and human orientation.

II. LITERATURE REVIEW

Both in Russia and abroad the phenomenon of “smart cities” over the past decade has become the subject of numerous scientific studies, which can be grouped in four directions.

A. Conceptualists

Urbanist Anthony Townsend’s book “Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia” describes urbanization and information technology trends that shaped the image of modern cities [7].

The most significant theory is presented by urban strategy expert Boyd Cohen in his work on three generations of “smart cities” [8]. The author characterizes this concept, highlighting three stages of the formation of “intellectual territories”:

Smart Cities 1.0: a technology-driven city where technology companies providing solutions and services are the main beneficiaries.

Smart Cities 2.0: a technology-enabled managed city where authorities are increasingly focusing on technological

solutions that help to improve the quality of life of the population.

Smart cities 3.0: a highly intelligent integrated city that is characterized by a high degree of interaction between the government and the population, civil participation in urban processes.

A triple-helix model of “smart cities” was introduced by L. Leidesdorf and M. Dikin in 2011 [9]. The authors demonstrate that “smart cities” are the part of the cultural reconstruction process, where governance must be supported by effective policies, academic leadership and corporate strategy. At the same time, this model reflects the relationship between business, government and academic communities, while the results of their interaction will affect the joint development of technologies.

In the same year T. Nam and T. Pardo developed a three-dimensional model — technology, society, and institutions — through which smart cities develop their strategies [10]. The authors consider the “smart city” as a model for improving urban services and economic development with local governments being active participants in these processes. The findings reaffirm the importance of social components for the best planning results of a smart city, as well as their connection with technologies that are able to transform the economy, the environment, and the society. So, R. Holland argued that the concept of digitalization of urban settlements should begin with the consideration of human capital [11].

The scientific community still lacks clarity and any consensus regarding the content of the term “smart city”. In his definition, Holland emphasizes that “smart cities” require not only the introduction of sophisticated information technologies, but also the contributions of various groups of people. A number of Russian researchers who concentrate on this problem can be distinguished: Ganina O. B., Maksimova S. N., Mizrahi M. V., Khayretdinova R. S [12,13,14,15].

R. Giffinger, S. Fertner S, H. Kramar, E. Meyers identified six main characteristics of a “smart city”: “smart people”, “smart management”, “smart economy”, “smart mobility”, “smart environment” and “smart lifestyle” [16].

B. Comparativists

Cities face the challenge of enhancing their competitiveness more frequently. Today new approaches and tools are being developed and applied that determine the status of cities in a competitive urban environment. High positions in numerous ratings create the image of an advanced city, which ultimately attracts investment and staff. Nevertheless, there is an assumption that increased public attention to rating is mainly focused only on the positions held, while its importance as a strategic planning tool is completely ignored. R. Giffinger and H. Gudrun analyzed various types of ratings and developed their own approach called the “Smart City Rating”, which can be used as an effective means to identify strengths and weaknesses and improve the competitiveness of a city through appropriate strategic efforts [17].

Ranking implies a system of indicators, according to which a comparison is made. Such a comparison led to the need to standardize and measure indicators of “smart cities”, as well as to standardize the methodologies of their creation. Kupriyanovsky V.P. and Namiot D.E. assume that the role of standardization cannot be overestimated: due to standards, all participants in the process have the same concepts and

characteristics of a particular subject. If these standards are available, it is possible to track progress in the implementation of a solution or a project [18].

The object of standardization is the best practice or a solution to an urgent problem. Experts believe that it is necessary not only to conduct discussions on the issue of international and domestic “smart cities” standards, but also to debate appropriate means and methods for their implementation.

In the works of Kupriyanovsky V.P., Namiot D.E., Drozhzhinov V.I. world and Russian approaches to standardization are compared. Moreover, these authors are confident that Russia will also contribute to the development of international regulation [18, 19].

C. The country- or industry-specific researches

Foreign authors seek to describe the best world practices of “smart cities” and highlight their features. T. Bakici analyzed the experience of Barcelona's transition from a traditional metropolitan area to a metropolis of the twenty-first century [20]. The case of Barcelona is of a particular interest since the objective of the current urban planning strategy is taking position of a leading metropolis in Europe. The results of this study show that Barcelona is effectively implementing its strategy in order to become a model of a “smart city” for the whole world.

The researches of A. Caragliu, K. Manville, K. Paskaleva are devoted to the “smart cities” of the European Union, providing guidance on the formulation of a new agenda in the field of sustainable urban development [21, 22, 23].

A. Mahizhnan studied the case of Singapore amid its effective transition from an industrial economy to an information one [24]. The author notes that the ultimate goal of the strategic program is not only economic growth, but also the improved life quality of all people, which makes Singapore not just a “smart city”, but an effective “smart city”.

The works of S. Shwayri, G. Lindsay describe the experience of the South Korean city Songdo, a city which was built from scratch [25, 26]. The advantage of the urban environment is not only green infrastructure, but also the provision of additional services combining information and communication technologies, as well as digital networks for the harmony between the environment, society and technology. Songdo will probably put South Korea in the group of leading nations and will be at the forefront of the development of “smart cities”, becoming the benchmark for other countries.

The representatives of Russian scientific community examine not only foreign projects of “smart cities”, such as Fujisawa, Songdo, Manheim, Rio de Janeiro, Barcelona, Copenhagen, Vienna, Singapore, Masdar, but also analyze the prospects for “smart city” creation and functioning in our country. According to I. Vershinina, this concept is quite achievable, while some regions are already successfully implementing it, using various innovations and technologies [27].

Nevertheless, a number of publications (Dolgikh E.I., Antonova E.V., Erlich V.A. and Erokhina O.V.) names obstacles to concept's adoption: the high cost of building “smart cities” and the implementation of individual “smart” solutions, long-term projects, the technological backwardness

of some territories, limited awareness of the concept or its absence among public servants, lack of skills and competencies in substantive areas, administrative barriers, potential security threats [28, 29]. Esaulov G. V and Esaulova L. G. conclude that Russia continues to search for an appropriate model of “smart” urbanization [30]. This process should be accompanied by taking into account the existing level and development trends of the territory, cultural and historical traditions, the necessary level of comfort, and the tasks of the economic and environmental well-being of residents.

D. School of Digital Governance

B. Barber, in his book “If Mayors Ruled the World: Dysfunctional Nations, Rising Cities,” argues that city administration is important to tackling global problems and that “mayors rule the world” [31]. At the same time, C. Landry emphasizes that local politicians and city managers should aim to make their city not the best «in the world», but «for the whole world» [32]. In his opinion, the main task of a city administration is not to solve all city problems, but to strengthen the ability of urban systems to address diverse issues and create a wide range of social values.

D. Torfing develops the idea that public policy plays a crucial role in the “smart cities” growth which fits well with the concept of public management emphasizing that solving social problems is not just a matter of developing appropriate policy, but a managerial problem of organizing close collaboration between the government and other stakeholders [33].

Within school of governance, we touched upon the issue of effectiveness of the government systems of “smart cities” in the Russian Federation. Important provision for the study is the idea that the digital transformation effectiveness will be determined at the level of city authorities. [34] We emphasize that it is the understanding of the purpose of the digitalization of management by municipalities and the need for the resources and a trained team will serve as success criteria for a “smart” transformation of cities.

III. RESEARCH METHODOLOGY

The current research is focused on a formulation of objective evaluation criteria, as well as applying the developed methodology in the process of assessing the readiness of Russian cities at the stages of goal setting, planning and programming. It appears that the readiness of management systems should be reflected in the adoption the “smart city” concept as regulatory and administrative documents by the executive and representative bodies of local self-government.

The availability of a specialized strategy or a program directly indicates that a municipality reflected on the goals and objectives of implementing the “smart city” concept on its territory, determined the resource provision (budget, personnel, infrastructure), evaluated the willingness of residents to transformations, who as follows from world practice play a key role in such changes.

To substantiate the degree of readiness at the municipal level, steps were taken to collect and categorize regulatory documents on the topic. Based on the data contained in narrowly focused programs, we ascertained the experience of integration of “smart” solutions and also checked the implementation of project management measures specified in

the guidelines for the preparation of the regional project “Smart Cities” [35].

To achieve the objectives of the study, an expert assessment method, a comparative method, a statistical analysis method, and content analysis were used. The analytical sample of our study included 100 Russian cities with a population of 188 thousand and up to 13 million people. At the municipal level, we searched for regulatory documents directly or indirectly related to the intellectualization of urban spaces of each city included in the sample and five evaluation criteria were developed.

1) Specific strategies for smart cities. Such documents should correspond to the following scheme: “Smart + name of urban settlement”. For example, “Smart St. Petersburg” or “Smart Novorossiysk”;

2) A specialized section in the development strategy of a urban settlement, devoted to the concept of “smart city”;

3) Highly specialized programmes implemented within the framework of urban digitalization, for example, “Smart traffic lights” or “Smart utilities”;

4) Allocated budget;

5) Targeted implemented projects.

It should be clarified that due to the lack of necessary publicly available data or documented confirmation of an approved strategy or project implementation, the assignment of some municipalities to groups of a lower degree of readiness can be adjusted once the local authorities disclose this information. In accordance with this limitation, the results can be determined as preliminary.

IV. RESULTS

A grouping of cities was made according to five criteria, where the first group comprises the cities with the highest degree of readiness and the sixth one of the lowest.

The term for being included in the first group was the compliance with all five criteria. Such cities are Moscow, St. Petersburg and Chelyabinsk.

The second group contains cities that we could not attribute to the first group due to the lack of information on the levels and sources of financing. This group includes Ryazan, Naberezhnye Chelny, Sevastopol, Taganrog.

The distinction of the third group was the lack of a section of strategy devoted to the informatization of urban spaces in the presence of all other events (Orenburg, Izhevsk).

The cities of the fourth group do not have specialized sections and allocated budget (Rybinsk, Yaroslavl).

The fifth group comprises 36 studied municipalities. These include all cities that do not have a specialized strategy and budget, but there are implemented “smart” solutions. This multiplicity gives an indication of extremely targeted nature of the digitalization of Russian cities.

Finally, we included 20 cities in the sixth group that adopted highly specialized programs and implemented projects within the framework of the “smart cities” concept.

TABLE I. DETERMINING THE DEGREE OF READINESS OF CITIES

	Smart City Strategy	Section in Strategy	Programmes	Budget for Smart City	Projects
1	+	+	+	+	+
2	+	+	+	–	+
3	+	–	+	+	+
4	+	–	+	–	+
5	–	+	+	–	+
6	–	–	+	–	+

In the specialized part of the study, a search was carried out for information confirming the implementation of measures to manage regional projects. According to the methodological recommendations of the Ministry of Construction of Russia, it is necessary to create a project management body or a project office, approve a project implementation plan for a three-year period, create a regional center of competence to digitalize urban spaces and create “smart cities”, train teams of municipalities and executive authorities of the constituent entities of the Russian Federation. The results of this work are given in Table 2.

TABLE II. IMPLEMENTATION OF PROJECT MANAGEMENT RECOMMENDATIONS

Task	City
Project Office	Moscow, Saint Petersburg, Nizhny Novgorod, Chelyabinsk, Ryazan, Sevastopol, Taganrog
Implementation plan	Moscow, Chelyabinsk, Ryazan, Sevastopol
Competence centre	Moscow, Saint Petersburg, Chelyabinsk, Krasnoyarsk, Ryazan, Bryansk, Tambov, Nizhnevartovsk
Training of municipalities teams	Moscow, Saint Petersburg, Novorossiysk, Yekaterinburg, Nizhny Novgorod, Chelyabinsk, Omsk

V. PRACTICAL SIGNIFICANCE

The practical significance of the study lies in the possibility of using its main provisions:

- by specialists and managers of companies adapting technological solutions as part of the implementation of digitalization projects of urban spaces;
- by experts of audit and consulting companies and analytical groups in the preparation of thematic reviews and information and analytical studies of the development trends of the “smart cities” model;
- in the preparation and improvement of educational and methodological materials within the disciplines of “smart cities”, sustainable strategies and business models, urban planning, digital technologies, designing cities of the future, managing digital transformation of the city;
- in the work of state bodies while improving the national management model.

VI. RECOMMENDATIONS

A generalization of the experience of the most progressive cities (the first group in our classification) allows us to formulate the following recommendations:

- The city management should be persistent and dedicated from an administrative perspective in the elaboration and official approval of the development strategy of their “smart city”. Without the adoption of this document, the financing and implementation of “smart” solutions can be strategically erroneous.
- The approval of the strategic document enables to plan an appropriate amount of the city budget expenditures for the introduction of “smart” technologies. We recommend to provide sufficient resources for integral or subsequently integrated “smart” solutions.
- It is critical to make decisions based on engagement in urban governance processes. To this end, authorities can use the capabilities of social networks or specialized platforms, for example, “Active Citizen”.

VII. CONCLUSIONS

The implementation of the concept of a “smart city” in Russia will have a significant impact on the effectiveness and efficiency of the national project “Housing and Urban Environment” and the national program “Digital Economy”.

After examining the legal documents on this topic, we have found that all the cities in our sample implement targeted technical solutions and consider a narrow range of tasks for digitalizing urban systems, while only three municipalities meet all our criteria, which can indicate a high degree of readiness for integrated adoption of the concept.

Nowadays it is important to prevent the spread of the problem, called the “digital divide”, which widens the gap between the rich and the poor, excluding the latter from the modern information economy. Within the framework of the “smart city”, which is, first of all, a management project, urban settlements can not overcome this barrier solely by technical methods. Each municipality needs an appropriate management system.

There are solid reasons to believe that the uneven readiness of management systems can create precedents for the outflow of talented staff to more promising cities. Municipalities that have not formed and trained their teams will be forced to face strong competitors in the “War for talent”. Accordingly the changes should be aimed not only at the development and implementation of core strategies of the “smart city”, the formation of specialized organizational structures, but also at increasing the interest of the heads of municipalities in these transformations.

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