

"Smart City" concept in the urban economy digitalization system of St. Petersburg

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Abstract. The article is devoted to the "Smart City" concept substantiation, focused on digitalization of urban processes and infrastructure facilities management in St. Petersburg. The priority strategic goals of this project and the corresponding tools are highlighted, a SWOT analysis is carried out to identify the range of possible risks of its implementation. The prerequisites for the "Smart St. Petersburg" concept implementation in the pursuit of widespread digitalization are highlighted, taking into account the dynamics of exo- and endogenous development factors.

1 Introduction

The task of urban economy developing in Russia through the introduction of digital technologies and platform solutions is outlined in the presidential decree and is based on five key principles: human orientation, technological effectiveness of infrastructure, improving the urban resource management quality, creating a comfortable and safe urban environment and ensuring economic efficiency.

The national program "Digital Economy of the Russian Federation" is aimed at increasing the volume of the digital economy to 9.6 trillion. rub. by 2025, which requires an average annual economic growth rate of 12%. At the same time, the share of the digital economy should increase from 4% to 8-10% of GDP, ensuring an increase in the socio-economic processes and structural transformation efficiency. Digital economy as a partnership economy is impossible without smart cities, but this concept is not sufficiently developed yet, which makes it difficult for regional and city authorities to understand the tasks and methods of creating smart cities.

In a broad sense, digitalization is the transfer of business processes to the digital space. It is obvious that in recent years in Russia, not only the pace of digitalization has increased, but also the degree of its integration into all spheres of society life [1-3].

The main positive aspects of the socio-economic space digitalization include: universal accessibility to information resources and the promptness of information signals, full implementation of the control function due to the widespread use of electronic devices, specialized software, remote execution of many processes and functions, easy access to

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necessary information, reduction in labor costs and, accordingly, an increase in labor productivity, etc. [3-5].

2 Main part

The Smart city concept is one of the most relevant in terms of urban management and the Digital Economy system, as it is aimed at ensuring a high quality of life for residents and guests of a certain territory through organizational, managerial, technological and product innovations. At the same time, an important feature is the complete integration of the participants in the process - from the state representatives and city government bodies, state and private companies, to the information technology specialists, each of whom plays the role of certain operations executors [6, 7].

The study showed that the main strategic goal of the Smart St. Petersburg project is efficiency, sustainability and livability, and the strategic objectives are aimed at:

- improving the quality of transport services provided to the population and optimizing the functioning of the city transport system;
- optimization of energy consumption management, garbage disposal and notification of emergency situations at housing and communal services facilities;
- increasing the level of public safety and crime detection;
- providing broad access to the city rich heritage [8].

At the same time, the basic technologies of the Smart City project are:

- Internet of Things (IoT) with 5G communication technology as the most obvious strategic element;
- artificial intelligence, blockchain and neuroelectronic interfaces, which are presented today as a "box" product.

Such assistive technologies as computer 3-D modeling and 3-D printing; technologies of virtual, augmented and mixed reality; big data, etc. should not act as the content of a "smart" city, but only as a tool for solving the most important tasks of its creation. New perspectives for smart cities are associated with the introduction of fifth generation wireless technologies. The capabilities of 5G make it possible to implement a wide range of functions for managing various areas of city life.

Taking into account that the basis of any projects in the field of digitalization is the info communication infrastructure, the telecom operators should necessarily actively participate with the removal of their functions beyond the simple provision of data transmission facilities and giving them a more significant role in the digitalization of cities [9-10].

World practice shows that no more than 20 countries are developing in the field of "smart" cities. Four out of five patented technical solutions are of Chinese origin. The study showed that there are examples of successful implementation of smart city projects with such important components as housing and communal services, security, transport, and healthcare. This experience indicates that a smart city project should be socially oriented and aimed at solving the most significant problems: transport, waste processing, water disposal and water treatment. Accordingly, when developing a project for a common understanding of the goals and objectives, a broad discussion should be organized between the city and regional authorities, citizens, experts in economics and urban studies, as well as business representatives. The main thing is that for such a project to become successful, a developed ICT- infrastructure that meets the IT tasks – the solutions and willingness to finance their creation and use.

For example, the Smart City project implementation in Sochi started with defining a number of fundamental questions that needed to be answered before its implementation. One of these questions is whether the city municipalities have a development strategy? It turned out that in Sochi the municipalities did not have such a strategy, therefore, more than

20 events were held to determine the main directions for creating a “smart” city with the participation of officials from city and municipal administrations, representatives of business, education and the public. As a result, it was decided to create a unified integration IT -an e-services platform in Sochi with both high and low monetization and return on investment potential. This made it possible to form a balanced system of them, avoiding the "imbalance" towards highly monetized solutions.

It is important to assess the effectiveness of the Smart City project not only in the economic context, while determining 5-7 resulting indicators (dynamics of industry indicators, budget savings by the city economy, dynamics of investments in the urban environment, etc.), but also in scientific, technical and social aspects (improving the welfare and quality of life of citizens, reducing accidents and increasing the infrastructure facilities safety, etc.) [11, 12]. In 2019, the Ministry of Construction approved the standard requirements for the structure of the "Smart" city project, where it is recommended to introduce urban environment management systems, public security systems, and develop telecommunications infrastructure.

In the system of financing the Smart City project, it is advisable to combine different models: a) the traditional contract model can be used to create critical IT systems; b) the service model is possible for projects requiring large capital expenditures; c) concession agreements for the implementation of projects with high initial costs, but in the cases where the return on investment is planned through paid services to citizens and companies.

It is obvious that the high quality of the population life is not always associated with the number of information systems used in the city. It is important to form IT -systems that ensure transparency, taking into account the opinions of citizens about the urban economy organization and monitoring the implementation of their wishes. Such systems are a tool that allows the administration to understand the real needs of residents and make effective management decisions.

In the context of the sustainable development strategy, the role of the energy management system in the Smart City project formation is high. The processes of urbanization and industrialization provoke an increase in the demand for electricity. In this situation, energy management is of particular importance, and distributed smart grids are a critical component of a smart city. At the same time, integrated platforms for energy metering and intelligent management can reduce budgetary energy costs.

Effective traffic management based on intelligent transport systems is a significant link in the functioning of a "smart" city, designed to solve a variety of tasks: from automatic control of traffic lights, fixing traffic violations, to dispatching and control of public and special transport, etc. Creation of such systems is advisable to be carried out on the basis of the companies - manufacturers long-term cooperation of IT solutions and regional and municipal authorities.

Formation of priority directions of IT systems development for solving urban problems is entrusted to the project office "Smart" St. Petersburg. The implementation of projects within the framework of the concept with the same name will affect all spheres of urban life - from public administration to healthcare and education. The largest number of implementations is planned in the housing and utilities sector. It is important to formulate requirements for smart city systems even at the stage of planning residential buildings and other facilities, so that the implementation of such systems is carried out purposefully during construction.

It is obvious that the concept implementation is possible provided it is fully supplied with the necessary financial and technological resources, as well as the integration of plans for the formation of "smart" administrative entities with strategies for the socio-economic development of the territory. In addition, it is important to ensure the implementation of effective interaction between the local authorities and business (for example, through

public-private partnerships), which would meet their mutual interests and not be limited to the execution of disparate contracts.

In order to identify the range of risks possible during the implementation of the Smart St. Petersburg project, as well as to assess the possibility of its feasibility and develop appropriate strategic decisions in the current economic conditions, we will conduct a SWOT analysis (Fig. 1).

	Opportunity	Threat
	1. Integration into the global digital system; 2. Ability to run local systems globally; 3. City digital transformation management based on open systems; 4. Development and implementation of digital standards of "tomorrow".	1. Rapid adaptation of existing and emerging technologies to the changes in the external environment; 2. The complexity of formalizing technical requirements for market dynamics; 3. Lack of qualified personnel; 4. Bureaucratic delays.
Strengths	STO Field	STT Field
1. Possibility of connecting socially significant objects and access of individual users to data transmission networks; 2. Availability of big data, which are available to large telecom operators and the development of a unified API standard and a global database capable of combining disparate storages; 3. Availability of an industry project "Smart City"; 4. Solving the financial problem through public-private partnership.	Simplification of city management processes	Increasing the involvement and confidence of citizens in the executive authorities' activities
Weaknesses	Field WEO	Field WET
1. Lack of infrastructure; 2. Lack of specialists; 3. Lack of a regulatory apparatus; 4. Weak funding.	Formation of the normative and technical base of the concept	Complication of city management processes

Fig. 1. SWOT - analysis of the project "Smart St. Petersburg"

Taking into account the possibilities of the external environment and the weaknesses of the project, it is necessary, first of all, to use the capacities of telecom operators, which ensure the constant modernization of networks, introduce the new technologies, and expand the available radio frequency resource. At the same time, it is necessary that the operators,

when interacting with city authorities, actively participate in the digital development concept implementation of the territory and promptly unleash the potential of creating services based on the communication network for a “smart” city project.

Taking into account the threats of the external environment and the strengths of the project, it is advisable to stimulate the citizens and the real sector of the economy to actively and independently participate in the development of new Internet of Things solutions that would meet their personal needs. This is accomplished by creating an evidence-based decision base that can be easily used in other similar projects.

The combination of threats from the external environment and weaknesses of the project makes it possible to single out only the chaotic, unsystematic expansion of urban areas, population growth without taking into account the possibilities of providing appropriate benefits, transport problems due to the inadequacy of the road network to new requirements, the emergence of "gray belts" due to the withdrawal of industry outside the cities, spontaneous transition of many processes to the digital environment.

So, let us highlight and analyze the prerequisites for the Smart St. Petersburg concept implementation in the context of the economic space digitalization:

- the project office "Smart St. Petersburg" in July 2017 under the scientific supervision of the Rector of the ITMO University. The practical work of the office is aimed at the formation of methodological foundations that determine the basic conditions that motivate all interested parties to use "smart" technologies in the economy and spheres of the city's activity;

- the concept of "Smart St. Petersburg", supported in 2018 by the Government, which creates an opportunity for the transition to the "open city" regime. According to this idea, one of the principles of modern St. Petersburg is the development of a single digital space based on open city data, services and tools for their use within the city information infrastructure for citizens and businesses;

- hardware and software complex "Safe St. Petersburg" - a center unique in its capabilities, accumulating information from various sources (System 112; automated system "Management of the single duty service of St. Petersburg"; city video surveillance system; security system at social facilities, etc.) and forms the foundation for the new tools and resources' creation in terms of integration, information protection, regulation of processes and the transition to "smart solutions";

- development strategy of St. Petersburg for the period up to 2035, where much attention is paid to the issues of ensuring a technological breakthrough, the conditions for supporting IT and knowledge-intensive industries;

- prospects of St. Petersburg joining the Open & Agile Smart City (OASC) association in the context of reaching a qualitatively new level of development. The OASC project is focused on the use of a set of methods for the development of information systems unified for all parties to the agreement and ensuring the compatibility of all developments on a single platform, both for each city and between the cities;

- agreement and well-established interaction with Japanese companies on the joint integrated solutions' implementation in the field of urban economy: "Urban Development", "Urban Transport", "Environmental Hygiene", "Cultural and Tourism Exchange".

One of the most promising areas for the use of "smart" technologies in St. Petersburg is public administration. The variety and complexity of the tasks to be solved, the unreasonable increase in the number of departmental information systems, the need to increase the openness of state authorities in St. Petersburg objectively determine the high need for a unified automated system for managing the socio-economic development of individual districts and the entire city. The implementation of such a system can be provided on the basis of creating a single information platform, which is a set of special programs (modules) that provide the ability to collect, store, transfer and process various

information, including those of geoinformation character. The composition of the programs that form this platform should also include software products that ensure the solution of problems of an analytical and, above all, their predictive nature, associated with the need to model behavior and manage the development of socio-economic systems [13-15].

Such a platform will make it possible to form not only a database characterizing the socio-economic development of city districts, but also ensure their actualization in 3D format for the current, planned and forecast periods of time. The information received, passing on-line through geospatial coordinates to the geographic information system, will form the information basis for strategic and territorial planning.

3 Conclusion

Considering that the “Smart City” idea is gaining more and more relevance, becoming human-centered and viewed as effective from the point of view of economics and management, its implementation in St. Petersburg is fully justified and beyond doubt. The results of the SWOT analysis showed that all the necessary resources and the corresponding prerequisites are in place for this. At the same time, one of the strategic objectives of the Smart St. Petersburg concept is the need to formulate the requirements for the relevant systems at the planning stage of residential buildings and other infrastructure facilities, so that their implementation is carried out systematically and purposefully during construction. After all, this ensures the competitiveness of the designer, developer, industry and the state as a whole. Taking into account the special importance of the urban environment for improving the quality of the population life, it is important to determine, even before the development of urban areas (city quarters), a set of smart city technologies that meet the goals of the Strategy of Social and Economic Development of St. Petersburg for the future.

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