Modern city: areas of modernization of the urban environment

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Abstract. Modern society places new demands on the urban environment. City residents pose new challenges for the urban development which can be solved by implementing information and communication technologies and modifying the urban environment. Most cities are going through this process in an intuitive way. By structuring the transition to the smart city system, one can increase the efficiency of the urban infrastructure, ensure transparency and develop and improve the urban environment by increasing efficiency and reducing costs, contributing to the economic growth and improving living standards due to the involvement of citizens, businesses and governments in solving urban problems. In Russia, attempts are being made to implement a system of intellectual transformation of cities, which can become a developing mechanism that takes into account existing priority industry directions and make citizens believe in the future of their city based on advanced technologies. The innovative infrastructure can solve problems of technological and human capital development.

1. Introduction

The modern economic system is part of urban economies. Half of the population live in cities. More than 80% of the world GDP are produced in cities. On a global scale, 60% of the global GDP are produced in 600 largest cities (City 600). [1, 2, 3]. According to the UN and the World Health Organization, by 2050, the urban population will be 70% of the world population (about 6.4 billion people) [4]

Cities are under enormous pressure caused by complex production processes and economic relations, increased migration and socio-psychological dissatisfaction, growing environmental pressure and transport problems, terrorist threats and emergencies, excess density and "urbanization diseases" - the rapid spread of infectious diseases and viruses caused by intensive contacts. Cities do not cope with their main task being unable to meet the needs of the population.

It becomes evident that it is necessary to reorganize the urban space and improve the urban environment since large cities attract a large number of people. The urban environment should be a working area and a place for relaxation. It should provide services based on new approaches to the urban development.

At the same time, large cities are characterized by heterogeneity, a significant amount of resources, a lack of clear specialization. Digitalization of the urban environment which would help eliminate "bottlenecks", relict technological structures and ensure the competitiveness of the entire territory for the short and long term period is required.
An analysis of Russian and foreign experience allows us to conclude that a large city does not implement its potential creating an innovative and intellectual environment based on advanced technological solutions and digitalization. It is an administrative center. [4, 5, 6, 7, 8, 9, 10]

In modern conditions, the main priority for the urban development is a safe and comfortable environment characterized by high environmental indicators and aesthetic parameters. It is necessary to develop engineering and transport infrastructures, create an effective urban space and an urban infrastructure, a high-quality and affordable housing market, i.e. a comfortable urban environment that allows us to design spaces taking into account existing buildings and infrastructure. This can be achieved through the use of innovations and high technology projects.

2. Materials and methods

Intellectualization of the urban infrastructure is part of the new requirements for the efficiency of the urban environment. Therefore, a smart city is a natural condition for integration into a changing system. [9, 11]

There are different interpretations of the concept “smart city”, but all of them are based on interconnected information and telecommunication technologies that allow for the most efficient provision, management of current internal processes and solution of urban problems.

Experts of the International Telecommunication Union (ITU) conducted a thorough study and analyzed more than 100 approaches to the definition of the concept “smart city”. [11, 12]

According to this study, “the smart sustainable city (SSC)” is an innovative city in which information and communication technologies and other tools are used to improve the quality of life, the effectiveness of the city and urban services, and to strengthen the competitiveness. These technologies are also used to satisfy needs of present and future generations without affecting economic, social and environmental components of the city.” [6] Thus, to transform a city into a smart city, it is necessary to solve the following tasks:
- creation of comfortable living conditions;
- creation of a favorable business climate;
- creation of an accessible environment and improvement of services for disabled people;
- involvement of the population in solving problems and managing territories.

Digitalization and implementation of innovative technologies can make the urban environment safer, more economical and comfortable. At the same time, this niche is becoming attractive for investors, government and local self-government bodies and local communities. According to Frost & Sullivan experts, by 2025 the technology market will have reached $ 2.4 trillion. According to the research company Markets and Markets, the market volume will have reached $ 1.2 trillion by 2022. Figure 1 shows data on the technology market financing volume for a smart city, billion US dollars. [1, 2, 3,

![Figure 1. Volume of technology market financing for a smart city, billion US dollars.](image)

The Markets and Market experts argue that the following elements that have a significant impact on the environmental quality are developing: urban public transport, housing and communal services, smart buildings, the Internet of things or the smart area of urban services. The inevitable growth of the urban population will be a key reference point.
3. Results
In Russia, technologization began a long time ago, but only in 2015 did it get a software status. In Russia, urban development strategies have already been developed.

In 2017, the Government of the Russian Federation made an attempt to develop legal acts (e.g., the decree of the Government of the Russian Federation of July 28, 2017 N 1632-r “On approval of the program Digital Economy of the Russian Federation” providing for a number of measures affecting creation and development of smart cities). This decree is inoperative as the decree of the Government of the Russian Federation of March 2, 2019 No. 234 “On the system for implementing the national program “Digital Economy of the Russian Federation” has come into force.

The problems of innovative and spatial development of cities and their role are solved by the Russian government. In the Address of V.V. Putin of March 1, 2018 and in the Decree of the President of May 7, 2018 No. 204 “On National Goals and Strategic Tasks of the Development of the Russian Federation for the period until 2024”, the need for spatial development of Russia was emphasized [13, 14]

The Ministry of Construction, Housing and Communal Services of the Russian Federation pays attention to the smart city project. The Smart City project is aimed at improving the efficiency of city management and comfort. Modern information and communication technologies should be implemented into the city infrastructure. They are implemented through the portal “Bank of Smart City Solutions”. This portal includes more than 300 projects aimed at improving various urban infrastructure areas: housing and communal services, urban public transport, communication systems, environmental safety, urban environment, urban planning, etc. All this can create a synergistic effect: the life of citizens will become more comfortable and it will save budget money.

Figure 2 presents the basic principles of implementing smart city system and their consequences.

Moreover, on March 4, 2019, the Ministry of Construction of the Russian Federation approved “Basic and additional requirements for smart cities (the Smart City standard)” in the following main areas:
- city management;
- smart housing and communal services;
- innovations for the urban environment;
- smart city transport;
- intelligent public safety systems;
- intelligent environmental safety systems;
- infrastructure of communication networks;
- tourism and services.
For the effective implementation of these tasks, Russian cities have to solve a number of existing problems [15]:

1. A high level of depreciation of urban public utilities systems and a constant increase in operating costs for the maintenance of old infrastructure facilities. In Russia, the average depreciation rate of fixed assets is 60%;
2. Deterioration of environmental indicators. For some Russian cities, the environmental situation is critical;
3. A significant decrease in the number of residents in small cities due to the outflow of the population to megacities;
4. Unreadiness of Russia to improve comfort, quality and safety of the urban environment;
5. A lack of financial resources for improving urban conditions.

Figure 3 shows main areas of modernization of the existing urban environment.

![Figure 3](image)

**Figure 3.** Directions of modernization of the urban environment.

The “smart city” system is characterized by the efficiency of smart technologies rather than their number. They have to solve existing infrastructure problems, overcome crisis situations and bring the urban environment to a new stage of development in the context of restricted budget financing.

4. **Discussion**
The basic concept of a smart city is availability of a “smart individual”. A new generation of city residents are placing higher demands on the urban environment. Modern society is forced to save its time, use optimal routes, rationally use available resources, search for required locations, receive services, and be confident in their safety. At the same time, the residents should recognize the need for technologies being implemented to create a comfortable urban environment so that changes in the existing system do not contradict their needs and expectations. [16] Figure 4 shows possible services for creating a comfortable urban environment.

In other words, one can say that residents perceive their city as a system providing a wide range of services rather than a living and working area. It is in compliance with the general logic of the modern digital society and the Russian economy.

The public space has to correlate with business interests in order to stimulate the receipt and accumulation of financial resources.

According to the new model of the urban economy, money should benefit the residents. The purpose of the city is accumulation and transformation of its own experience to create a comfortable and safe environment for people. [6, 8]

The interest in smart cities caused a lot of theoretical discussions, but no final decision was made on the application of the smart city strategy. In addition, there are a number of factors that impede the implementation of the “smart city” system:
- the scale of new technologies is uncertain;
- the technologies challenge the existing urban management system;
- the technologies are understudied and their efficiency has not been tested in all sectors of the urban infrastructure

5. Conclusion
The digital transformation can solve problems of rapidly growing cities and create a safe, comfortable and economical urban environment.

This effect can be achieved by involving the population in this process and increasing the business activity of residents. Of course, technologies can change the urban architecture and structure - technologically new cities will appear along with new structural spaces, new social standards and

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Figure 4. Services for creating a comfortable urban environment.
opportunities for involving people in environmental management. All this will increase the competitiveness of Russian cities and contribute to the human capital and innovative infrastructure development.

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