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COMBINED MECHANISM OF PUBLIC MANAGEMENT OF A SMART CITY IN THE DIGITALIZATION OF ECOSYSTEM INTERACTIONS

SPECIALTY 5.2.6. MANAGEMENT

Annotation

DISSERTATION FOR THE DEGREE OF DOCTOR OF ECONOMIC SCIENCES

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Relevance of the research topic. Modern cities play a key role in the socio-economic development of society, are centers of innovation, places of attraction of resources, points of economic growth. One of the trends associated with the development of modern society is the acceleration of urbanization processes, the growth of the urban population, which leads to poorly controlled changes in the urban environment, increases the risk of infrastructural, socio-economic, and environmental problems.

An important change in recent years has been the widespread distribution of digital technologies and the creation of complex socio-technical ecosystems. Digital technologies affect most areas of modern society, change the principles of interaction between economic entities, reduce transaction costs, and are the basis for the formation of new economic models, therefore they are increasingly becoming an object of socio-economic research. Digitalization processes have a significant impact on the development of modern cities. Innovations in the digital environment are considered as a tool for solving problems in modern cities. New models of urban areas are created on the basis of digital solutions, and a strategy for the formation and development of smart cities is being implemented. It is important to note that smart city innovations are ultimately a tool for public administration and act as a superstructure for local government. Therefore, advanced forms of local self-government in a smart city form an ecosystem that determines the living conditions of the local population. A problem arose - the theoretical and methodological apparatus of economic science was unable to offer adequate tools for studying smart cities and public management of their development processes. In this regard, issues related to the development of management tools in the field of digitalization of urban areas, improving the mechanisms for managing smart cities, taking into account the balance of interests of the main parties involved in the development of the smart city ecosystem, which requires the development of new approaches to city management, the creation of combined mechanisms for managing urbanized areas.

The relevance and timeliness of the topic of smart cities, insufficient elaboration of theoretical issues, incomplete methodological justification, high practical significance of the issues of public management of the development of smart cities determined the choice of the topic, the definition of the object and subject of this study, the setting of goals and objectives.

The object of the dissertation research is the socio-economic processes of public management of the development of a smart city.

The subject of the dissertation research is economic relations in the formation and development of the public management system of a smart city.

The aim of the dissertation research is to develop a combined mechanism for public management of an urbanized territory with the digitalization of ecosystem interactions of smart city agents. The stated aim of the research involves setting and solving the following **tasks:**

1. To develop a typology of cities based on the level of their informatization and digitalization, justify the need to use differentiated approaches to the public management system of cities based on their current stage of development, consider a smart city as a new model of public management of the development of the urban environment.

2. To reveal the evolution of ideas for the development of smart cities, to clarify the essence of the ecosystem approach to public management of a smart city, to expand the system-forming ideas about the strengths and weaknesses, risks and threats of the public management system of a smart city.

3. To systematize the socio-economic effects of implementing smart city initiatives.

4. To develop a factor model for managing the development of a smart city ecosystem based on the definition of exogenous and endogenous groups of factors, with the identification of subgroups of external factors and factors of the internal environment, and determine and justify the principles of managing each block of factors.

5. Based on the factor model for managing the development of a smart city, to develop a comprehensive analytical methodology for assessing the development of a smart city.

6. To identify the levels of smart city management, develop a conceptual algorithm for the digital transformation of urbanized territories. In developing ideas about the mechanisms for managing urbanized territories, develop a combined mechanism for public management of a smart city.

Methodology and research methods. The dissertation research uses methods of correlation analysis, system logical analysis and synthesis, systematization, graphic, factor modeling, abstraction, elements of the scientific and practical method of SWOT analysis, PEST analysis.

The information base of the research was the fundamental and applied developments of domestic and foreign scientists who developed concepts and hypotheses substantiated and presented in the scientific literature devoted to the principles, laws, methods, resources, and norms of public management of socio-economic processes, federal and regional government databases (websites of the Government of Russia, the Ministry of Economic Development of the Russian Federation, the Federal State Statistics Service, the Government of the Sverdlovsk Region, websites of municipal governments), international and foreign databases (UN platforms, Eurostat), Russian analytical systems SPARK-Interfax, Rusprofile, SBIS, geolocation services Yandex.Maps, 2GIS, the results of empirical research conducted by the author.

Structure and volume of the dissertation research. The dissertation consists of an introduction, main part, conclusion, list of references. The research contains 58 tables, 41 figures, 12 appendices. The main content of the research is presented on 379 pages.

The introduction substantiates the relevance of the dissertation, defines the research problem, the object and subject of the research, the goal and objectives, and reveals the logic of the research work.

The first chapter considers issues related to the theoretical foundations of public management of smart city development. In particular, it considers the stages of urban environment development, starting with industrial cities and ending with smart cities, in the context of the formation of a digital urban eco-environment and the introduction of digital technologies into various areas of urban economy. It is shown that different types of cities require different approaches to management due to their economic, social, infrastructural and other features. The main difference between the post-industrial type of cities is the use of advanced digital technologies for the most efficient organization of economic activity. New tools for socio-economic interactions, such as digital platforms, social networks, crowdsourcing platforms, etc., are formed on the basis of digital innovations. Such innovations are actively introduced into the urban management system, involving the population and the business community in the processes of making management decisions. In addition, a bibliographic analysis of the Web of Science and Scopus databases was carried out, studies on the topic of smart cities were systematized, the evolution of scientific publications in the field of smart cities was identified, and the author's tree of research on a given topic was built. Based on the analysis of publications, the prospects and contradictions of the smart city model as a tool for the development of urbanized territories in the context of the formation of a digital society were identified, and a conclusion was made about the need to apply an ecosystem approach to the analysis of the processes of managing the development of a smart city.

The second chapter shows a number of dependencies indicating the influence of smart development ideas on a number of characteristics of the urban environment, to one degree or another characterizing the quality of life of the local population, confirmed the results indicating that digitalization significantly improves the quality of public management of the urban environment in various areas, in the transport, social, economic, environmental spheres of modern cities. The socio-economic effects of the formation of smart cities were identified, which were systematized depending on the volume of implementation of digital

technologies. A general scheme for digitalization of an urbanized territory at the strategic level has been developed, within the framework of which four main stages have been identified, a number of functional principles of the general scheme for digitalization of urbanized territories have been proposed, and the main stages of digitalization of an urbanized territory at the strategic level have been considered in detail. The author's definition of the mechanism of public management of a smart city has been proposed, and various types of the mechanism of public management of a smart city have been considered.

The third chapter discusses issues related to the methodological provisions of public management of smart city development. Here, the smart city ecosystem model is presented in graphic form, the main components and actors of the smart city ecosystem are identified, and exogenous and endogenous factors influencing the development of the smart city ecosystem are analyzed.

. The fourth chapter discusses issues related to the methodology for assessing the development of smart cities. In particular, the methods of socio-economic research of smart cities are systematized by the method of describing the objects under study (static and dynamic) and by the method of their model description (tables, diagrams, matrices, graphs). Static methods include methods for assessing ecosystem characteristics, cost-output analysis, development diagrams, data ecosystem coordination analysis, and ecosystem assessment for older residents. The dynamic methods include the matrices "value capture - value creation", stimulating management elements, "digital ecosystems - entrepreneurial ecosystems", as well as graphs of the life cycle of the smart city ecosystem, the evolution of civil ecosystems, the stages of digital transformation, the dynamic capabilities of innovation and the quadruple spiral. The applicability of the methods for analyzing the development of smart cities for various territories is shown. In addition, the toolkit for assessing the development of smart cities is considered, an approach to assessing the development of endogenous components of the smart city ecosystem based on the 7I matrix is proposed. The possibility of using the 7I matrix as an information basis for comparing the level of development

of cities in the coordinates "readiness for digital transformation / involvement in digital transformation processes" is shown.

The fifth chapter discusses issues related to the implementation of smart city projects. It considers the features of implementing smart city ideas in different types of territories, and proposes a classification of smart city projects. The life cycle of smart city projects is considered, the main problems that hinder their implementation within the framework of public management of urban environment development are systematized, the main features of smart city projects that must be taken into account when implementing ideas for the formation of a smart urban environment are highlighted, in particular, the participatory nature of smart city projects is noted. As part of the development of methodological support for the implementation of smart city initiatives, an algorithm for implementing innovative projects for the development of the urban environment has been developed, taking into account the participatory features of smart city projects.

The sixth chapter discusses issues related to the prospects for the development of urbanized territories based on the ideas of a smart city. The author's conceptual algorithm for the digital transformation of urbanized territories within the framework of the implementation of smart city ideas is proposed, which includes a number of steps that are most important in the implementation of smart city ideas. A combined mechanism for public management of the development of a smart city has been developed, its main functions, forms of participatory relations arising within the framework of the development of urbanized territories based on the smart city model have been identified. Based on the studied patterns and principles, recommendations for the development of the smart city of Yekaterinburg and the smart city of Chelyabinsk have been developed.

The conclusion contains findings based on the results of the dissertation research and corresponding proposals, recommendations, as well as prospects for further scientific and practical developments.

The appendices contain auxiliary, analytical, comparative materials that allow illustrating and supplementing individual provisions and conclusions.

Scientific novelty and provisions submitted for defense. The dissertation research submits for defense the following significant scientific provisions and results that possess novelty:

1. A typology of cities has been developed based on the criterion of their level of informatization and digitalization, the need to use differentiated approaches to the system of public administration of cities based on their current stage of development has been substantiated. Based on the analysis of fundamental theories, scientific concepts and works of modern scientists, the content of the smart city concept has been revealed. In addition to the existing approaches to defining a smart city, it is presented as a territory where projects are being implemented to improve the quality of life of the local population through the formation and development of a socio-technical ecosystem. In contrast to existing approaches, it has been determined that the change in the state and quality of socio-economic processes in the development of smart cities is due to the expanded use of digital technologies and the subsequent transition to new forms of organization of the economy and production, i.e. the evolution of the smart city ecosystem, which determines the need to strengthen participatory relations in the public administration system.

2. The evolution of smart city development ideas is revealed, the essence of the ecosystem approach to smart city public management is clarified, which, in comparison with existing concepts, reveals the elemental composition of the smart city management ecosystem from the standpoint of structural relationships. The stages of the smart city ecosystem evolution are shown, including the introduction of digital technologies, ensuring comfortable living conditions for the local population, harmonious development of ecosystem elements, as well as its participatory nature, on the basis of which its main stakeholders are identified. As part of the analysis of the contradictions of the smart city ecosystem stakeholders, the system-forming ideas about the strengths and weaknesses, risks and threats of the public management system of urbanized territories based on the smart city

model are expanded, which expands the existing provisions in the field of public management of urbanized territories.

3. A number of statistical dependencies have been identified that indicate the influence of smart development ideas on a number of characteristics of the urban environment, which to one degree or another characterize the quality of life of the local population; it has been proven that digitalization is a factor in improving the quality of public management of the urban environment in various areas. The socio-economic effects of the implementation of smart city initiatives have been systematized depending on the volume of implementation of digital technologies by types of technological innovations; in particular, the effects of improving process management mechanisms, effects of infrastructure optimization, effects in the field of transformation of social institutions, and technical and economic innovations have been identified. Unlike existing approaches to systematizing the socio-economic effects of digitalization of urbanized territories, the proposed approach allows for a comprehensive forecast of the results of the processes of formation and development of smart cities.

4. A factor model for managing the development of a smart city ecosystem has been developed, complementing existing ideas about managing the development of digitalization processes in urbanized areas by systematizing the conditions for the development of smart cities and related factors based on the definition of exogenous and endogenous groups of factors, with the allocation of subgroups of external factors associated with the use of digital technologies in society, socio-economic, administrative, technological factors, and seven factors of the internal environment associated with infrastructural and institutional support, communication systems, digital data, interfaces, the potential for innovation development, and the innovations used. The principles of managing each block of factors have been defined and substantiated, allowing for a new way of forming an innovative policy for public management of the digital transformation of urban areas.

5. Based on the factor model of smart city development management, a comprehensive analytical methodology for assessing the development of a smart city has been developed, which consists in calculating the integral indicator by calculating the evaluation components calculated based on the characteristics of the main endogenous determinants. The methodology, unlike existing approaches, makes it possible to focus on universal and at the same time the most important factors that allow reflecting the dynamics of smart city development and ensuring their comparison with each other, and also allows assessing the development of smart cities in the coordinates of "readiness for digital transformation/involvement in digital transformation processes".

6. A two-level conceptual algorithm for the digital transformation of urbanized territories based on strategic and project management tools has been developed. In developing ideas about the system of smart city management levels, it is proposed to distinguish two management levels - strategic and tactical levels as key elements of public management of a smart city, which can become independent management objects in further developments. The structural and functional features, the participatory nature of the functioning of the mechanism of public management of a smart city, developing the idea of the mechanisms of management of urbanized territories in the context of digitalization processes are substantiated. The evolution of management mechanisms for different types of cities is presented, a combined mechanism of public management of a smart city is developed, which complements and expands the toolkit of public management of urbanized territories in the context of a digital society.

The theoretical significance of the obtained results lies in the development of a theoretical apparatus for describing, analyzing, and assessing the development of smart cities, and expanding system-forming ideas about the possibilities of public management of the development of a smart city.

The practical significance of the obtained results lies in the possibility of using the obtained results in the processes of managing the development of smart cities. The materials and results of the research work were reviewed by the office

of the Plenipotentiary Representative of the President of the Russian Federation in the Urals Federal District, received approval and can be recommended for use by specialized executive bodies of state power of the constituent entities of the Russian Federation located within the Urals Federal District in the development and implementation of regional programs for the digitalization of urban areas (Yekaterinburg, Chelyabinsk, Tyumen). Certain conclusions and recommendations obtained as a result of the study were tested in the practical activities of the municipal authorities of Chelyabinsk. The application of the research results is confirmed by the implementation certificate. The obtained results can be used in the implementation of educational programs of basic and additional education in the direction of "Management".