INTEGRATION OF GIS AND BIM IN THE CREATION OF AN INTELLIGENT URBAN ENVIRONMENT USING THE SMART CITY TECHNOLOGY

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ANNOTATION

The article discusses the issue of urban infrastructure management and urban planning using the "Smart City" technology. The possibility of modernizing urban areas using this technology is being studied. The actual tasks of managing "Smart Cities" are considered. The possibility of a positive economic effect is being studied.

Keywords: organization of construction, construction economics, application of Smart City technology, urban environment, city life cycle.

The prospects for the development of society are associated with the growth of cities and the growth of their influence on socio-economic processes. The formation of hyper-urban spaces cannot be considered something fantastic, since at the moment more than half of the world's population lives in cities [1-2]. Cities concentrate the main research and production potential of states. At the same time, the infrastructural development of cities does not keep pace with their growth: an increase in the logistics load, obsolete planning solutions, an increasing environmental load, overcrowding, outdated management institutions, social molecularization of the average city dweller, etc. The solution to these problems is based, in our opinion, in the creation of "smart cities". The term "Smart city" came into use not earlier than the end of the 90s of the twentieth century. Its appearance has become a new word in the cognitive approach to modern urban planning [3-5]. At the theoretical level, the “smart city” model is presented, firstly, as an advanced, modern method of achieving a high quality of life for urban unification, and, secondly, as a whole phenomenon that unites the following sides within the boundaries of a single urban space:

1) smart economy;
2) smart mobility;
3) smart environment;
4) smart people;
5) smart life;
6) smart management.

In practice, this means transforming the concept of a "smart city" to improve the system of urban planning and urban management [6].

The Smart City concept opens up great opportunities for cities to meet the challenges of rapid expansion, the need for new infrastructures and buildings, the modernization of obsolete buildings and infrastructures, the provision of new urban services and the global transformation of the city into an environmentally and socially friendly city

The Smart City concept is based on the use of data relating to the physical components of the city (infrastructure, buildings, public places), the natural environment (air quality, green plantations, water resources, greenhouse gas emissions), urban services (transport, water supply, energy supply, municipal waste, education, health care, culture, sports.), economic activity and citizens [7]. (Figure 1).

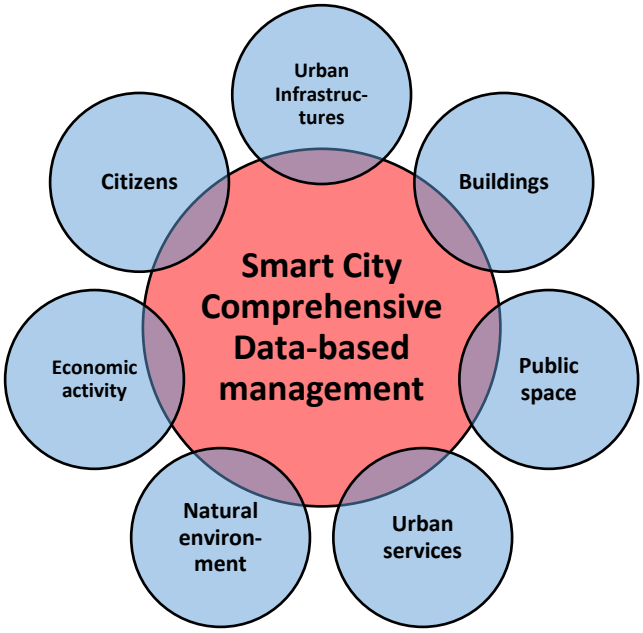

Fig. 1. Smart City Concept– Data-based management of urban systems

Building a management model within the "Smart City" involves the definition of the final stages of the formation of products or services required by society in the long-term development plan, and the corresponding change in the infrastructure and technological regimes [1, p. 21]. For example, the “Detroit phenomenon” associated with the transformation of a once large industrial center into a “ghost town”. The destruction of Detroit is of an internal, urban nature. USA did not experience an economic, military or environmental catastrophe, but the megalopolis formed around only one production concern turned out to be subject to a systemic crisis inherent in production structures. If the life cycle of a monotown is tied to the cycle of a production enterprise, then the natural processes of devolution of production turn out to be processes of devolution of an enterprise. The lack of a reserve of modernization of the urban structure leads to the degradation of the entire urban conglomerate and the destruction of the city. Therefore, the construction or modernization of urban settlements on the principle of "smart city" involves the creation of a long-term plan for the modernization and self-sufficient evolution of the urban structure without reference to any one production and economic factor [10].

In this regard, it is pertinent to note that the life cycle of buildings and structures is a time frame that is limited by the technologies used and includes the birth of an idea, design and survey work, a choice of options, architectural solutions, design of objects with given properties, examination of projects, construction, operation of the constructed facility, reconstruction and modernization (Figure 2).

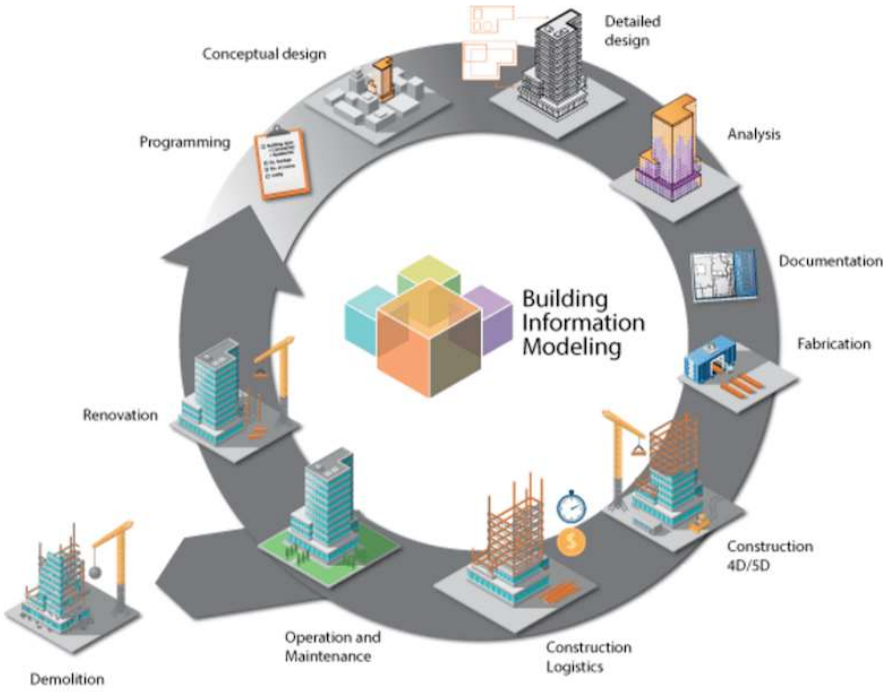

Figure 2. "Ring" of the building life cycle

It is quite obvious that when designing "Smart Cities" it is necessary to create a global information environment that allows managing these categories. To achieve this goal, a mechanism for forecasting the development of urban areas with a time step of five, ten and twenty-five years should be developed. Drawing up a realistic information model allows one to determine possible scenarios for the development of the city, including population growth, the main sectors of employment, and possible changes in the development paradigm. Then, taking into account the mandatory legal requirements, the procedure or the process of integrated development of each urban sector with possible negative and destructive factors is clearly defined using block diagrams, matrices, tables. As a result, operational plans for urban infrastructure management and long-term urban development plans are developed, including:

• generation and implementation of new ideas and technologies;

• a multilevel system of interaction between the city administration and the population with the obligatory presence of obligatory communication;

• improving the quality of life of the population and creating an attractive business environment;

• confirmation of the detected parameters through analysis and scientific explanation of the research results;

• definition of the concept of achieving the state of the "Smart City" as a multifunctional urban environment.

The life cycle of a Smart City is stratified according to the following briefly periodic phases: development, expansion, stagnation, decline. Purposeful impact on the “Smart City” system allows prolonging its transition from one phase to another, delaying stagnation and decline as much as possible, or transforming a qualitative transition into a new phase of development.

The intensive growth of the "Smart City" presupposes a directed and controlled increase in the ratio of the total area of housing and the volume of public goods in proportion to the change with the number of residents and jobs. The “smart economy” assumes the intensification of construction or the expansion of city-

forming enterprises, ensuring the investment attractiveness of the city, the growth of operating assets of the city economy and the city economy. This makes it possible to diversify the economic base and eliminate unemployment, increase the ergonomics of workplaces, and transport accessibility.

Innovative management allows you to control the volume of production and the ratio of employment and labor flows.

The slowdown in the growth of the Smart City also turns out to be a manageable process. Its pace is controlled by a unified information environment, which makes it possible to reduce the shortage of housing or other means of support in comparison with natural urban systems. At this stage, it is possible to halt the growth of the depreciation of fixed assets of enterprises and the urban environment through timely measures for the modernization or reconstruction of assets. Thus, it is possible to postpone or exclude - with timely management - the growth of costs for maintaining the profitability of enterprises and the maintenance of the housing stock.

Stagnation of the Smart City can be a deliberately implemented phase in a crisis, when it is required to mothball the main assets in order to preserve them in an unfavorable period. Under these conditions, population growth stops, the minimum provision of the functioning of the urban infrastructure is ensured, and the maintenance of urban structures in a functional state.

Decline is understood as the state of the city, when there is an outflow of the population caused by an unfavorable economic situation, lack of jobs, destruction of the urban environment.

A smart city is characterized by a non-stop life cycle, since there are functional levers that ensure continuous reconstruction and modernization of existing assets.

The implementation of the “Smart City” system in depressed cities is possible only in the context of a radical modernization of the economic component, targeted modernization of the entire city-forming sector, and determination of growth prospects by key points. The basis for the development of management decisions and the choice of strategic priorities for the city leadership policy in the implementation of the Smart City technology involves the development of the real economic sector, reduction of intermediate management links, centralized cost control and quality management of work performed at all levels.

The information component of the Smart City makes it possible to determine the “cores” of the growth of urban structures, to verify the methods of managing the development of a specific urban sector, to calendar the stages of growth of urban elements according to the nodal points of the transition to a new investment and urban planning or infrastructure-supporting level.

The new quality of cities is achievable only with the reconstruction of the city management system. An archaic system of hierarchical production structures of an industrial type should give way to a multifunctional system of local self-government, subordinate to the logic of prospective development, not fixated on only one industrial type.

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