Basic Directions in the Formation of a Hybrid Urban Environment of Coastal Cities in the South of Primorsky Region

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Abstract. The problem of forming a hybrid urban environment using digital technologies in coastal cities in the south of Primorsky Krai is relevance and beyond doubt. The article discusses the basic directions of development of the architectural and design environment using digital technologies. Particular attention is paid to improving the quality of customer service in the architectural and construction business through the use of social networks and multimedia media; active use of modern digital gadgets and their software (digital advertising presentations, information collection and the possibility of remote service from various mobile devices); mutual, almost tactile, interaction with the client (remote designer, client, supplier), which allows you to control all processes "online" in real time. The authors focus on the potential economic effect of the digital technologies under study, point to the advantages of 3D architectural design and 3D additive manufacturing over standard technologies. The paper examines the influence of local regional conditions on the design of the urban environment; the cost of producing subject-spatial content using 3D printers; creation of management systems of the "smart" urban environment type; environmental friendliness of the use of digital technologies. The problems of modern legal regulation of urban planning activities and technical regulation are considered. A hybrid urban environment is seen as a space for a safe and comfortable living environment for human society.

1. Introduction
Currently, the paradigms of modern society are changing. The digital and physical world are so closely intertwined that this fact alone changes the rhythms of all processes in community, including in urban life. Personal information and personal data of users are becoming a new economic resource. Social networks with the help of algorithms embedded in digital gadgets are already actively managing our lives.

It seems necessary to investigate the questions of how modern digital technologies are manifested in the urban space, how they are applied and what changes they bring. It is no secret that, Facebook, Twitter, LinkedIn, Google and other resources are actively penetrating the physical space of the city.
and transforming its environment [1]. Free Wi-Fi and all-seeing video cameras are popping up everywhere; urban subject-spatial set of street furniture begins to acquire sensors, interfaces and multimedia surfaces. All this actively changes the way of life of people and their models of behavior.

The digital spread that is currently underway is leading to the emergence of an innovative hybrid environment of architecture and design. It is becoming obvious, that this environment must now begin to be regulated not only with the help of laws, but with the formation of a new regulatory framework that should take into account local regional characteristics and modern digital technologies. In particular, it should take into account the specifics of creating a barrier-free environment for people with disabilities and low-mobile groups of the population. The study of the possibilities and problems associated with the introduction of a hybrid environment in cities with difficult terrain and an unstable climate is of particular relevance [3].

The purpose of this article is to consider the basis directions of the formation and development of a hybrid urban environment in the conditions of coastal cities in the south of Primorsky Region.

2. Discussion and results

Today, digital technologies are opening up wide access to targeted interventions in urban life. The active development of modern Internet technologies in the field of mobile applications, PC-based VR / AR, Mixed Reality in the urban environment creates the need for the population to learn new digital skills and mode of thinking. New methods of urban traffic management, principles and features of the development of projects in the field of virtual, augmented and mixed reality lead to the need for urban residents to quickly adapt to new living conditions.

Self-regulating urban systems are capable for instantly adapting to user requests in real time. They are aimed at attracting to innovative technologies, including the use of environmental energy resources. Particular attention is paid to equipment that using solar, wind and kinetic energy.

In an era of pervasive digitalization, the designing of complex smart urban systems a systems approach and interdisciplinary research and a phased implementation and joint development of the integrated design of the architectural environment is required. They includes many elements which are based on an understanding of the physical urban space and modern construction materials and promote to understanding the potential of new digital, including 3D technologies in this space. For example, the analysis of city traffic patterns, the creation of comfortable territories that adjoining to houses, and also the development of socio-cultural and tourist-recreational spaces, the organization of object-spatial content in them (small architectural forms, outdoor furniture sets, external improvement objects, lighting, landscape design and elements of external improvement etc.) [4; 5].

In process of designing various physical objects in a virtual environment, modern architects and designers should actively interact with cultural, educational and leisure programs of local communities, as well as social media networks. They must actively use to innovative alternative and energy-saving technologies, including such as the smart home and the smart city.

Especially, this is in demand when designing of regional cities, that often located in extreme climatic conditions. For example, it's cities in the south of Primorsky Region, where for solving urban problems it is necessary to take the relief, climate, socio-demographic, historical, religious, political and economic conditions of the region [4].

One of the main directions for the strategic development of the cities hybrid environment in the south of Primorsky Region is the creation of an innovative comfortable urban environment, that including the use of digital technologies. For example, when choosing housing, people actively pay attention to its quality, the organization of comfortable public, cultural and educational, leisure, sports, health and recreation spaces in new and old residential areas. They are interested in landscaping, the availability of courtyard driveways and parking spaces, the provision of playgrounds and sports grounds, landscaping and landscape design, as well as solving lighting problems and the light-color organization of adjacent territories.
Thanks to digital technologies, many problems can be identified and eliminated at the design stage, while other problems can be solved using more efficient digital, alternative, energy-saving and multimedia technologies [6].

One of the main factors for creating a comfortable innovative hybrid urban environment is the possibility of active and passive recreation in parks, squares, boulevards, embankments and other public, cultural and educational, sports and recreation and landscape and recreational areas. In Vladivostok, for example, the first steps are taken to create such an environment [7; 8].

It seems, that innovative digital technologies are called upon to play an important role in the formation of an aesthetically attractive, comfortable hybrid architectural and design environment in coastal cities of Primorsky Region, that are located to a complex climate and relief. Their use will help to combine traditional architecture, design, art and engineering, and will also contribute to the formation of a new toolkit for architect-designers who create projects on topical themes of our time. Especially when they design a "smart" subject-spatial urban environment with elements and technologies of virtual and augmented reality.

The main challenge in the design of a hybrid architectural and design environment is to use a new digital context, that includes conceptual design, collection and analysis of big data (information flows), generative design and algorithmic management.

In these new conditions, the systems of governance and regulation in cities are in a stage of complex transformation. Existing methods of analysis and design don't always meet the emerging demand. Therefore, it is necessary to update the design tools of architects-designers who study and design an innovative urban environment [9-11].

Digital technologies in architecture and design are actively developing. We can see so-called computational design, where, with the help of algorithms, a procedural scenario for the creation and development of an architectural and design object is set. This scenario takes into account local regional conditions: from modeling a building or structure to creating information models of the entire urban environment as a whole.

Today, it is impossible to design a modern hybrid urban environment without the use of the latest digital technologies, that including artificial intelligence and machine learning, augmented and virtual reality, cloud technologies, computer vision, neural networks, etc. [12].

There are three main areas for introducing digital technologies:

- first, the improving of the customer service quality, including in the architectural and construction business, that using social networks and multimedia media;
- second, the active use of modern digital gadgets and their software (digital advertising presentations, information collection and the possibility of remote service from various mobile devices);
- the third, mutual, almost tactile, interaction with the client (remote designer), which allows you to contact "online" in real time with clients, colleagues and consumers.

All of this allows transforming and actively using digital automation, virtualization of the workspace; use remote working groups for optimization, group various databases for collective use by all employees and designers into a single product or project [13; 14].

There are many Russian companies, that including design companies, which are actively implementing IT technologies and the Internet. They were able to transform their architecture and construction business and move from traditional “paper-based” 2D design to digital 3D design. This made it possible to use digital "cloud" technologies and integrate into a single global Internet network for quick and efficient management of your business from any geographic location in the world. Mobility and accessibility have allowed them to enter the international market.

If we consider the problems and opportunities for the Primorsky Region, then the following should be noted: the process of digital transformation of architectural and design firms and companies here requires the use of new opportunities for the design of a hybrid architectural and design environment of coastal cities. The difficult relief is a specific of these cities.
All of this will require more active integration and transformation of "digital technologies" into the creation of hybrid business models of a comfortable urban architectural and design environment. The creation of the subject-spatial content of the hybrid architectural and design environment of Primorsky cities, that have a complex relief, is requires except the using of traditional standard technologies the organization of additive manufacturing. For example, 3D printing of finished products are based on the layer-by-layer creation of a digital three-dimensional model (reduced scale and in full size). Currently, the market provides the widest range of materials for 3D printing in various techniques (inkjet casting, laser sintering, etc.). In the printing of a three-dimensional digital model various types of 3D printers that use a variety of plastics, liquid glass, ceramics, concrete, powdered metal and other materials are used.

We would like to especially note that, 3D modeling, as a method of industrial production and urban construction, is actively developing and becoming more and more in demand in the world. So, for example, in the Arab Emirates, houses and villas for recreation and tourism are actively printed. In China, residential buildings and skyscrapers are printed. Street furniture and art objects are printed in Europe etc. It seems that, in the future, 3D printing can replace such standard technologies for the production of architectural and design products as casting, welding, forging, molding, milling and other technologies for artistic processing of materials.

3D printing already today allows the production of various architectural and design objects without purchasing additional equipment and using new forms. Additive 3D printing a layer by layer, almost from scratch allows you to create a natural copy of a three-dimensional model of a projected architectural and design object, which will later become an element of the urban environment. One of the 3D printer model can be reused to create different digital models. This allows you to create a wide variety of products. The new production is changing the entire paradigm of house-building factories of reinforced concrete products and other industrial enterprises that centrally produce standard elements and products.

As a result, the system of construction production is transferred to a new local, environmentally friendly and unique form that can be created construction in mass volumes, without increasing the time of their production and cost.

It is no secret that, at present most of the products for creating a comfortable subject-spatial urban environment are made in small batches. Sometimes they use of expensive, highly skilled manual labor. 3D digital models have the high precision of additive manufacturing. The production of urban environment elements that designed with their help, can significantly reduce the cost of many production costs. This will contribute to the rapid growth of small innovative enterprises that are now actively being created in the Primorsky Region.

3D printing does not require the use of additional equipment. This allows small innovative enterprises that work in the field of creating an innovative urban environment to significantly save their time and money. It becomes possible to instantly correct changes in the supply chain of the required raw materials and materials. Thus, the variable 3D production of architectural and design products for the integrated formation of a comfortable urban environment allows small local firms associated with the architectural and construction business to become more and more in demand and competitive in the markets of the Asia-Pacific countries.

3. Conclusion
Thus in general, the situation with the formation of a comfortable urban environment, in the context the using of digital technologies in cities and towns of Primorsky Region, now looks much more complicated. There are many problems that needs to be resolved in the future. For the coastal cities in the south of Primorsky Region, several basis directions of development can be distinguished, that aimed at the formation of a hybrid urban environment.

1. Through the introduction of the latest digital technologies, the use of innovative hybrid technologies in the field of visual communications, digital navigation systems, landscape design and the organization of a light-colored urban environment will change the actual state of affairs in the field
of organizing a comfortable urban environment. Currently, it boils down to only minimal greening, landscaping, patching roads and cleaning areas.

2. The widespread introduction of 3D architectural design, as well as additive 3D printing, will allow small business to develop and the reduce of products cost.

3. Under the current conditions, it is urgent to start developing projects for reconstruction, renovation and modernization of urban courtyards, which currently do not have a sufficient number of parking spaces, normal passages, cars park directly on lawns and children's playgrounds. It makes a habitat unfriendly to humans and violates of ecology urban environment. Courtyards and many urban spaces, for example, recreational spaces, are poorly lit, there is no full-fledged barrier-free environment for people with disabilities and low-mobility groups of the population. All this poses a threat to the health of townspeople in the dark time and contributes to various injuries and injuries.

4. The situation that has developed in Vladivostok city is aggravated by the fact that the authorities unreasonably give permits for the construction of point buildings and structures. In this regard, urban recreational squares, forest-park protective territories, etc. are actively destroyed. Digital monitoring using social networks and multimedia media could change this situation. People will be able to influence actively the taking place in the city processes through the online system with the help of digital gadgets and software for them. The population will have the opportunity to react in real time to all changes in the urban environment.

5. In the process of forming a new hybrid architectural and design environment in modern cities of the Russian Far East, it is necessary to legally consider, develop and change, new standards for arranging a comfortable urban environment, that use modern methods of the digital economy.

6. Now the country has a system of various building standards (former GOSTs, as well as the system of SanPiNs), which ensure the quality of the environment and people's lives. Many of them are already morally outdated, since they were adopted back in the USSR. Developing and approving new and adjusting old standards takes time and money. Today in Russia there are still old, sometimes don't adapted to new conditions, various temporary acts and standards regulating the processes of life and life support of modern cities.

Currently, the Vladivostok city is not only the capital of the Russian Far East, but also the cultural, historical, political and economic center of the region, which in the near future will become the center of international tourism, including for the countries of the Asia-Pacific region (APR) [15] . The era of digital globalization increasingly requires for urban residents is using: the digital resources in the form of cloud technologies, augmented and virtual reality, computer vision, various neural networks with elements of artificial intelligence. As the result, a hybrid, "smart" and comfortable architectural and design environment is forming.

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