

PROSPECTIVE DIRECTIONS OF URBAN CONCEPTS TRANSFORMATION IN THE CONTEXT OF THE IMMERSIVE PRESENCE ENVIRONMENTS DEVELOPMENT

Frankiv R., PhD, Associate Professor,
Lviv Polytechnic National University
romanfrankiv@gmail.com, ORCID: 0000-0003-1100-0930
S. Bandera St., 12, Lviv, 79000, Ukraine

Abstract. The proliferation of immersive presence environments (an artificially created multimedia environment of an alternative reality) is evolving into a widespread social phenomenon that gradually influences how people live and interact. As a result, it has the potential to reshape expectations and demands regarding living spaces and their arrangement. While numerous studies have explored the impact of virtual and augmented reality technologies on urban planning, relatively little attention has been given to the possibility that the behavioral changes brought about by these technologies could prompt a reevaluation of the fundamental principles underlying urban planning.

Previously, immersive environments were primarily seen as tools for a limited group of individuals to enhance their problem-solving capabilities within the existing framework of urban planning. However, with the widespread adoption of virtual presence tools, there is a potential for a significant shift in this paradigm. The exact nature and implications of these changes are still not well understood and remain uncertain. However, through the method of behavioral interpolation, we can begin to model the key aspects and potential outcomes of this paradigm shift.

The object of this article is to present a theoretical framework for potential transformations in the contemporary urban planning paradigm resulting from the widespread adoption of personalized virtual reality technologies. Through analysis, five key categories within modern post-industrial urban planning are identified as likely to undergo changes: a) residential areas; b) accessibility radius; c) social cohesion; d) transportation requirements, and e) optimal density. Residential units will necessitate additional opportunities and spaces, altering living requirements and lifestyles. The significance of the accessibility radius, particularly for pedestrians, may diminish as a considerable number of desirable locations become accessible directly from individuals' homes. Reducing strain on transportation networks will enhance cities' environmental sustainability and create new opportunities for green spaces. The concept of social cohesion will experience stratified transformations, as differences related to ethnicity, religion, gender, race, age, social status, etc., become neutralized through the development of shifting virtual personas and non-deterministic identities. These interrelated changes will also diminish the weight of the optimal density category. Collectively, these transformations form a comprehensive conceptual framework that reimagines the city.

This article outlines two potential directions of change in the urban paradigm that could arise from the proliferation of personalized metaverse communication technologies. The first direction pertains to the contemporary interpretation of deurbanistic concepts, incorporating elements of self-sufficiency, stability, security, and communication infrastructure characteristic of the information age. The second direction is likely to focus on various approaches to transforming the existing urban environment. This transformation will occur through the involvement of market regulatory mechanisms and the development and implementation of specialized municipal programs aimed at modernization and stimulating population growth.

Keywords: urban planning, concepts, transformations, immersive environments, metaverse.

Introduction. Despite the significant progress of the phenomenon of immersive environments, the understanding of their impact on urbanism is mainly limited to the subject of imitation and modeling of urban development processes within the framework of current ideas

about urban spaces of the post-industrial age. They are perceived as elements that improve the design and predictability of existing concepts of interpretation of the urban environment and are rarely considered themselves as a factor in changing the existing urban paradigm.

Obviously, this is due to the fact that the experience of immersive presence has not yet reached critically large volumes and has not become a reality for most citizens, even in developed countries. However, existing experiments and analysis of projects, that are already being implemented, show that spaces of virtual presence will play an increasingly important role in many areas of everyday life and will acquire a routinized character, both in the format of professional employment and private life. Collective and individual activity can equally be transformed by the metaversal experience, which will significantly affect the behavior and requests of the average city dweller. His needs will change significantly, which cannot but be reflected in the ideas about the functioning of the city body. It is likely that new criteria for assessing the quality of urban space will emerge, and therefore, other principles of its design and interpretation.

Publications and sources analysis. The reflection of the role of immersive technologies in urban planning is only in the first stage of its formation and to a large extent still depends on ideas about urban spaces that developed in the post-industrial era. Therefore, the greatest attention was paid to the possibilities of virtual and augmented reality as a means of modeling processes within the framework of the late modernist paradigm [1,2]. The continuation of this trend was also proposals for the involvement of more accessible means of augmented reality, aimed at increase the number of participants [3]. In the future, it is possible to note the specification of the use of such means in various segments of the modern urban planning discourse - for example, the involvement of an immersive environment for the improvement of participatory urban planning [4, 5]. Thus, we can talk about the gradual emergence of a new terminological framework with concepts such as "e-urbanism" [6], or cyber-urbanism [7,8]. A possible prospect is also the involvement of virtual presence tools for visualizing the memory of a place [9].

A more significant step towards the self-sufficiency of immersive spaces as a new urban reality is the development of the concept of "meta-urbanism", which is based on the emergence of a virtual real estate market in metaversal environments, which can take the form not only of a small personal environment, but also of an entire urban organism with enormous possibilities of interaction between virtual characters. At the same time, current experiments show that the morphological structure of such an organism currently does not have its own individual character, but repeats the form-creative and spatial-creative principles of the late-industrial/post-industrial city (cyber-city project "Liberland") [10].

The goal of the article is to theoretically outline possible changes in the modern urban planning paradigm under the influence of the mass spread of personalized virtual reality technologies.

The object of the article. The spread of immersive presence environments is becoming a broad social phenomenon that improves lifestyles and the nature of interaction between people. In this role, it can change expectations and requirements for living space and its organization. Despite the emergence of a significant number of studies highlighting the roles of virtual and augmented reality technologies in the progress of urbanism, relatively little attention has been paid to the fact that a corresponding change in the behavior of large numbers of people can lead to a revision of the more fundamental foundations of urban planning.

If until now immersive environments were considered as tools for a certain small group of people who were given the opportunity to more effectively solve tasks within the existing urban planning paradigm, then the mass spread of virtual availability of tools can probably destroy this very paradigm. The nature and content of these changes remain poorly understood and uncertain, although their main features can be modeled by the method of behavioral interpolation.

Research materials and methods are based on the analysis of the current discourse, which has developed around the issues of modern urban planning on the one hand, and on the other - on the study of the experiences of virtual and remote involvement of city residents, which is connected

with the development of the possibilities of immersive presence. These two analytical arrays were included in the method of comparative and synthesizing analysis, the results of which formed the basis of the conclusions for the article.

Results and discussion. The modern idea of the efficiency of the urban space is connected with the postmodern criticism of the industrial city, which began to gain popularity in the 70s of the 20th century. The improvement and expansion of this criticism became the conceptual basis for the formation of new categories of environmental value and the key concepts that define them - such as environmental friendliness, sustainability, ingenuity, self-sufficiency [10], diversity, social cohesion [11], inclusiveness, optimal density [12], etc. These categories formed a vision of a post-industrial living space [13], a certain urban ideal, which, however, cannot have a static character due to the rapid progress of technology and innovation. A post-industrial city aimed at attracting and retaining the most valuable human potential must constantly adapt new opportunities, including in the field of improving social interaction.

In this sense, the development of immersive places of presence can become not only a factor in improving the paradigm of the existing city, but also a source of deeper changes that will significantly affect the perception of the desired urban space. This article examines five expected transformations of today's post-industrial urban model, which arise from the fact of mass distribution of personalized virtual reality technologies.

The first of them is the rethinking of the basic unit of the urban fabric - the residential unit. The COVID-19 pandemic became an experience of a positive rethinking of remote employment, which led to a reduction in traffic load, noise, and pollution, which in some places even gave rise to the revival of wildlife and a healthier environment [14]. The development of personalized systems of immersive presence will provide additional arguments for strengthening home employment, due to which new requirements for the space of the residential unit will arise. Its parameters should take into account the fact of a much longer stay and diversification of activities of residents inside their apartment. The growth of the home delivery sector of various goods is another factor in the "domestication" of daily activity. Therefore, there are new requirements for the planning of apartments, which must now include areas for the safe use of VR headsets, the look and character of which will also change and expand. A longer stay at home may also stimulate the growth of the list of other mandatory spaces, such as offices, leisure rooms, etc., potentially changing requirements for parameters such as noise isolation (in the presence of several people using VR devices at the same time) and security (an active user The VR headset loses full control over its surroundings in the traditional sense). On the other hand, the usual requirements for the design of physical premises may change because they lose the monopoly on creating the living space of one or another person.

The next expected transformation is related to the activity distance. In post-industrial urbanism, the valorization of the concept of density is closely related to the possibility of pedestrian accessibility to a wide range of services [12]. "Cities of short distances" were supposed to significantly reduce the traffic load and save time spent on the road. However, now, immersive environments bring a large number of choice objects inside the home.

As a result, the requirements for the residential environment are changing. Work, education, leisure, communication, and shopping are much more often carried out within the home space, due to which the concept of optimal density and pedestrian accessibility loses a significant part of its argumentation. Under these conditions, requirements for operational qualities of housing, ensuring its optimal microclimate, safety, integration into life support systems and self-sufficiency will gain more importance. For example, facilities related to health care, sports, recreation, personal communication, and social rituals may remain in the pedestrian accessibility zone.

At the same time, other species do not disappear in general, but their importance and necessity decrease. They can exist in a mixed form, for example, different ways of combining leisure with recreation, personal communication with work and social rituals, etc. However, such, even hybrid forms of non-virtual presence will have an alternative in immersive spaces of presence, which will further increase the possibilities of personal choice. The mandatory real environments, under these

circumstances, will probably monogenize, and housing will become an even more dominant type of buildings, although the requirements for it will be significantly transformed.

Significant changes can also be expected in the interpretation of social cohesion [15], which is associated with the third predicted transformation. By modeling different forms of cohesion, the potential for conflict between different groups with different identities that inhabit large cities should be reduced. They overcome their territorial and psychological isolation and together form a common organism of the urban collective. Tensions that may arise on the basis of ethnic, social, religious, linguistic, age and other differences are alleviated by a number of regulatory techniques, including those of an urban planning nature – such as, for example, minimization of spatial segregation, creation of inclusive public spaces, etc. Improved in this way, the solidarity collective should have a more effective influence on the urban progress of its city, through various forms of participation, joint projects of neighboring communities and other types of participation.

Nevertheless, achieving the appropriate level of social cohesion remains a serious problem, especially in the context of relations between more and less wealthy categories of citizens and the inertia of traditions of isolation of communities united by a certain identity. In this sense, the development of environments of immersive presence is potentially able to significantly improve the overall level of social cohesion due to the emergence of virtual personalities, which are characterized by a much higher degree of variability.

Racial, age, social and other differences cease to play an important, if any, role in the interaction within the urban collective. Concerns about spatial segregation are losing ground, and multiculturalism and multiple identities are becoming not a characteristic of society but of a single individual. Under these circumstances, isolated blocks of communities with a deterministic identity are universalized through the layering of various changing roles, with temporary symbolic expression. Other variations of potential conflict that may arise will not, however, be actively expressed in a non-virtual environment.

The fourth likely change in the urban planning paradigm is related to the rethinking of the need for transportation. Immersive environments of presence for work, study and leisure reduce the need for personal presence in traditional offices, educational institutions or recreation facilities, due to which the load on the transport network is significantly reduced. In addition, the development of home deliveries, including with the help of unmanned aerial vehicles, can significantly affect the intensity of use of personal and even public transport. Therefore, the level of pollution and noise decreases, as well as the possibility of increasing pedestrian zones and landscaping due to the use of excess road surface area. Transport networks, however, will continue to be used for service, delivery, law enforcement and healthcare services. At the same time, the prospect of the disappearance of personal modes of transport should not be considered, as they increase the breadth of personal behavior choices, which in the conditions of the metaversal experience is one of the main values.

The next potential transformation is related to the rethinking of the density category, the main advantage of which is considered to be close accessibility to various service, employment and leisure facilities. In practice, however, the variety of choices within the imaginary pedestrian zone does not always become a reality. Often, dense construction is formed as a result of commercial calculations of construction companies, the priority of which are those types of structures that are more profitable on the real estate market. In addition, the method of acquiring the necessary qualities of the territories of historical buildings, especially of the pre-modern era, remains uncertain. Therefore, achieving "optimal density" has turned into a difficult problem, unattainable for most areas of the urban fabric.

Reducing the level of dependence of choice on direct physical accessibility significantly changes the basic circumstances that led to the valorization of density. Since convenient choice and high density cease to be connected with each other, there is an opportunity to return to the psychology of the optimal distance of individual living spaces. Given the nature of the above transformations, it is obvious that it should be increased at least due to the increase in the area and

functional diversity of the apartments.

In connection with the probable transformations outlined above, a question may arise about the contours of a new urban planning paradigm that will replace the existing one. As such key categories as transport, density, cohesion, accessibility and personal living space undergo a radical rethinking, the conceptualism of urban space will be directed in a different direction. It can be assumed that at the first stage, trends associated with deurbanization connotations, renewed attention to relevant searches of the 20th century (for example, Broadacre City) and attempts to form a new lifestyle and its visual ideals will become noticeable. On the other hand, deurbanization ideas will run into problems of infrastructural provision and a tradition of skepticism about urban growth.

Therefore, the most possible is the development of two conceptual directions of urbanism in the era of the spread of metaverse communication technologies. One of them is related to the modern reading of deurbanistic ideas, which will be significantly supplemented with elements of self-sufficiency, sustainability and security and the corresponding communication infrastructure. The second will be focused on the transformation of existing urban structures, both through market regulation mechanisms and, probably, thanks to special municipal programs of modernization and population growth stimulation. In this regard, new varieties of multi-story residential buildings and advanced methods of renovation of historical objects may also arise.

Another principled approach can be the revival of the concepts of mobile housing, which, for example, was developed by the futurists of the 1960s and 70s. Increasing the time spent in immersive environments and reducing dependence on physical communications for employment and leisure opens up a perspective for a new stage of understanding mobile living space. This, in turn, changes the very category of static "dispersion", which goes beyond the boundaries of one static urban area and acquires a wider scale of territory, district, region, landscape zone, etc. Unlike the ideas of the 1960s and 1970s, however, "nomadic" residential formations have the opportunity to rely on significant experience in the development of technologies of self-sufficiency and communication inclusiveness, which reduces the distance from the traditional static residential environment, integrated into urban life support networks.

Conclusions:

1. Based on the analysis, five categories of modern post-industrial urban planning are outlined, which may undergo changes under the influence of the development of personalized virtual reality technologies: a) residential area; b) radius of availability; c) social cohesion; d) transport necessity and e) optimal density. Residential units will require additional opportunities and areas, which will change the requirements for living and lifestyle. The radius of accessibility (in particular, pedestrian) may partially lose its current value, as a significant number of choice objects will move directly to the homes of citizens. Reducing the load on transport networks will improve the environmental performance of cities and allow new areas for greening and sustainability. The issue of social cohesion will undergo stratigraphic changes, as differences in ethnicity, religion, gender, race, age, social status, etc. will be neutralized due to the development of the phenomenon of changing virtual personalities and non-deterministic identities. These changes will also cause the optimal density category to lose its weight. The above changes are interconnected and create a single conceptual complex of the new vision of the city.

2. Two directions of potential changes in the urban paradigm that may occur as a result of the spread of personalized metaverse communication technologies are outlined. The first applies to the modern interpretation of deurbanistic ideas, to which the elements of self-sufficiency, stability and security and the communication infrastructure characteristic of the information age can be added. The second will probably be devoted to different ways of transformation of the already existing urban environment. This will happen both through the involvement of market regulatory mechanisms and through the development and implementation of special municipal programs for modernization and population growth stimulation.

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**ПЕРСПЕКТИВНІ НАПРЯМКИ ТРАНСФОРМАЦІЇ УРБАНІСТИЧНИХ КОНЦЕПЦІЙ
В КОНЕКСТІ РОЗВИТКУ СЕРЕДОВИЩ ІМЕРСИВНОЇ ПРИСУТНОСТІ**

Франків Р.Б., к.арх., доцент,
romanfrankiv@gmail.com, ORCID: 0000-0003-1100-0930
Національний університет «Львівська політехніка»
вул. С. Бандери, 12, м. Львів, 79000, Україна

Анотація. Поширення імерсивних середовищ присутності поступово перетворюється в помітне соціальне явище, яке поступово впливає на життя та взаємодію людей. Як результат, вони мають потенціал змінити очікування та вимоги щодо житлових приміщень та їх розташування. Хоча численні дослідження вивчали вплив технологій віртуальної та доповненої реальності на міське планування, порівняно мало уваги приділялося можливості того, що поведінкові зміни, викликані цими технологіями, можуть спонукати до переоцінки фундаментальних принципів, що лежать в основі міського планування.

Завдяки проведеному аналізу визначено п'ять ключових категорій у сучасному постіндустріальному міському плануванні, які можуть зазнати змін: а) житлові райони; б) радіус доступності; в) соціальна згуртованість; г) транспортні вимоги та д) оптимальна щільність. Житлові одиниці вимагатимуть додаткових можливостей і просторів, змінюючи характер та спосіб життя. Значення радіуса доступності, особливо для пішоходів, може зменшитися, оскільки значна кількість бажаних місць стане доступною безпосередньо з помешкання. Зменшення навантаження на транспортні мережі підвищить екологічну стійкість міст і створить нові можливості для зелених насаджень. Концепція соціальної згуртованості зазнає стратифікованих трансформацій, оскільки відмінності, пов'язані з етнічною приналежністю, релігією, статтю, расою, віком, соціальним статусом тощо, певним чином нейтралізуються через розвиток мінливих віртуальних персон і недетермінованих ідентичностей. Ці взаємопов'язані зміни також зменшать вагу категорії оптимальної щільності. У сукупності ці трансформації утворюють комплексну концептуальну основу, яка переосмислює місто.

У цій статті окреслено два потенційні напрямки змін у міській парадигмі, які можуть виникнути внаслідок поширення персоналізованих комунікаційних технологій метавсесвіту. Перший напрямок стосується сучасної інтерпретації дезурбаністичних концепцій, що включає елементи самодостатності, стабільності, безпеки та комунікаційної інфраструктури, характерні для інформаційної епохи. Другий напрямок, ймовірно, зосередиться на різних підходах до трансформації існуючого міського середовища. Ця трансформація відбуватиметься шляхом залучення ринкових механізмів регулювання та розробки та реалізації спеціалізованих муніципальних програм, спрямованих на модернізацію та стимулювання зростання населення.

Ключові слова: містобудування, концепції, трансформації, імерсивні середовища, метавсесвіт.

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