INFORMATION MODELLING AS ONE OF THE BASIC COMPONENTS OF THE ARCHITECTURAL AND PLANNING ORGANISATION OF THE ADAPTIV PUBLIC COMPLEXES

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ABSTRACT

The article contains analysis of the information design development as one of the basic components of the modern architectural design of the resilient public complexes. Reviewed the impact of technologies and information technologies on the way of life and perception of the world by human. Also, was given a few examples of use cases of information technologies practically. BIM technology is considering as the basis for design of the adaptive architecture.

Key words: information modelling, information technologies, modern technologies in architecture and design, building information modelling.

1. INTRODUCTION

Pace of life is one of the basic features of the modern society; it grows continuously and, in its turn, makes the society to seek new means and methods to satisfy its needs. Such onrush development is caused by the scientific and technological advance, which entails changes in the societal life and extension of mankind activity. As a result, architecture should be one of the first to respond to all existing and predicted transformations.

Before airplanes come in our life postmen spent months to deliver letters. Before washing machines came into use, it was necessary to work physically for a whole day so as to wash and dry family clothes and linen. Same with the hoisting cranes – it took decades, sometimes centuries, to build such large facilities as castles and cathedrals. The point is: whatever you are doing, it is the technologies which will enable you to do it best of all [1].

2. MATERIALS AND METHODS

The research is based on the approaches that regard network of public complexes as a complex system, which requires a comprehensive study by related sciences and by using contemporary information technologies.

The purpose of the study is the definition and selection of the indispensable components of adaptivity in design of public complexes for further elaboration of set of tools and methods, which could be used by architects and designers practically.

For the study of this topic were used methods of theoretical examination, analytical, historical, comparative and thematic analysis, materials from archival sources and internet resources.

The review of the current state of the design and usage of public complexes in Ukraine and foreign experience provided an opportunity to identify main aspects, while comparative and thematic analysis made it possible to determine the ways of further improvement and development of these and functionally similar institutions.

A new stage of the society development which delineated essential changes in human life has been shaped as a result of the information technology development which may scientists characterize as the post-industrial era.

Considering development of information technologies and identifying the most significant of them, W. Mitchell concluded that the 21-st century is the digital era in the development of technologies when architecture is not "autonomous" as before but deals with space, mass and light, and "now undoubtedly serves as a constructive basis   which enables to find and elicit meaning out of intertwined flows of textual, graphical and digital information". [2]

Information technologies combine such wide spectrum of things because the technologies and intermediaries which use essentially contributes to the changes in communication of a man with the outer world, reorganizes human perception of the world and his lifestyle.

Speaking about modern public buildings intended for a transfer, storage and use of information, the known architect Toyo Ito affirms that all of them will "merge in a single common typology, there will be no boundaries between a museum and art gallery, between a library and theatre – all of them will restructure into a new form – Multimedia Library, something like a convenient, easy-to-handle media-supermarket where all media are got together and "everything is compartmentalized". [3]

Impact of the information technologies is vivid on four levels – these are the building types and their functional structure; building mass; architectural and artistic characteristics; and design process.

When architects analyse processes taking place in the society, they design the building space in a different manner, which creates another building mass structure. The information technologies tools make it possible to create and optimize zoning inside premises thereby creating so-called "controlled fields" and getting rid of rigid elements of the structure arrangement such as walls, partitions and other visible boundaries. [4]

The verge of the end of the 20th – beginning of the 21st centuries, when the development of information technologies boosted, was, at last, marked by emergence of a fundamentally new approach to the architectural and building design which means development of a computerized model of a new building that contains all data about the future facility. It was a natural response of a man to the cardinally changed information richness of our environment.

3. RESULTS AND DISCUSSION

Under contemporary conditions it became utterly impossible for designers to efficiently process with the aid of old means a huge (and steadily growing) "Big Data" flow which precedes and accompanies the design proper. The design results are also full of information which is to be stored in a convenient to use form.

Such dataflow does not cease even after the building has been designed and built because, as operation of the new facility commences, it begins to interact with other facilities and the environment (city infrastructure). Along with commissioning of the building the inner essential services of the building are started up, i.e., using modern language, the active phase of the "life time" of the building begins.

The information "challenge" of our modern world necessitated the intellectual and technical community to give a serious response. Such response followed in kind of a concept of the informational modelling of buildings.

Having initially emerged in the design medium and having received a wide and quite successful practical application in creation of new facilities, this concept, nevertheless and rather quickly, moved beyond the set framework and nowadays we see that the information modelling of buildings means much more than just a new design method.

Now it is another markedly different approach to erection, outfitting, maintenance support and repair of the building, to management of the life cycle of the facility including its economic component, and to the management of our manmade environment. It means a change of the attitude to buildings and facilities, a new glance on the world around and re-thinking of the ways of a man's impact on this world. [5]

Companies and organizations always were looking for such workstation which improves work and productivity of the employees. Even before the offices took their present shape, designers and innovators have already studied workstations, for instance at factories, in order to develop the higher labour productivity strategy. In the 1960s Robert Propst, the designer of a furniture stable for Herman Miller's offices, studied workstations, same as many other designers, and, as a result, "modern cubicles" (small area workstation fenced by small partitions/walls from the other premises) have appeared. (Fig.1) These developments were made primarily on the basis of observations and intuition targeted at organization and arrangement of employees in the seemingly efficient way.

Today's technologies enable a designer to apply more complex approach using the sensors, accessories and equipment ("Internet of Things") connected to the Internet as well as analytical data required for studying premises online. This refers to solution of the fundamental problems of providing people with the environment they require. "Many of our designers make beautiful shapes but we should prove why this particular shape is better than the others. «So, we consider the methods of comparison and it suggests that

we should review the spatial data", says Uli Bloom, London architect, co-founder of "Analytics and Insight Unit" at "Zaha Hadid Architects". (Fig. 2)

Fig. 1. Herman Miller "Action Office system". Prototype of organization of contemporary office space – "modern cubicles". Source: [6]
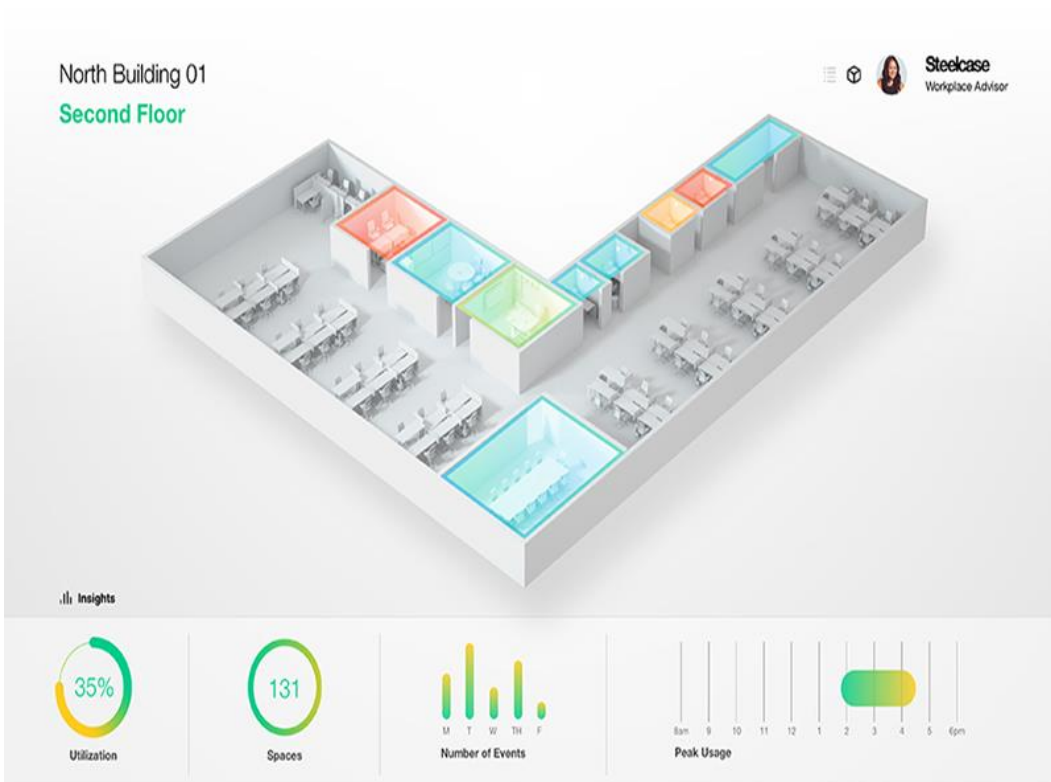

Fig. 2. Use case of analytical and spatial data online. Source: [1]

A spectacular example and a pioneer in application of advanced technologies is presented by Parkins+Will architectural firm. Throughout its entire 82-years practice, they continuously test and apply innovative technologies, such as Big Data; virtual, mixed and added realities; generative process and computational design. The approach to design of buildings with the use of their information modelling provides, above all, acquisition, storage and integrated processing of all architectural, design, technological, economic and other information concerning the building including all kinds of its interaction and dependencies when the building and everything pertaining to it are viewed as a single object. (Fig. 3)
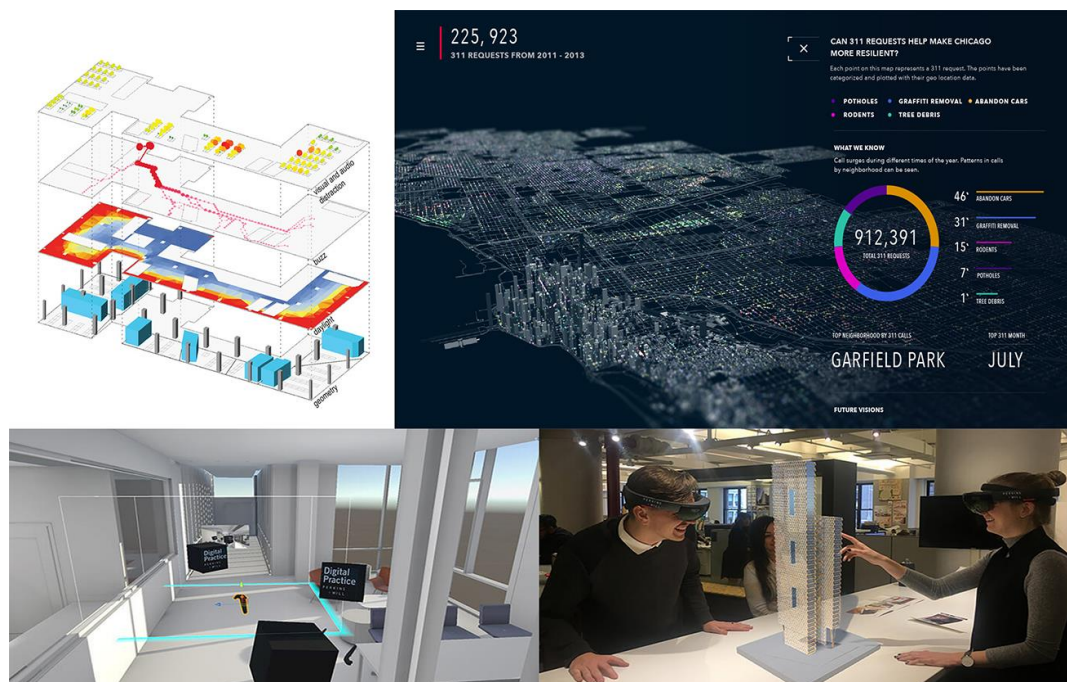

Fig. 3. Description of the Picture. Use cases of information technologies. Source: [1], [7]

Correct determination of these interactions as well as precise classification, well-thought and organized structuring, relevance and reliability of the used data, convenient and effective tools for access to and work with the available information (data management interface), a possibility of transferring this data or the results of its analysis for further use to external systems – these are the basic components that describe information modelling of buildings and determine its future success. It is only required to take into account the following circumstances. Information modelling of buildings appears not instead of the classical design methods but presents their development, therefore it logically co-opts them. With the use of a new design method, the work at a project becomes more informational. [5]

4. CONCLUSION

When closely examining development of the contemporary architectural design, it is possible to note the main peculiarity – the concept of information modelling of buildings still

leaves the conceptual design decisions with a man while the "computer" performs, as before, a technical function limited by storage, special processing, output or transmission of information. However, in the era of information technologies, when literally every day occur new scientific and technical breakthroughs, still remain the problem of lack of accessible and comprehensible methods and tools for design of truly adaptive objects. In current situation, BIM technology is considered as the basis for further elaboration of tools and methods for design of adaptive architecture, because it does not only not hinder but also stimulate the implementation and development of new technologies in building industry.

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