Problems of the implementation of BIM technologies in Russia

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Abstract: This article is devoted to the latest technology of computer-aided design - Building Information Modeling (Building Information Modeling or Building Information Model). It discusses the prerequisites for the emergence of information modeling, describes its advantages and capabilities compared with the traditional two-dimensional design method and are presented in the figures. Currently in Russia there is a problem of introducing BIM. In this paper, we identified the main problem of introducing BIM technologies in Russia, which is associated with a decrease in the productivity of designers when switching to a new design technology, as well as possible solutions to this problem. In addition, the difficulties arising from attempts to move to BIM-technologies are described. The main conclusion is the indisputable advantage of BIM-technologies over 2D design.

1. Introduction
In the modern world, the development of technology brings a number of changes in various areas of activity [1-3]. The emergence of technology information modeling occurred as a result of the necessity processing for man the huge and steadily growing flows of information used at the design stage and subsequently used throughout the life cycle of buildings and structures. The flow of incoming information is becoming more and more and a person is forced to look for new ways of processing and compiling the received data. Information technology progress improves computer technologists, which in turn is instantly reflected in the design and construction activities [4-6]. At the moment, it is not enough to have only a paper project of the building being created, since information continues to flow even when the building has already been built and is being actively exploited, interacting with the environment.

2. Information model of the use of BIM technologies
In the current realities, when modeling objects, it is necessary to take into account not only the architectural-design features, but also all the data of different contents associated with it as a single information complex. This entails the need to structure of data large volume with different typologies.
More in demand will be information model, which will remain relevant at any point in time and allow you to make changes throughout the life cycle of the property (figure 1).

Figure 1. Information model structure [10]

Figure 2. Integration of information in the framework of BIM [10]
However, it should not be just a copy of a cardboard layout showing only the architectural appearance and spatial solutions of the object, but should contain all information about the building, its structural elements, materials and equipment, quantitative and qualitative characteristics. Accordingly, it should be a single living model, able to respond to the changes and automatically complement and adjust the entire model (figure 2) [7-10]. In connection with these requirements, information modeling of buildings and structures appeared.

Awareness of the need to use information modeling in the Russian construction industry is only beginning to gain momentum. The overwhelming majority of design organizations already use this concept of design, which cannot be said about companies that are directly involved in the process of constructing a building. Today, when developing a project, information design in design organizations is reduced to modeling a 3D layout of engineering networks and the architectural appearance of a building, less often – to all main sections within the framework of creating complete design and estimate documentation.

3. Problems of the implementation of BIM technologies
The introduction and mass application of BIM technologies requires huge initiative efforts and associated risks caused by the lack of mandatory expertise of the 3D model and the regulatory framework governing all aspects of working with the information model, from its creation to its use throughout the entire life cycle of the property [11-14]. But even if the regulatory framework is created, rapid implementation and widespread use will not occur. Organizations that do not work in BIM, unfortunately, do not receive an adequate level of motivation. Here the psychological factor plays a special role. An ordinary employee interested in the development and success of his organization will find it easy to master a new design environment. However, some managers want to switch to a new technology without loss of productivity of their subordinates at the initial stage of implementation, which is unlikely (the graph of labor productivity is presented in Figure 3) [15].

In practice, it turns out that when switching to BIM, as a result of a decrease in productivity, we have a decrease in the volume of work with a simultaneous decrease in the level of wages. In such a situation, employees will try to maintain their income levels, and perceive BIM as the cause of their financial problems and oppose their implementation in every way. In this case, the introduction of any new technology will not happen, despite the best efforts of management [11-13].

According to Vladimir Talapov’s book, BIM Basics: An Introduction to Building Information Modeling [16], in Russia there are three ways to implement BIM:
- Private company;
- With the company's own efforts, but a specialist is invited, who coordinates the entire implementation process and trains employees to work in the software package;
- Attracting third-party organizations.

Indeed, in order for the introduction of new software, the curve in figure 3 should be more even and with minimal difference, it is recommended to make the transition not by the whole organization at
once, but by departments that ensure the full output of the product of the project activity. You can invite a specialist who has at least the slightest understanding of the technology of information modeling, even without practical experience in the field of design. Such a specialist will support and accelerate the transition to BIM.

To make the transition to BIM, you need a proper understanding of the laws of this process, the optimal combination of ways to optimize and mitigate the process of implementing the information modeling programs described above.

The psychological factor is the main problem arising in the transition to BIM design, and, unfortunately, the most formidable. Unreasonable distrust of the new software, misunderstanding of the emerging opportunities for working in the BIM complex, its potential for development and use aggravates attempts to switch to an innovative type of modeling [17].

There are a number of other difficulties that are listed below.

The introduction of BIM technology always incurs costs. The main costs are in purchasing software licenses and various training courses. And this is an inevitable phenomenon, as well as a decrease in the productivity and efficiency of workers in the new software package, and accordingly, the costs associated with a decrease in productivity. However, the costs of information modeling will quickly pay for themselves, and the subsequent economic effect of using these programs will increase the profit of the organization.

Also, one of the factors that impede the transition to BIM is the judgment that information modeling consists in unintelligent execution of mechanical work. This judgment is dangerous because highly qualified specialists who do not have skills in this software package will be uncompetitive compared with young designers who have experience in information modeling programs, but who make a number of design errors due to the lack of necessary knowledge and experience. This will lead to a decline in the construction sector and design culture.

The resulting factor from the above is the problem of a fuzzy level of responsibility for the work performed. Undoubtedly, the concept of information modeling implies the correction of inaccuracies in the project due to the simultaneous work of a large number of employees and the interrelation of all designed elements, but because of these advantages, unlike the traditional design method, where each project participant individually works with the project, BIM blurs the personal level responsibility of the employee in case of revealing a critical error. In addition, there is a blurring of the control points of the project stages, it is quite difficult to track the result at a certain point, the work is carried out in parallel by different employees and, collectively, this leads to an increase in cost risks, which also causes some concern and mistrust on the part of users.

4. Conclusion

Of course, the information modeling technology has changed and optimized the process of designing, erecting and operating the structure. The use of BIM programs has led to the achievement of an enormous economic effect associated with a reduction in risks and costs, a decrease in the design and construction terms, an increase in the project's profitability, income and quality. The number of computer programs based on the BIM concept is currently growing in direct proportion to the number of users of these software. But the massive introduction is just beginning to gain momentum. To achieve this goal, firstly, it is necessary to overcome a number of difficulties associated with the designers’ distrust of this complex, personnel training in BIM programs and the development of a design and construction culture in general. Despite the slow introduction of BIM technologies in Russia, there is a high probability that they will soon completely replace traditional 2D design methods.

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