Improving the construction production organization efficiency based on the BIM-technologies use

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Abstract. The new technologies development in the construction field makes it possible to accurately predict construction costs, design more efficient, qualified constructions and increase competitiveness. In this regard, there is a process of implementing BIM-technologies that contribute to the complex processes implementation in the construction industry. The article discusses the BIM-technologies introduction in Russia, the problems of using information modeling in the building complex and the results of using these technologies. BIM-technology is the process of designing facilities for construction, operation and reconstruction of buildings and structures. These technologies facilitate collaboration and provide an opportunity to control and eliminate deficiencies at each design stage. The use of BIM-model is primarily the quality of design work and the working prospect in the market.

Introduction
The construction industry development contributes to improving the life of the population, including the improvement of areas, the formation of the necessary residential areas, and the improvement of the financial component. The need for the development of this industry directly depends on the buildings and structures (BIM information modeling) design and construction implementation in practice.

Main part
Since the construction industry in Russia is among the middle-technology spheres of the economy, innovative activity remains in the background and less attention is paid to it compared to the high-tech industries. The construction production high proportion in the country's economy, the transition of the construction industry to the high-tech production will ensure the development of the Russian economy as a whole, as many other sectors of the economy interact with the construction industry [1, 2].

The modern approach to construction consists of the factors having a great influence on the development of this industry, such as architectural and construction standards, climatic and environmental conditions, economic opportunities, social needs of the population and the desire of the modern world to improve the buildings and structures design and construction system implementation. The BIM technologies concept [3, 4] is an absolutely new and radical tool for meeting these needs.

Currently, there occurs the buildings information modeling active application, which contributes to the design quality improvement [5, 6, 7, 8]. This is also important for construction projects on a budgetary basis, from the point of view of the budget money rational use, and in general for the buildings and structures construction and operation.
Building Information Model (BIM) is a design method taking into account all the parameters related to the life cycle of a building, ranging from the construction costs to the subsequent monthly energy costs. All these data form an information model, which, when one parameter changes, leads to the automatic recalculation of the rest.

A single model of the object being built is the basis of BIM, which provides complete and consistent information on the building. The building characteristics full-fledged calculations can be carried out, the facility construction can be managed, the specifications and necessary working documentation can be generated, the movement of funds and supply components to the construction site can be planned only by a single model.

BIM-model is not only a beautiful three-dimensional visualization, where it is possible to see all the ways and processes of working together with information about intellectual objects in its incoming and parametric relationships between them, but also a transparent business plan for all the project participants. Information about the object is used at all the building or structure life cycle stages, such as design, construction and operation, reconstruction and demolition. At any of these stages, information about the construction site allows to make management decisions. At the same time, the new data in the information model can be changed, supplemented or replaced, reflecting the current building state, throughout the construction object’s entire life cycle.

The information model is a database for the calendar planning and project management system, procurement systems and other enterprise systems. Determining the BIM model detail level at each life cycle stage is one of the key elements of implementing BIM technology.

This technology allows to optimize the construction process, which is quite expensive, simplifies the work of designers and improves the quality of project documentation. It is necessary to use the information model of the building, because it permits to get a very accurate calculation of an object’s value, which makes it possible to manage the construction costs.

The main BIM-model achievement is the possibility only by “intellectual” efforts to obtain almost complete compliance of the new building operational characteristics with the customer’s requirements, up to commissioning or even before the construction of the facility starts. This is achieved due to the fact that the BIM technology makes it possible to produce the object itself with all the structures, materials, engineering equipment and processes taking place in it and adjust the basic design solutions with a high degree of confidence in the virtual model.

Several groups of specialists - architects, engineers, designers, etc. - can work simultaneously with a single information model. With the computer processes development and the increasing complexity of social demands for the architect, the design tools have changed. The transition of the industrial and civil construction industry to a higher level of competitiveness in many countries of the world is associated with the full-value BIM-models creation.

The development of information modeling began in Western countries, such as the United States and the United Kingdom. In Russia, the question of introducing BIM began to be seriously considered at the beginning of the 21st century. The use of BIM in the construction industry in Russia lags behind the leading countries by about 8 years, there is still no mass use of information design, but it is gradually gaining momentum.

The use of BIM-technologies for the state-owned objects construction in Russia will become mandatory already in 2019, as this reduces the design cost by 30%. Information modeling in Russia has already found application in some companies. It is about the quality of design work and the prospect of working in the market.

In Russia, there are no problems with BIM, but there are problems with its implementation. Since the discipline of all project participants is required, the formation of a fairly rigid internal corporate standards for working with the program seems problematic. Until recently, the main problems due to which the introduction of BIM in Russian construction enterprises was impossible are:

1. Misunderstanding of the ultimate goal for this technology use. Many companies, having already debugged the design process using the necessary set of programs, do not want to make changes to their work, as this will lead to the schedule disruption and the workflows cyclical nature.
2. To work in BIM, it is necessary to have a database (product family library) which is to be created from scratch. Why are there such posts as BIM-managers who are engaged in creating the necessary basis for work, etc.?

3. Since BIM has foreign software roots, the regulatory framework improvement is required. For the BIM introduction, the development of a regulatory technical base is a long process, since it requires the changes to the legislation of Russia, the quality certificate improvement (QC), the national standard creation.

4. Implementation cost (software licenses purchase, BIM-managers departments creation, a new server and network infrastructure creation, etc.).

5. Shortage of the qualified staff. It all starts with educational institutions where there is no mastering of this program yet. If the employees are trained to use BIM from scratch, long period might be needed, since an average of three or four projects is to be completed.

The information modeling application depends largely on the experience and focus of the company on the program development. Naturally, the new technologies introduction always brings a change in the entire structure of work, but since this will ultimately create a more efficient model for designing buildings and structures, then why not move to a new level. The use of BIM will allow to bring the construction industry to a new level and get a modern quality standard in the field of information design.

Today, the construction industry needs a conceptual solution to implement the widespread use of innovative processes and technologies despite the financial and time costs for training people, implementing pilot projects, etc. If the approach to introducing BIM is more comprehensive, then the most tangibly and quickly implemented costs will begin to pay off themselves dozens of times by reducing the design time and the construction itself, improving the quality and, of course, reducing the cost. The BIM-technology introduction requires a change in the regulation of all the processes, otherwise the industry will delay in stagnation, which will adversely affect the economy of Russia as a whole. Intensification of any one direction will not give any tangible results, an integrated approach to technical, methodological and personnel issues is needed [9].

The measures implementation for the phased implementation of BIM will provide an opportunity to increase the competitiveness of the Russian construction complex in the world market, improve the quality of survey processes, design, expertise, construction and operation of facilities, also reduce construction costs during the crisis, reduce the design errors risk, estimated calculations at all the object life cycle stages.

Summary
The development of architectural and construction design will depend on the computer hardware and software tools development level in the future. The tasks arising in the design and construction of buildings and structures stimulate the information technologies development. The result is a single, jointly developing complex, which combines design, construction and computer technology. This is the reality that determines the development strategy of the entire design and construction industry for quite a long term.

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