

## Опыт внедрения BIM технологии в компании старого и нового образца

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Информация о статье      научная статья

### Аннотация

*Отечественные компании начали активно внедрять BIM – технологии в свои проектные отделы. Однако вместо того, чтобы использовать готовые методики и наработки зарубежных организаций, приходится создавать всю методологию и информационную базу под особенности своей компании, а зачастую переделывать или создавать все с самого начала, что еще больше усложняет процесс перехода и внедрения. Тем не менее существует большое количество компаний, которые готовы предоставить свои услуги по созданию внутренних стандартов. В данной статье описывается опыт внедрения BIM технологии в компании с различной структурой организации. Приведены 2 различных способа интеграции технологии. А также на основе данного опыта, разработаны общие рекомендации, по развертыванию BIM платформы, с минимальными затратами как в экономической, так и в ресурсной сфере.*

Ключевые слова:            проектирование, BIM - технологии, управление, организация, производительность, производительность работ, оптимизация, эффективность

### Содержание

1.	Introduction	37
2.	Methods	37
3.	Results and Discussion	38
4.	Conclusions	43

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## 1. Introduction

In the construction sphere of foreign countries every year the implementation phase of BIM technologies is more active and dynamic. The advantage of these technologies is undeniable but nevertheless in Russia there is a completely opposite reaction. Most companies ignore the general trends in the project industry and continue to use obsolete technologies that have shown their effectiveness and reliability over the years. In open sources there are several examples of how domestic companies switched to BIM design technology but the contained information describes the general provisions and the final results of the implementation. According to this information, it is difficult to track what problems the companies encountered during the transition to BIM tools.[1-3]

The purpose of this study is to tell and summarize the experience of implementing BIM technology on the example of 2 companies, to tell about all the stages of implementation and the problems that were encountered in the transition to the methodology of BIM-design.[4-5].

## 2. Methods

As a platform for the introduction of innovative BIM modeling technology, which from 2019 will be mandatory for the state companies, 2 subsidiaries of TGC was offered. The names of the companies will be changed, since the director wished to keep them in secret.

The first company "Master" is engaged in designing, reconstruction and erection of industrial buildings. It has 125 employees including the management team, and they have been in the construction market for 16 years. The second company "Specialist" was founded last year, it is engaged in residential buildings and objects of urban infrastructure, the company has 56 employees.

From the department of innovative developments a plan-project on the introduction of BIM technologies was received. This project has to be implemented by the end of 2018 in both companies.

Let's consider the structure and the completed stages of implementation at the moment in both companies.

In the company "Master" the structure is represented by this scheme on the figure 1.

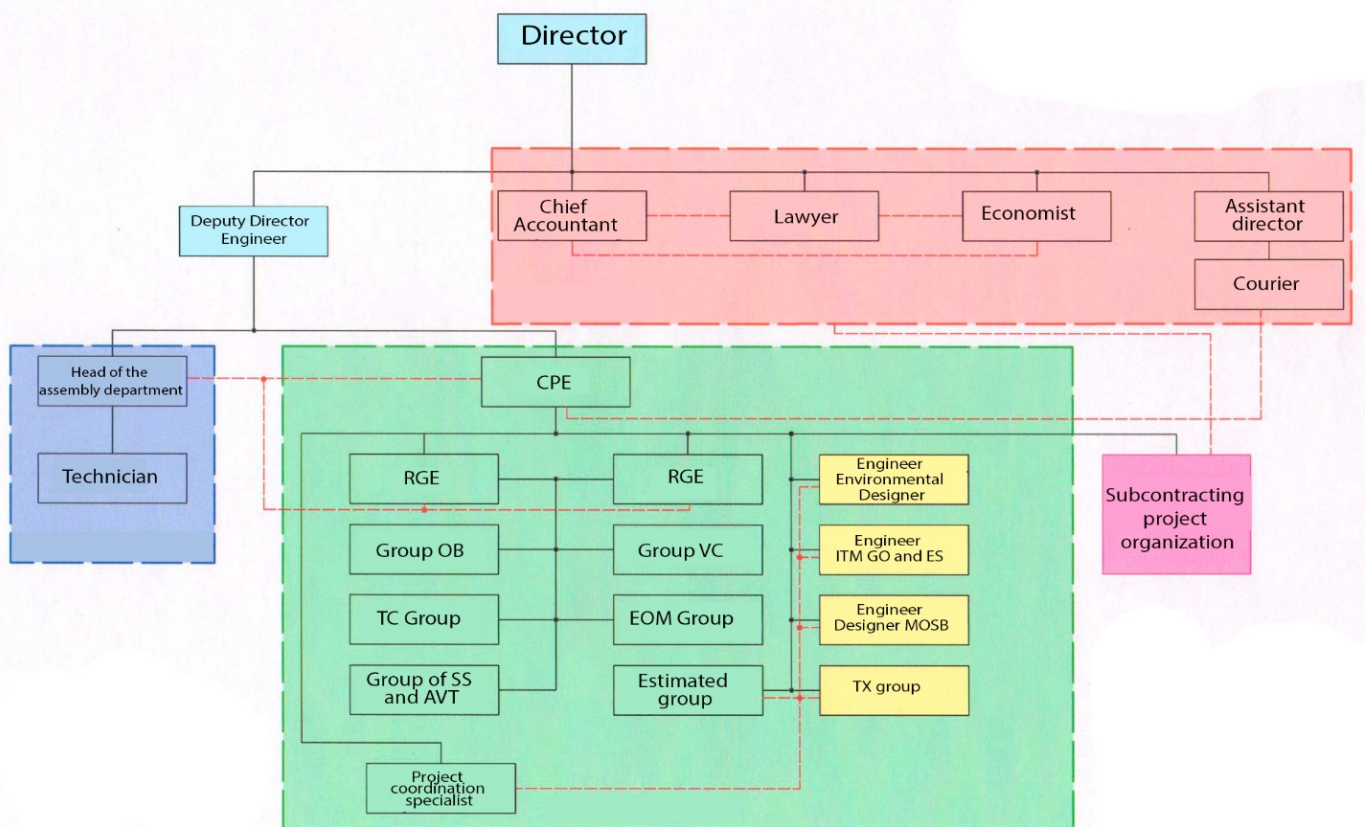
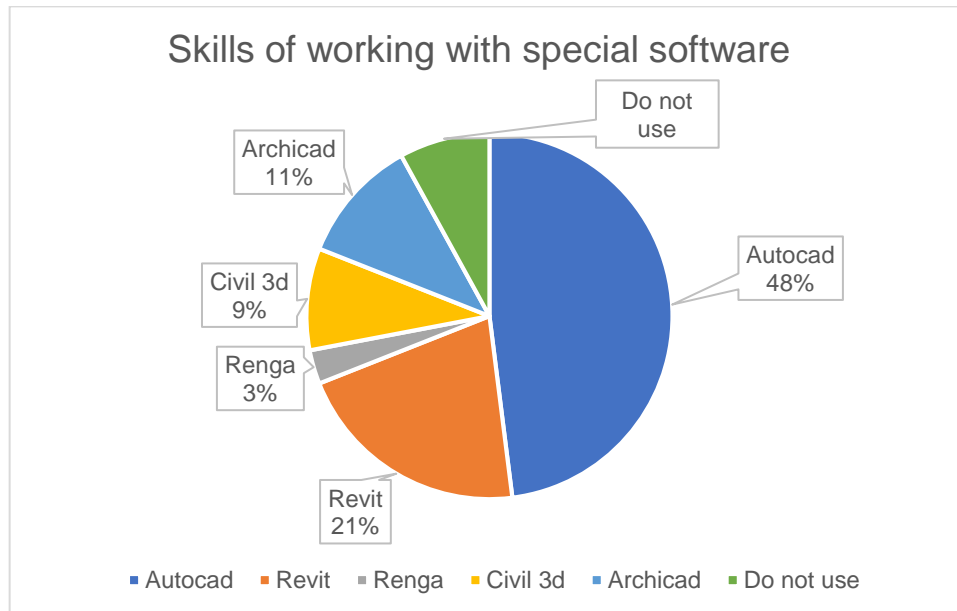


Figure 1. The structure of the project organization in the company "Master".

### 3. Results and Discussion

The employee survey was conducted, it had questions about their work experience, age and a number of other parameters that helped to fully assess the level of personnel training for the transition to BIM. Also in the survey there was a question "Are you ready to switch to new software and to undergo training?" This survey showed that most of the employees have a lot of experience and do not want to switch to new design tools on a voluntary basis, justifying this with unnecessary waste of time.

Another question was about the skills of working with special software. Most of the employees can work with only one software package such as AutoCAD, even fewer employees can work with 3D modeling software.[6]

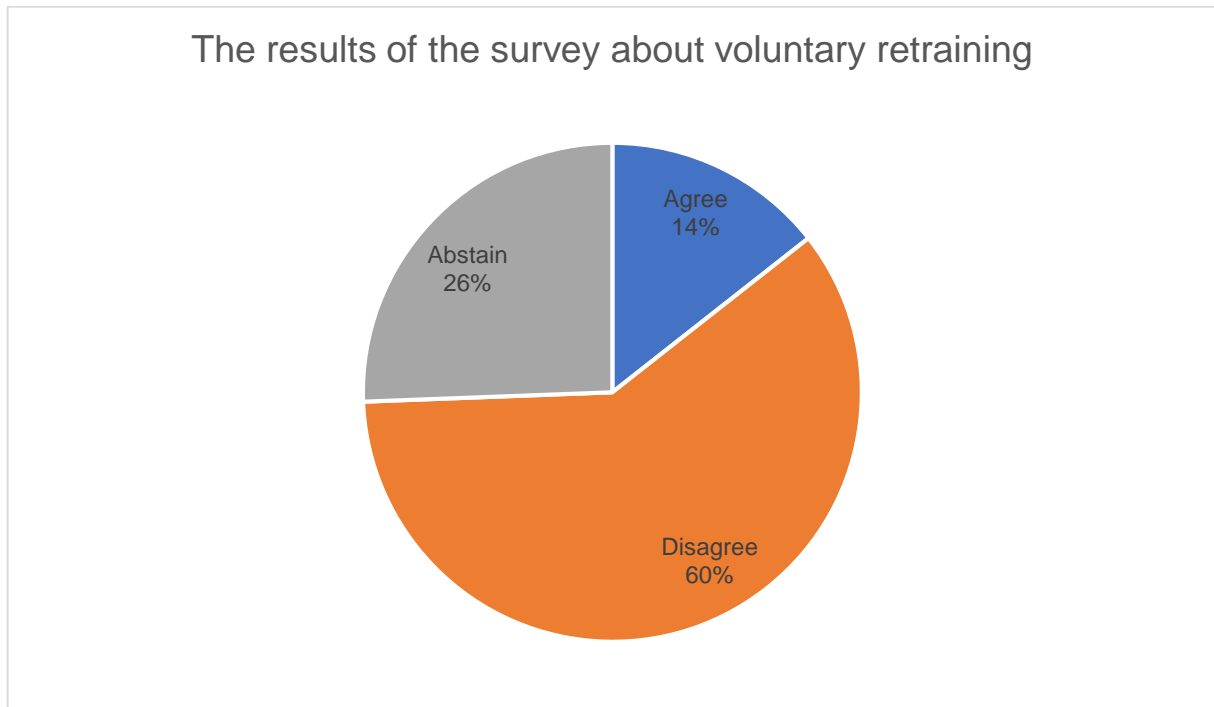


**Figure 2. Skills of working with special software in the company "Master".**

In contrast to the company "Master" the results in the company "Specialist" were different, as when creating that company it was initially taken into account that new methods will be tested and the company "Specialist" will focus on new approaches to designing. The data of the survey is given below.[7]

Table 1. Results of the survey in the company "Master".

Age	Amount, persons	%	Experience, years	Amount, persons	%
20-25	9	7,2	up to 5 years	3	2,4
26-30	20	16	5-8	6	4,8
31-35	35	28	9-10	14	11,2
36-40	30	24	11-15	19	15,2
41-45	14	11,2	16-20	21	16,8
46-50	11	8,8	21-25	29	23,2
50+	6	4,8	26 and more years	33	26,4



**Figure 3. The results of the survey about voluntary retraining in the company "Master".**

Table 2. Results of the survey in the company "Specialist".

Age	Amount, persons	%	Experience, years	Amount, persons	%
20-25	9	16	up to 5 years	9	16
26-30	15	27	5-8	14	25
31-35	12	21	9-10	16	29
36-40	11	20	11-15	7	13
41-45	6	11	16-20	5	9
46-50	2	4	21-25	3	5
50+	1	2	26 and more years	2	4

The main staff consists of young professionals under 35 years old and has little work experience but nevertheless it is compensated by a high desire to learn new techniques. This may be due to the recent graduation from universities and a high information culture.

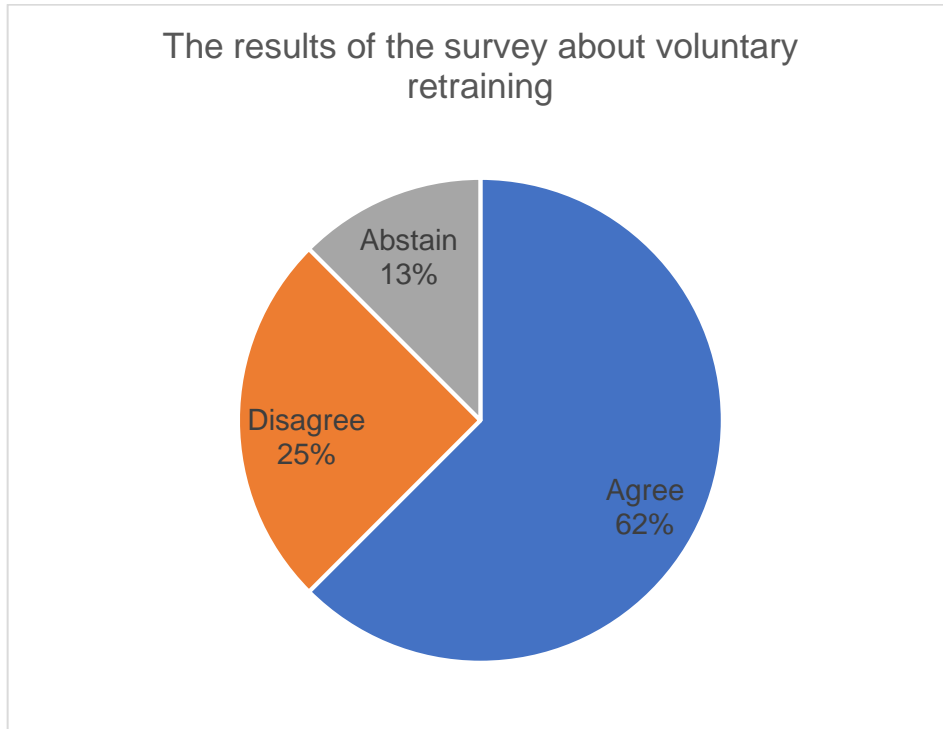


Figure 4. The results of the survey about voluntary retraining in the company "Specialist".

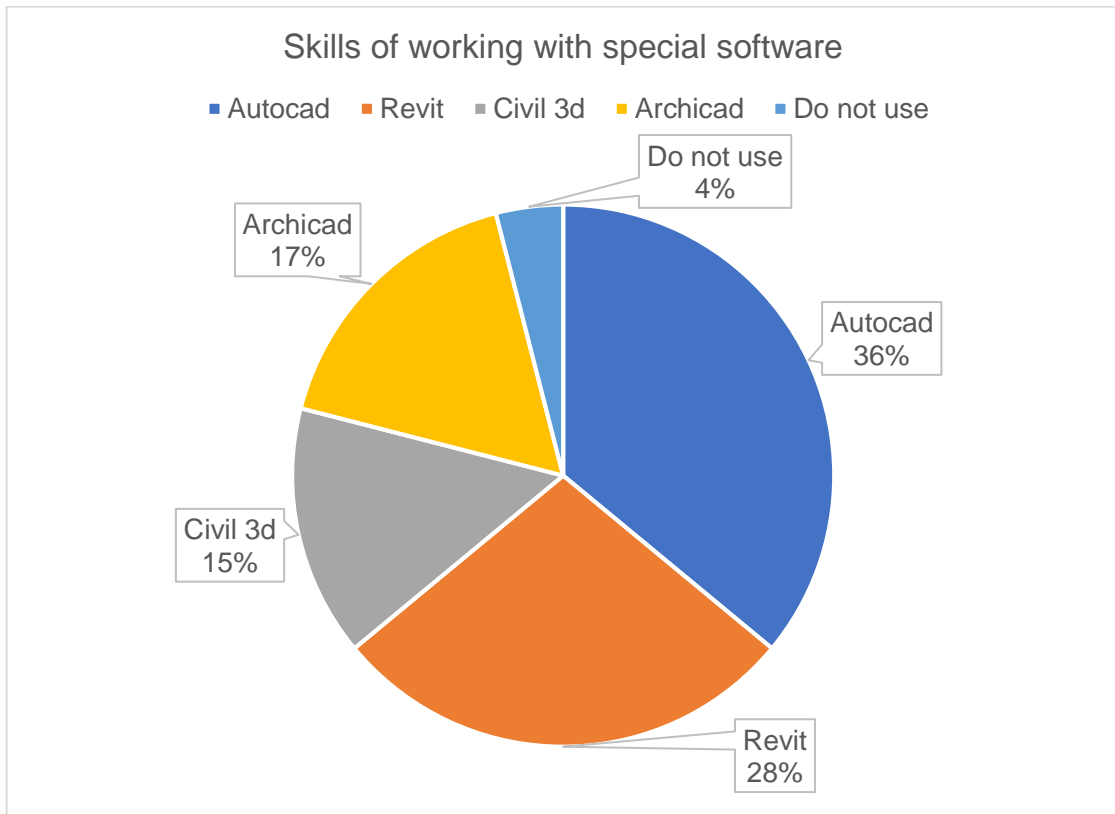


Figure 5. Skills of working with special software in the company " Specialist ".

The questionnaire showed that to introduce a new environment it is necessary to:

1. Rotate people
2. Hire new employees

3. Retrain old employees
4. Replace and install new PC stations
5. Change the structure of the organization in the company

The Director did not want to risk much because of the loss of productivity, it was decided to implement BIM in small stages and in different companies with different approaches.[8-11]

"Soft" approach was proposed for the first company which made it possible not to get rid of personnel with extensive experience who did not want to undergo retraining and to maintain the company's productivity.

For the second company a "hard" approach was used in which all employees were obliged to undergo retraining and also to adjust to the new structure within 2 months.

Let's consider the first option of modernization.

The first step was to replace the PC within a month with the installation of old and new software. All the work was done outside of working hours and also on weekends. The main problems at this stage were a selection of portable stations for normal operation in existing software. In order to run old and new software in parallel, higher performance was required, but this problem was solved before new stations were bundled with parts from old ones. Also, there were difficulties with the server part, as one of the ideas of BIM design is a clear structuring of files, and on the server all the files were in an unstructured tree of documents created by the employees themselves. A lot of time was spent on structuring the information.[12-15]

The next step was a partial reduction and hiring of employees who can work with BIM design technology. The reduction in each department was from 4 to 6 employees, which was 17% of the total in the company. These employees were replaced by new ones under the age of 27, including students. Thus, the following ratio was obtained: of the 7 employees 6 were old and 1 was a new specialist. Later this ratio was increased to 3 to 2 (3 old and 2 new specialists) due to the fact that new employees performed the work faster and more efficiently. The main problem at this stage was bustling that old employees made due to fear of being fired as a result of the reduction.[16-17]

At the third stage, the process of retraining was started. This was done by delegating part of the work of old employees to new ones, thereby freeing up time for retraining. For even greater time savings retraining was carried out on the premises of the company's office which allowed to reduce the time for a trip to the training center for 1.5 hours. The entire process of retraining took 3.5 months. Employees who did not undergo retraining were asked to pass it at their own expense or consider switching to another company.

At the final stage, minor changes were made to the structure of the company, which allowed full implementation of BIM. Also their own BIM standard was created.[18]

For these purposes another survey was conducted which helped to understand what important elements it is necessary to consider when developing a single environment. On its basis a query matrix was obtained which showed the key parameters that are necessary for specialists to clarify issues between departments.[19-22]

Table 3. The number of parameter requests between departments.

	AR	OV	VK	TC	CC and ABT	IOM	OOC	ITM	MOPB	TX
AR		41	15	26	14	6	4	7	8	14
OV	41		12	17	21	23	36	14	11	8
VK	15	12		9	17	11	16	24	14	5
TC	26	17	9		8	9	11	10	9	7
CC and ABT	14	21	17	8		17	14	12	14	11
IOM	6	23	11	9	17		21	9	11	14
OOC	4	36	16	11	14	21		14	14	12
ITM	7	14	24	10	12	9	14		24	17
MOPB	8	11	14	9	14	11	14	24		10
TX	14	8	5	7	11	14	12	17	10	

After systematization of the data 6 design templates for all departments were created, and the order of work within the unified system was written. To ensure the filling of templates with information from different families 2 specialists were hired.

It took 11 months for the full transition of the BIM design from the concept and development of the plan to signing changes in the structure of the company.

In contrast to the first "soft" approach, the second - "hard" way suggested a quick transition for 7 months.

Since the company was founded recently, there were no problems with the conversion of portable stations due to the fact that it was bought with a margin of productivity for 10 years ahead.

The next stages were:

1. Completion of ongoing projects
2. Selection of qualified personnel
3. Retraining of employees

To use the new technology, it was necessary to complete all current projects, so that the personnel passed the stage of training and retraining as quickly as possible.[23-24]

Due to the fact that the scope of work and the readiness of the implementation of projects at the time of implementation was different, a consistent method of training was proposed. After the completion of any project the team that worked on its implementation immediately went on retraining, without waiting for all the employees of the department to finish work on the remaining projects. This approach allowed the creation of in-service training for employees. Simultaneously with this stage, the restructuring of the company began. The peculiarity of this stage was that the employees who had undergone retraining should have been doing projects on a new structure, while the other colleagues still adhered to the old organization.

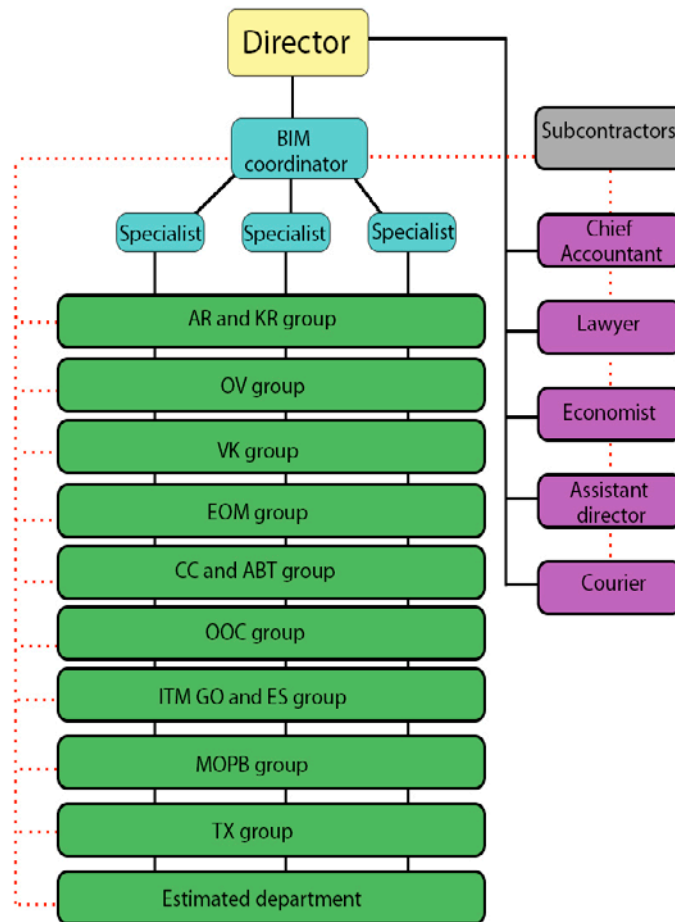
Also the implementation was negatively affected by the stagnant behavior of the management team, which tried to implement new projects through people who did not undergo retraining which pushed back the time for the retraining of the remaining employees. However this problem was solved after the intervention of the director - the number of current projects was reduced. And nevertheless, it was possible to pass the stage of retraining of all personnel within the set deadlines - for 2 months. An important advantage was the availability of certificates of professional training from the company Autodesk and Certiport.[25-26]

To introduce order in the structure of the company, positions were abolished or replaced such as: Design Engineer, BIM-manager, specialist of internal software and so on. All these changes led to the following organization scheme.

Table 4. Summary table.

	Spent time, months	Total expenditure, rub	Scope of work during the engagement, %	Scope of work after implementation, %
Master	11	3745000	-7	+12
Specialist	7	1681000	-56	+24





**Figure 6. Changed scheme of interaction between departments.**

Since the companies "Master" and "Specialist" are very similar the BIM standard developed in the company "Master" was used in the second company too but was adjusted in accordance with organizational changes.

The duration of the transition to a new design method directly depends on the experience and skills of employees and whether the company is ready to take on the risks of reducing the amount of work. Due to the fact that the implementation process was started last year it is now possible to visually cut out the production growth trend.

Companies that are thinking about switching to a new design methodology should pay attention to students who studied BIM in universities.

## 4. Conclusions

The implementation of BIM technology allowed to increase the speed of work on the project, reduce the number of errors at the stage of coordination of the project documentation, as well as improve the profitability indicators.

Due to the transition to the BIM design the company began to receive a large number of orders of national importance. Also after the closure of the financial quarter management decided to replace the design methodology in 3 other companies.

Work with the application of BIM standards is a promising and profitable one. However, due to large initial investments and the risks of business stagnation companies often refuse and prefer to use traditional methods and programs for design.

As the main stages for the implementation of new technology we can distinguish the following steps:

1. Questionnaires
2. Analysis of implementation
3. Restructuring of personnel
4. Training of personnel
5. Changing the structure of the project organization



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*Маричев, А.П., Гришина, О.С., Залата, Е.С., Кукушкина, Г.А. Опыт внедрения BIM технологии в компании старого и нового образца // Alfabuild. 2019. № 3(10). С. 36-47.*

*Marichev, A.P., Grishina, O.S., Zalata, E.S., Kukushkina, G.A. Experience of implementing BIM technology in the company of the old and new sample. Alfabuild. 2019. 3(10). Pp. 36-47. (rus)*

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## Experience of implementing BIM technology in the company of the old and new sample

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Article info

review article

### Abstract

*Domestic companies began to actively introduce BIM - technologies in their design departments. However, instead of using ready-made methods and achievements of foreign organizations have to create a whole methodology and information base for the specifics of the company, and often modify or create from scratch, which further complicates the transition and implementation process. Nevertheless, there are a large number of companies that are ready to provide their services to create internal standards. In this article, we describe the experience of introducing technology in a company with a different organization structure. Also, based on this experience, general recommendations are given on the deployment of the BIM platform in its department, with minimal costs.*

Keywords:

designing, BIM - technologies, management, organization, productivity, productivity, optimization, efficiency

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