Automation of the process of coordinating project work

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Abstract. The article explores the benefits of using specialised tools and technologies to simplify and accelerate the coordination of project work. This includes the use of project management software, electronic communication and collaboration systems, and tools for project progress tracking and risk management. The main purpose of automation is to increase efficiency and simplify tasks for project participants. The article discusses the various ways in which automation can improve project outcomes, including better communication, faster decision-making and better risk management. Overall, the article highlights the benefits of automation in coordinating project work and provides insight into how organizations can successfully implement these tools and technologies. Keywords: project, project coordination, coordination, automation, management, system, construction, BIM.

1 Introduction

In recent years, automating the coordination of project work has become an increasingly popular topic in project management. With advances in technology and the increasing complexity of projects, organisations are turning to specialised tools and technologies to simplify and speed up the coordination of project work. Automating the coordination of project work involves the use of project management software, electronic communication and collaboration systems, and project tracking and risk management tools. This approach has been shown to improve project results through better communication, faster decision-making and better risk management. However, further research is still needed on the benefits of automation and the ways in which organisations can successfully implement these tools and technologies. This article aims to contribute to the existing literature by exploring the benefits of automation in project coordination and providing information on how organizations can successfully implement these tools and technologies. The article also highlights the challenges and limitations of automation in project work coordination and suggests areas for future research. Overall, this article aims to provide a comprehensive understanding of the role of automation in project coordination and its impact on project success.

Over the last decade, there has been an increase in the number of projects that have been developed using automation systems. Managing complex projects is impossible without automation. Effective project management relies on the ability to analyse the project both

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during its execution and after the completion of a phase or the entire process. This requires the ability to compare project key performance indicators and targets.

Although the share of project work in the total construction investment is small, between 5% and 7%, the investment cycle cannot do without the design phase. This stage is important to speed up and reduce the cost of construction and the subsequent operation of the project, and it requires highly qualified specialists.

In recent years, most Western and some Russian design organisations have switched to CAD - computer-aided design systems. In the US, design capital has increased by about 30 times in the last 20 years and productivity has increased by 2.5 times. In Russia and other former Soviet republics, however, productivity growth has been only 5%. There are about 1.3 times as many designers in Russia as there are in the US, but that does not translate into more work because we are almost twice as good as the Americans.

Before you start setting up computer aided design systems, you need to do an economic analysis, as start-ups and medium-sized companies that have already established themselves in the market argue that using specialists from other companies is more profitable than building and maintaining their own team of qualified specialists to perform these services.

Construction management requires the application of certain methods and skills in order to carry out the process successfully. The sequence of steps and interaction at different stages of construction projects is very important, and most of them are strictly regulated by current regulations.

Project management processes are used to manage the interaction of the construction participants and are prescribed in the relevant national standards.

2 Problems encountered when automating project work.

Let us consider the main problems that need to be solved when automating design work. The automation of design approval in construction requires the integration of different software tools and technologies. Integration problems may arise due to incompatibility of software systems, differences in data formats, and limited communication protocols between different tools.

Handling large volumes of data created by different project teams is a major challenge in construction coordination automation. Problems with data quality, consistency, accuracy and completeness can arise.

Collaboration between the different teams involved in the project work is essential for successful automation of construction coordination. Problems with communication and cooperation can arise due to different working styles, cultures, time zones and language barriers.

Automating the coordination of design work in construction may require the use of different software packages. Interoperability problems can arise if software tools used by different teams are incompatible with each other.

Construction coordination automation requires technical expertise in software development, data management and design coordination. Lack of technical knowledge can lead to delays, errors and cost overruns.

The automation of design coordination in construction can cause security problems due to the confidential nature of the data involved. Data privacy, confidentiality and security breaches may be an issue.

Construction coordination automation may require significant investment in software, hardware infrastructure and technical expertise. Cost overruns may occur if the cost of automation exceeds the expected benefits.

The automation of design co-ordination in construction may raise legal issues related to intellectual property, copyright and liability. There may be problems related to data
ownership and the rights and responsibilities of the various parties involved in the design process.

3 Materials and methods

The aim of this work is to automate the coordination of project work using information modeling in order to reduce project timelines and improve the quality of work by eliminating the influence of human factor. The following tasks were carried out: analysis of Russian and international experience in automation of coordination of project works based on information modeling; review of existing solutions for automation of coordination of project works based on information modeling; developed an algorithm of automated system for coordination of project works based on information modeling; created an automated system for testing the coordination of project works based on information modeling. An important aspect of project management is the ability to analyse the project both during and after its completion. This requires the ability to compare the project's key performance indicators with its planned performance.

Effective project management requires the ability to analyse planned and actual values, such as the planned value of the services performed and the projected value of the planned work. However, the key element of an automated project management system is the forecasting capability, which includes defining optimistic and pessimistic values of project work, forecasting based on the project schedule and best statistical projections, and calculating the parameters that characterise the effectiveness of each option. In addition, an important function of system project management is integration with cost accounting and work control systems.

It is desirable to include in the project management system functionality that enables effective management of project documents. This functionality can be implemented either within the system or with a third-party program integrated with the system. A document management system allows you to regulate access to document folders and block files for monopoly editing, providing document version control.

Industrial project management systems usually contain certain requirements. There are many software products on the market today that are designed for project document management tasks.

Design work involves the creation of documents in textual and graphical format which define the technical solutions for the construction of facilities with their parts or the commissioning of the facilities. The scope of design documentation is defined by the requirements of RF Government Decree No.87 dated 16.02.2008 (as amended on 27.05.2022) "On Structure of sections of design documentation and requirements for their contents". For the customer, the design documentation is required to pass state or non-state expertise and obtain a permit for the construction of the facility.

The use of automated systems for the coordination of design work provides a number of undeniable advantages, such as: real-time communication with the project team, timely updates of documentation, accessibility for all project participants, cost control in the project process, risk management and results forecasting, as well as improving the ability to resolve problems in a timely manner through the availability of reports and quick access to data.

Due to the political situation, we are unable to use some software packages, including BIM 360, which are usually used to automate coordination of project work between employees. But with the advent of cloud storage, we can transfer documentation faster and don't have to store large volumes of paper drafts until the project is completed.

Today, the construction industry makes extensive use of cloud technology for communication between employees, but as projects become more complex and more professionals become involved, new solutions and applications are emerging that can be
useful. However, an overabundance of communication applications can lead to misunderstandings, loss of important information, missed deadlines and useless work on outdated versions of a project, making it more expensive.

Autodesk, taking into account the full potential of cloud technology and learning from previous experiences, has optimised all core applications while eliminating unnecessary features that interfere with user interaction. They have also added new features, resulting in a new software package that includes the capabilities of the BIM 360 cloud service (see Figure 1).

![Working in BIM 360 software](image)

**Fig. 1.** Working in BIM 360 software.

Autodesk BIM 360 is a suite of cloud-based services that can be used at different stages of a construction project, such as design and construction. These services can be accessed from both desktop applications and mobile devices. BIM 360 enables all parties involved in the construction process to collaborate, thereby accelerating project delivery and reducing risk.

Autodesk cloud solutions enable collaboration, project, resource and construction management, construction planning, site model deployment, and analysis. In the final phase, these solutions can be used to predict operational plans and allocate responsibility for facility maintenance.

BIM 360 Team is a software package designed for project development. This service allows you to store up to 500 GB of project data, view more than 50 2D and 3D formats, and collaborate with everyone involved in the project. It also allows contextual comments and observations on the project, comparing versions and discussing the model in real time from any device or location (see Figure 2).
BIM 360 Glue is a software package that simplifies model coordination and verification and provides a wide range of functions. For designers, this tool serves as a means of checking models for intersections and interactions. For example, BIM managers or project principal engineers can use this tool to reduce the time it takes to assemble models in Autodesk Navisworks. Because all models have already been checked for intersections, you can focus on more specific conformance checks, planning and visualization, and creating specifications for the entire model without wasting time.

The main tool for the construction site is the 3D model, which can be accessed from tablets. This model is primarily designed to help surveyors, who can position themselves in the 3D model to view full-size elements in real time at a particular survey point. They can also use this tool for collision analysis based on design data of erected elements. BIM 360 Layout is a comprehensive solution that primarily serves to assist surveyors. With Glue, this tool can bring the 3D model to the site, reduce the use of human resources, and provide better resource allocation for other tasks.

Feedback showed that using BIM 360 Teams resulted in a 30% increase in speed for the design department. BIM 360 Docs allowed teams to complete projects ahead of schedule, and with Glue, they made fewer errors, resulting in higher quality projects. In addition, surveyors spent an average of eight times less time placing points on site using BIM 360 Layout.

The withdrawal of the BIM 360 software product from the market has raised concerns about the automation of project coordination in Russia. As a result, alternative solutions needed to be explored to ensure efficient and effective design coordination.

To improve efficiency, the decision was made to create a website that automates design work using domestic software packages. To meet CAD requirements, the company needs to develop and approve an organisational structure that effectively distributes information between the participants in the design process, avoiding repetition. Coordination between employees must also be well structured so that each person has a clear area of responsibility. When selecting software, a timeline of at least five to six years should be considered, and database resources, including the number of databases required for fault tolerance and load balancing, should be identified.
4 Research results

As a result of the study, the project work coordination process has been automated to reduce the time needed to complete the work as well as to qualitatively improve the work process while eliminating the human factor by developing a website that automates the design work using domestic software packages. This website can improve work efficiency and allow for faster coordination of design processes. Coordination between employees is organised in such a way as to ensure that each person has clear areas of responsibility. The selection of the software has been designed for a period of five to six years. Overall, these efforts will simplify the coordination of design work and improve the overall efficiency of the project.

The following tasks were accomplished:
1. The experience of Russia and other countries in automation of design work coordination by means of information modelling was analysed.
2. the currently available solutions for automation of design work coordination based on information modelling were studied.
3. The algorithm of the automated system of design work coordination based on information modeling was developed.
4. An automated system that coordinates design work based on information modeling has been created, with subsequent testing and validation of the system's effectiveness.

5 Conclusions

In conclusion, it is worth noting that the current political situation has disrupted the automation of project approvals for employees. Due to the sanctions imposed on our state, some software packages that were previously used for automation can no longer be used. To address this issue, this work has created a website to automate project approvals and improve the speed of project documentation without compromising efficiency. This site will help save time and financial resources during the design phase.

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