



AUTOMATION OF FINANCIAL ACCOUNTING IN CONSTRUCTION COMPANIES: PROSPECTS AND RISKS

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Abstract

The article considers the issues of automation of financial accounting in construction companies in the context of digital transformation of the economy. The theoretical foundations of digitalization of accounting processes are defined, modern technologies are analyzed, including integrated ERP-class systems, cloud solutions, artificial intelligence, blockchain and robotization of routine operations. Based on practical examples of the implementation of automated systems in Russian and foreign construction organizations, the key advantages of digitalization are identified, including increased transparency of financial flows, reduced costs, improved control over the use of resources and stronger trust on the part of investors and customers. At the same time, the risks associated with high implementation costs, staff resistance, cybersecurity threats and difficulties in integrating various systems are identified. Ways to minimize these risks are proposed, including planning, employee training, ensuring information security, using scalable solutions and applying analytical tools. It is concluded that automation of financial accounting is a strategic direction for the development of construction companies, contributing to their sustainable growth and increased competitiveness.

Scientific novelty

The scientific novelty of the study lies in the comprehensive analysis of the prospects and risks of automating financial accounting in construction companies, taking into account the specifics of the industry and modern trends in digital transformation. The work systematizes the theoretical foundations of digitalization of accounting processes and proposes a classification of risks



arising from the implementation of automated systems. Promising areas of development are highlighted, including the integration of financial accounting with project management systems, the use of predictive analytics, artificial intelligence technologies, blockchain and digital twins. Based on the analysis of practical examples, the need to develop an integrated approach to automation is substantiated, taking into account not only technological but also organizational aspects, such as personnel training and information security. For the first time, an emphasis is placed on the strategic role of automating financial accounting as a factor in increasing the competitiveness and sustainable development of construction companies in the digital economy.

Purpose of the study

The purpose of the study is a comprehensive study of the prospects and risks of automating financial accounting in construction companies, determining the theoretical foundations and modern technologies for digitalizing accounting processes, analyzing practical examples of implementing automated systems, and developing recommendations for minimizing risks and increasing the efficiency of automation in order to ensure sustainable development and competitiveness of construction organizations.

Keywords: Automation of financial accounting, construction companies, digitalization, ERP systems, cloud technologies, artificial intelligence, blockchain, robotization of accounting, digital twins, information security, predictive analytics, automation risks, competitiveness of the construction business

Introduction

The historical development of the construction industry has always been accompanied by the need for strict accounting of costs and control over financial flows. Even in ancient times, during the construction of public buildings, there were special officials responsible for accounting of materials, labor, and payment of remuneration. In medieval Europe, construction cooperatives kept



books of settlements with customers and craftsmen, which can be considered a prototype of modern accounting.

The formation of scientific foundations of accounting is associated with the development of double entry at the end of the fifteenth century, when the works of Luca Pacioli became the foundation for the organization of financial accounting in various areas, including construction work. Already at this period it became obvious that construction as an industry requires special attention to accounting due to large volumes of capital investments, long project implementation periods and the need for strict documentation of each operation. In Russia, construction cost accounting began to develop actively in the nineteenth century, especially during the industrialization period. State and private construction companies kept records of material and labor costs, and generated estimates and reports. However, the process was completely manual and depended on the qualifications of accountants.

With the spread of computing technology in the second half of the twentieth century, the first attempts to automate accounting processes began. In the Soviet Union, electronic computers were used to calculate estimated costs and process accounting documentation in large construction trusts. This became the first stage of accounting automation in construction.

Since the early nineties, against the backdrop of market reforms and the emergence of commercial construction companies, the need for automation of financial accounting has increased sharply. During this period, the first specialized software products focused on accounting and tax reporting were distributed. The most widespread application was the 1C system, which gradually turned into the main tool for accounting in Russian construction organizations.

With the beginning of the twenty-first century, automation reached a new level. Integrated information systems emerged that combined financial accounting, project management, supply and logistics. The introduction of ERP solutions allowed large construction companies to exercise centralized control over projects distributed across regions and even countries.

The current stage of development is characterized by the active use of cloud technologies, artificial intelligence, machine learning and blockchain.



Automation is no longer limited to accounting, but has become the basis for strategic management of financial resources of construction companies.

Thus, the historical evolution of financial accounting in the construction industry shows a natural transition from manual methods to complex automation, which today is an integral condition for increasing the transparency, efficiency and competitiveness of business.

Theoretical foundations of automation of financial accounting in the construction industry

Financial accounting is one of the key functions of any company, since it is on the basis of its data that management decisions are made, reports for external and internal users are generated, and strategic business development is determined. In construction companies, this function acquires special significance, since activities in this area are characterized by large investment projects, long implementation periods, a high level of financial risks and the need for constant monitoring of resource use. [1]

The theoretical basis for the automation of financial accounting is the principles of accounting and management accounting adapted to the conditions of the digital environment. The main idea is to replace manual processing of information with automated processes based on specialized software products. This approach allows for increased data accuracy, reduced processing time, and minimization of errors caused by the human factor.

In scientific literature, several levels of automation are distinguished. The first level is associated with the use of software packages for accounting in accordance with current legislation. The second level involves the integration of financial data with management processes such as planning, budgeting and control. The third level is expressed in the use of complex enterprise management systems, in which financial accounting is an integral part of the general information circuit.

In the context of the transition to a digital economy, construction companies view automation not only as a means of increasing the efficiency of current processes, but also as a strategic tool for ensuring competitiveness. The concept of digitalization of the industry involves the creation of a single information



environment that covers all stages of the life cycle of a construction project. Financial accounting in this context is considered the most important element of cost control and management. [2]

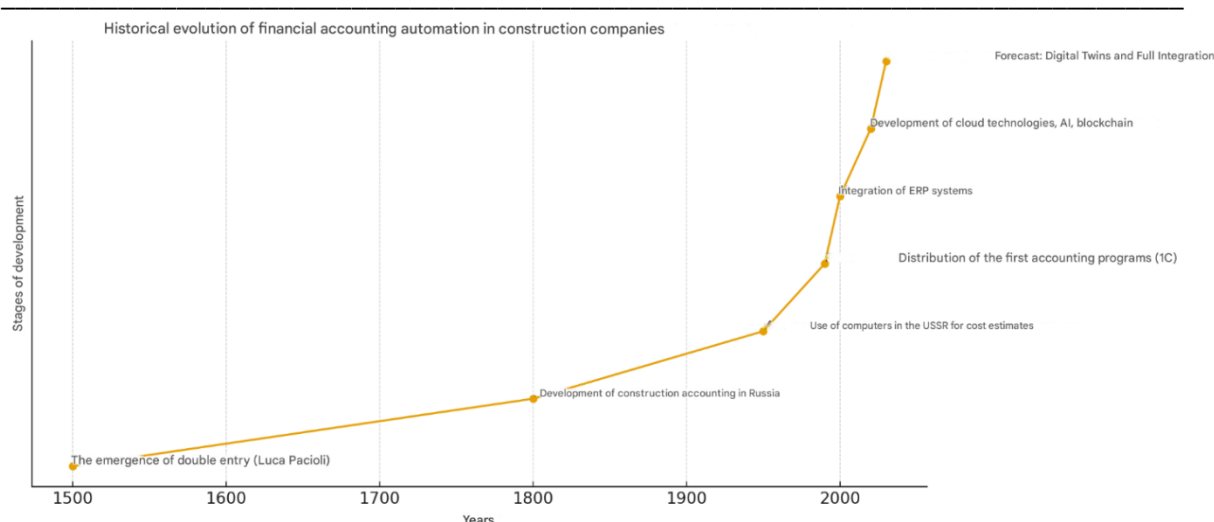
The theoretical foundations of automation are also related to the concept of accounting information systems. According to modern approaches, the financial accounting information system should ensure the continuity of data processing, their protection, adaptability to changes in the external environment and the ability to integrate with other subsystems of the company. This means that automation is not considered a one-time process of implementing a software product, but as a constant development and update of the system, corresponding to the dynamics of the regulatory framework and business needs.

In addition, automation of financial accounting in construction companies is inextricably linked with the development of big data processing technologies and the use of intelligent information analysis methods. Scientific research confirms that the combination of automation with analytical tools can significantly increase the level of predictability of financial flows and reduce the likelihood of crisis situations. [3]

Thus, the theoretical foundations of automation of financial accounting are based on modern achievements of accounting science, information technology and management. Their implementation in construction companies requires a comprehensive approach that takes into account both the features of financial accounting and the specifics of construction activities. [4]

Modern digital technologies in financial accounting of construction companies

The development of digital technologies radically changes approaches to financial accounting. In the construction industry, where the volume of information is extremely large and requires constant monitoring, the introduction of modern tools becomes especially relevant.



The graph shows the historical evolution of financial accounting automation in construction companies. The line demonstrates the key stages of accounting technology development from the end of the fifteenth century to the projected prospects of the near future.

One of the most common solutions is the use of integrated software packages of the ERP class. Such systems allow you to combine accounting, cost planning, procurement management and personnel records into a single database. This significantly reduces the risk of data discrepancies and simplifies the formation of reports. The use of ERP systems in construction ensures not only the accounting of financial flows, but also the ability to forecast costs based on real indicators.

Another important technology is cloud data processing. The transition of construction companies to cloud solutions allows them to abandon expensive local infrastructure and gain access to financial information at any time from any location. This ensures the mobility of management decisions and makes it possible to remotely control the activities of branches and construction sites.

The use of artificial intelligence and machine learning technologies is of great importance. These methods allow analyzing large data sets, identifying hidden patterns and generating forecasts for changes in financial flows. In construction companies, this can be used to assess risks when concluding contracts, determine optimal project financing schemes and control cash gaps. [5]



The development of blockchain technologies is also used in the financial accounting of construction organizations. Blockchain allows creating immutable chains of records, which ensures a high level of reliability and security of information. For construction companies, this is especially important when making payments to contractors and customers, as well as when monitoring the fulfillment of obligations.

Among the new trends, it is worth highlighting the use of robotic automation of processes. This technology involves the execution of routine operations by software robots. In the financial accounting of construction companies, such robots can automatically generate primary documents, transfer data between systems and reconcile calculations. This significantly speeds up the process of information processing and reduces the number of errors. [6]

The use of analytical data visualization technologies deserves special attention. Modern systems allow financial indicators to be presented in the form of visual graphs, charts, and dashboards. This facilitates the perception of information and facilitates faster management decision-making. Construction company managers can monitor the state of the project budget in real time and take measures if there is a deviation from the planned values.

Modern technologies also help ensure compliance with legal requirements. Automated systems are updated in accordance with changes in the regulatory framework, which allows companies to promptly adjust accounting policies and avoid penalties. [7]

Thus, digital technologies are becoming the basis for effective financial accounting in construction companies. Their implementation allows for a significant increase in the transparency of activities, reduction of costs, improvement of control over the use of resources and ensuring sustainable business development.

Practical examples of implementation of automated systems

The implementation of automated financial accounting systems in construction companies has long ceased to be a theoretical concept and has moved into the practical plane. Today, a number of successful cases can be identified both in Russia and abroad. These examples clearly demonstrate the advantages of



digitalization and allow us to identify the main patterns characteristic of the implementation process.

One of the most common solutions on the Russian market is the use of the 1C software package. Many construction companies have integrated this system into their activities, which allowed them to unify accounting processes and ensure compliance with regulatory requirements. Practice shows that the implementation of automated accounting and tax accounting based on 1C allows for a reduction in the labor intensity of accounting operations, accelerated reporting, and increased transparency of financial information for management. Large construction holdings often use larger ERP-class systems. For example, SAP is actively used in international companies implementing projects in different countries. This software package provides not only accounting of financial transactions, but also integration with project management, warehouse logistics and supply. The practice of using SAP in construction companies shows that the system allows minimizing the risks of data inconsistency between branches and provides centralized control of financial flows.

The experience of using cloud solutions is interesting. Some Russian development companies have switched to using cloud services for financial accounting, which has significantly reduced the costs of maintaining server equipment and simplified employee access to data. In the context of remote work and the need to coordinate a large number of participants in a construction project, this solution has proven to be especially effective.

In international practice, there are successful examples of the implementation of automated systems in companies implementing infrastructure projects. Thus, in a number of Western European countries, complex systems are used that allow real-time control over the costs of building roads, bridges and industrial facilities. Such systems are integrated with construction site monitoring systems, which ensures high accuracy of data on the actual use of materials and equipment. [8]

Practice also shows that automation of financial accounting allows to effectively solve the problem of interaction with subcontractors. In large construction projects, the number of subcontractors can reach several dozen, which creates difficulties in accounting for settlements and monitoring the fulfillment of



obligations. Automated systems allow for centralized accounting of all contracts and payments, which reduces the likelihood of conflict situations and financial losses.

It is also worth noting examples of the use of blockchain technologies in financial settlements. In pilot projects, construction companies used blockchain to record contracts and payments, which ensured transparency of interaction between all participants. Despite the fact that this technology is still in its infancy, the practice of its use demonstrates high prospects in terms of increasing trust between customers and contractors.

Thus, practical experience in implementing automated financial accounting systems confirms that digitalization is an integral condition for increasing the efficiency of the construction business. Companies that have successfully integrated automation note a reduction in costs, an improvement in the quality of financial information, and increased confidence on the part of investors and customers.

Prospects for the development of automation in the construction business

The development of the construction industry in the digital economy is impossible without constant improvement of financial accounting. The prospects for automation in this area are determined not only by the current state of technology, but also by global trends that are shaping the new face of the construction business.

First of all, it is worth noting the growing integration of financial accounting with project management systems. In the future, automated systems will function not as separate modules, but as part of a single digital ecosystem covering all stages of the life cycle of a construction project. This will allow companies to monitor in real time not only the movement of financial resources, but also the physical progress of work. Thus, financial accounting will become a tool for strategic management, and not just a means of recording the facts of economic activity.

One of the promising areas is the implementation of predictive analytics technologies. Based on the accumulated data, automated systems will be able to predict possible cash gaps, identify the risks of budget overruns and offer



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optimal financing scenarios. For construction companies working with large investment projects, this is of particular importance, as it allows minimizing financial losses and ensuring sustainable development.

Prospects are also associated with the expansion of the use of cloud solutions. In the coming years, we can expect the transition of most construction companies to hybrid or fully cloud models of financial accounting. This will ensure mobility, scalability and the ability to flexibly adapt systems to changing business conditions. An additional advantage will be a reduction in technical support costs and an increase in the level of information security due to centralized administration.

Great opportunities are opening up thanks to the development of artificial intelligence. Automation of the future involves not only performing routine operations, but also intellectual support for management decisions. Artificial intelligence will be able to identify hidden patterns in financial flows, analyze the impact of macroeconomic factors and offer optimal strategies for using resources. For construction companies, this means more accurate planning, increased competitiveness and stronger investor confidence.

Particular attention should be paid to the development of blockchain technologies. In the future, they can become the basis for creating decentralized accounting and settlement systems in which all financial transactions will be recorded in open registries. This will ensure absolute transparency of relationships between customers, contractors and government agencies. The use of blockchain in the construction industry can significantly reduce the number of disputes and increase confidence in financial reporting.

An equally important area is accounting robotization. The use of software robots in the future will cover not only simple operations, but also more complex processes, including the analysis of contractual documentation, verification of compliance with regulatory requirements and automatic reporting. This will significantly reduce the costs of accounting personnel and focus the efforts of specialists on strategic tasks.

In the long term, we can expect the integration of financial accounting with digital construction modeling technologies. The concept of digital twins involves the creation of a virtual model of a construction site that will include



not only technical characteristics but also financial parameters. This will allow company managers to simultaneously monitor the progress of construction and the movement of financial resources, which will ensure a higher level of project management.

Thus, the prospects for automation of financial accounting in construction companies are associated with the formation of a new digital environment, where financial information will not only be recorded, but also used for forecasting, analysis and strategic planning. The introduction of new technologies will open up opportunities for the industry to improve efficiency, reduce costs and ensure sustainable development.

Main risks and challenges

Despite the obvious advantages of automating financial accounting in construction companies, this process is associated with a number of risks and challenges that must be taken into account when implementing digital technologies. Ignoring these factors may lead not to improvement, but to complication of management and accounting processes.

Table 1. Advantages and risks of automation of financial accounting in construction companies

Advantages	Risks
Increasing transparency of financial flows	High cost of implementation
Reducing information processing time	Staff resistance to change
Minimizing human error	Cyber threats and risk of data leakage
Possibility of integrating accounting with management systems	Non-compliance with regulatory requirements when legislation changes
Improved forecasting and cost planning	Difficulties in integration with other programs

One of the key risks is the high cost of implementing automated systems. Construction companies, especially medium and small ones, face the problem of limited financial resources. Implementing complex solutions requires



significant investments in software, equipment and personnel training. As a result, the payback period for such projects can stretch over several years, which reduces their attractiveness for business.

Another important challenge is the resistance of employees to change. Personnel accustomed to working according to traditional schemes often perceive automation as a threat to their position. This is manifested in low motivation to master new technologies, unwillingness to work with digital tools, and even direct sabotage of the systems being implemented. In such conditions, the success of automation largely depends on the quality of personnel training and the correct organization of the implementation process.

A significant risk is associated with cyber threats. The transition to digital accounting systems is accompanied by an increase in the company's vulnerability to attacks by intruders. A leak of financial data or a system failure can lead to serious losses. Such risks become especially dangerous when using cloud technologies, where information security largely depends on the service provider. [9]

The risk of non-compliance of software with legal requirements deserves special attention. The regulatory framework in the field of accounting and tax accounting in Russia and abroad is constantly changing. If the system does not adapt to changes in time, the company may face problems when submitting reports and receive penalties.

An important challenge is the need to integrate different systems. A construction company simultaneously operates accounting, cost planning, personnel management and logistics programs. Inconsistency between them can lead to errors, duplication of information and violation of the integrity of financial data. Another difficulty is adapting foreign software solutions to Russian conditions. Many international systems are oriented towards other accounting standards and require significant modifications for use in domestic practice. This increases the implementation time and company expenses.

The human factor also poses a risk when using automated systems. Even the most modern technology does not exclude the possibility of errors in data entry or incorrect user actions. As a result, the reliability of financial information may suffer, which will negatively affect management decisions.



In addition, automation is often accompanied by scalability issues. A system that works well in a small company may prove ineffective when the business expands or the number of projects increases. This leads to the need for repeated investments in new solutions.

Thus, automation of financial accounting in construction companies, despite its prospects, is associated with many risks. Ignoring them can lead to significant financial losses and a decrease in the efficiency of activities.

Ways to Minimize Risks and Increase Efficiency

Understanding the risks associated with the automation of financial accounting in construction companies requires developing strategies to minimize them. Only a comprehensive approach to the implementation of technologies allows achieving real efficiency and avoiding negative consequences.

One of the key areas is the development of a clear plan for the implementation of an automated system. Before starting digitalization, it is necessary to conduct a detailed analysis of the company's needs, determine the main goals and objectives of automation, and also create a list of functions that should be implemented in the system. This approach allows you to avoid unnecessary costs and focus on truly significant processes.

Of great importance is the preparation and training of personnel. To overcome resistance to change, it is necessary to organize regular trainings and courses that will allow employees to master new tools and understand their practical value. It is also important to create a sense of involvement in the digitalization process among employees. If personnel understand that automation makes their work easier and contributes to the development of the company, resistance to change will be significantly reduced.

To minimize cyber threats, it is necessary to pay special attention to information security issues. This includes the use of modern data protection tools, regular software updates, and the creation of a multi-level access system. When switching to cloud technologies, construction companies should carefully select service providers, focusing on their reputation and the availability of security certificates.



The risk of non-compliance with legislation is reduced by choosing software solutions that provide automatic updates in accordance with changes in the regulatory framework. In addition, companies are advised to cooperate with developers and consultants who can quickly adapt the system to new requirements.

Particular attention should be paid to the integration of automated systems. The most effective is the use of integrated ERP class solutions, which are initially focused on combining all business processes into a single information environment. If a company uses several different software products, it is necessary to provide mechanisms for data exchange between them, which will avoid errors and duplication of information.

To reduce the risk of human errors, it is necessary to implement mechanisms for automatic verification and control of data correctness. The use of artificial intelligence and machine learning technologies allows for timely detection of anomalies in financial flows and signaling of possible problems.

To solve the scalability problem, companies should initially focus on systems that can adapt to business growth. Many modern solutions offer a modular design principle, where functionality can be expanded as the number of projects or branches increases. This approach avoids the need to completely replace the system when expanding operations.

Increasing the efficiency of automation is also associated with the active use of analytical tools. Modern systems should not only record data, but also ensure its processing in order to identify trends, forecast and support management decisions. For construction companies working with large investment projects, this is especially important, as it allows for more accurate risk assessment and resource allocation.

Thus, ways to minimize risks and improve the efficiency of financial accounting automation include planning, personnel training, ensuring information security, integrating systems, monitoring data accuracy, and using analytical tools. The comprehensive application of these measures allows companies to make the most of digitalization opportunities and reduce the likelihood of negative consequences. [10]



Conclusion

Automation of financial accounting in construction companies is one of the key areas of digital transformation of the industry. It is due to the high complexity of accounting processes, large volume of financial flows and the need for strict control over the use of resources. In modern conditions, manual accounting methods are becoming insufficient, and the use of automated systems is becoming a strategic factor in increasing business efficiency.

The conducted analysis showed that automation of financial accounting has stable theoretical foundations based on the integration of accounting, management and project accounting with the use of information technologies. Modern digital solutions, including ERP class systems, cloud technologies, artificial intelligence, blockchain and robotization of accounting operations, open up wide opportunities for improving the quality of financial information, accelerating data processing and forming reliable analytical tools.

The practice of implementing automated systems in construction companies both in Russia and abroad demonstrates significant advantages of digitalization. Among them are reduced costs, increased transparency of activities, improved interaction with contractors and customers, as well as increased trust on the part of investors and regulatory authorities. At the same time, the automation process is accompanied by a number of risks associated with high implementation costs, staff resistance, cybersecurity threats and difficulties in integrating various systems.

To minimize risks and increase the efficiency of automation, it is necessary to develop clear implementation plans, provide employee training, pay attention to information security, choose flexible and scalable software solutions, and actively use analytics and forecasting tools. Such a comprehensive approach allows not only to reduce the likelihood of problems, but also to turn automation into a strategic advantage for a construction company.

Prospects for further development of automation are associated with the deepening integration of financial accounting into the overall digital ecosystem of the construction business. In the coming years, we can expect widespread use of predictive analytics, blockchain and digital twin technologies, which will provide a new level of control over construction projects and financial flows.



Thus, automation of financial accounting in construction companies is not just an optimization tool, but an important condition for the sustainable development of the industry in the digital economy. Its successful implementation allows companies to increase competitiveness, ensure transparency of activities and form the basis for long-term growth.

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