# CYBER THREATS TO CREATING COST ESTIMATES IN CONSTRUCTION

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Abstract. Construction is one of the most important industries in achieving the goals of sustainable development of society. Digital transformation in the construction industry affects all stages of construction: planning, creation of estimate documentation, procurement of materials and construction work itself, delivery of the project to the customer. Digital technologies are used to monitor situations at the construction site, remote control of construction machines and mechanisms, the use of robotic systems and unmanned aerial vehicles. All these technologies raise certain concerns in the field of cybersecurity. The joint interaction of people and machines at construction sites increases the consequences of the implementation of cyber risks. This paper will analyze the directions of the emergence of cyber risks in the preparation of estimate documentation using new digital technologies. The limitations of the analysis are the lack of a sufficient number of publications devoted to cybersecurity in terms of such a construction business process as drawing up construction estimates.

Keywords: Cybersecurity, Digital Transformation, Construction Industry, Estimation Software, Risks.

#### JEL Classification: O14.

#### **INTRODUCTION**

The results of the review of bibliographic sources showed that cybersecurity issues for the construction industry are mainly considered from the perspective of building information modeling (BIM), construction robots and prefabricated platforms, construction project management, ensuring safety at the construction site, working with confidential and commercial information (Turk, Žiga, et al. article 103988).

In the work of (Enshassi, M.S.A. et al. article 05019004), an integrated risk management framework was developed, including risk mitigation strategies, which aim to improve decision making and risk management in modular construction.

#### MAIN CONTENT

Cybersecurity risks in construction estimating are difficult to identify. The volume of information to be digitized in construction projects is steadily growing. Construction companies that digitize electronic document management and design using specialized software receive clear competitive advantages.

A digital document can be worked with remotely, it is difficult to lose or destroy, and the use of an electronic digital signature ensures the authenticity of the document. However, the construction industry has the lowest level of digitalization compared to other sectors of the economy (Regona, M. , et al. article 45).

It is especially important to pay attention to cybersecurity issues in the construction industry, since it is not only about preserving commercial and other confidential information, but also about the physical safety of users of the facility during its operation.

The cybersecurity risks in construction cost estimating are numerous and difficult to identify. The introduction of artificial intelligence (AI)-based assessment tools helps improve the accuracy and efficiency of the process, but also creates conditions for new risks that can compromise data security and calculation accuracy. Some of them include:

1) data errors: using outdated or incorrect data can lead to inaccurate estimates;

2) limited interpretation of context: AI may not consider unique aspects of a construction project (Mard, H.R.S.A. et al. 570-577).

3) integration difficulties: problems with integration with other systems can slow down the process;

4) legal risks: calculation errors can lead to legal consequences;

5) cyber threats: the threat of data leaks and attacks on cloud systems (Pinto, A. et al. 616-624).

6) ethical risks: completely trusting AI without verification can lead to serious errors and a decrease in demand for specialists.

As recommendations, we can propose to implement standards in the field of cybersecurity. Currently, many standards and guidelines have been developed: ISO/International Electrotechnical Commission (IEC) 27001:2013 (ISO/IEC 2013), identifying IT security requirements; "Framework for Improving Critical Infrastructure Cybersecurity v1.1" by the National Institute of Standards and Technology (NIST) (NIST 2018), addressing both OT and IT security; and "Guide to Industrial Control Systems (ICS) Security (NIST SP 800-82)" (Stouffer et al. 2015) by NIST, particularly addressing OT security (Sonkor Semih et al. article 04021172).

An example of the application of ISO 27001 and NIST standards in a construction company is Skanska, which has implemented an ISO 27001-compliant information security management system (ISMS), thereby ensuring the protection of project documentation through data encryption and regular internal audits, and also uses NIST recommendations to monitor and protect its cloud platforms from cyber threats.

There is a method for ranking safety risks in the construction industry using gray multi-criteria decision making. This approach allows for accurate risk assessment even with limited data and does not require the definition of membership functions, which simplifies calculations and increases its practical value for safety management on construction sites. The method can be applied when there is a small number of samples and there is uncertainty, which makes it an effective tool for risk assessment when traditional multi-criteria decision-making methods, such as statistical approaches, are not very convenient to use (Abootorabi, S.M. et al. 67-74).

An analytical hierarchy process (AHP) can also be identified for assessing safety risks in construction projects at the planning and budgeting stage, as this allows potential safety hazards to be effectively identified and mitigated at early stages (Aminbakhsh, S. et al. 99-105).

With the development of digital technologies in the construction industry, the use of specialized software for estimating is becoming more and more relevant and important. These software not only increase the accuracy of calculations, but also simplify the entire process, allowing construction companies to effectively manage resources and remain competitive. The following are some

examples of popular estimating software, as well as modern online platforms that are based on AI and are gaining popularity in the industry. Popular Software Examples:

- «GRAND-Estimate» a comprehensive software for generating all types of estimates required for construction projects, from cost to resources;
- «Smeta.Ru» suitable for generating and verifying construction estimates, particularly for both large companies and small contractors;
- «TURBO Estimator» designed for creating and checking local estimates, acts, and resource statements;
- «SmetaWIZARD» automates calculations and verification of estimate documentation;
- ABC a system for preparing estimate and resource documentation for participants in the investment process.

In addition, modern AI-based online services are gaining traction, further simplifying the process of creating estimates. These platforms help automate routine tasks, analyze data, and offer optimal solutions. Examples include:

- Smeta.RU an online platform for automatic calculation of construction estimates, supporting up-to-date databases;
- Grand-Smeta 2.0 utilizes machine learning to improve calculation accuracy and cost forecasting;
- AI-Smeta integrates with BIM to account for all parameters, providing personalized calculations tailored to specific project needs.

With the development of digital technologies in the construction industry, the use of specialized software for drawing up estimates is becoming increasingly relevant and important. These programs not only improve the accuracy of calculations, but also simplify the entire process, allowing construction companies to effectively manage resources and remain competitive. An important advantage of such programs is: 1) time-saving – programs speed up the estimation process, as most operations are automated; 2) calculation accuracy: the risk of errors is reduced due to built-in databases with current material and service prices; 3) compliance with standards –programs ensure that estimates comply with current legislation and regulatory requirements; 4) convenience of updates- quick updates of prices and regulations based on market changes; 5) versatility - support for various types of estimates, including project, resource, and local estimates; 6) documentation and archiving – programs automatically generate documentation and store it in a convenient format.

## CONCLUSIONS

The use of digital technologies and specialized software in the construction industry also influences the strategic decisions of companies. The study by (Gunhan, S. et al. 928-937) analyzes the factors that influence the choice of a construction company when entering international markets. These factors include risks, various competitive advantages and economic and political aspects, thereby helping companies choose the right market and strategy for expansion. In a globally competitive environment, the effective use of technologies such as automatic estimating systems or AI-based platforms plays a key role in strengthening a company's position in the international arena.

This paper examines some of the features of digital technology application in construction from the perspective of cybersecurity. The construction industry has one of the lowest rates of digitalization. At the same time, cyber risks are growing much faster than new technologies are being implemented.

In our opinion, it is necessary to further consider cybersecurity issues in the construction industry in the context of technologies being implemented for various business processes.

### REFERENCES

- 1. Abootorabi, S.M. et al. "Proposing a model for safety risk assessment in the construction industry using gray multi-criterion decision-making." *Health Safety Work*, 4(3) (2014), pp.67-74.
- 2. Aminbakhsh, S. et al. "Safety risk assessment using analytic hierarchy process (AHP) during planning and budgeting of construction projects." *Journal of Safety Research* 46 (2013), pp.99-105.
- 3. Enshassi, M.S.A. et al. "Integrated risk management framework for tolerance-based mitigation strategy decision support in modular construction projects." *J. Manag. Eng.*, 35 (2019).
- 4. Gunhan, S. et al. "International expansion decision for construction companies." *Journal of Construction Engineering and Management* 131 (2005), pp.928-937.
- 5. Mard, H.R.S.A. et al. "Occupational risk assessment in the construction industry in Iran." *International Journal of Occupational Safety and Ergonomics* (Int. J. Occup. Saf. Ergon.) 23 (2017), pp.570-577.
- 6. Pinto, A. et al. "Occupational risk assessment in construction industry overview and reflection." *Safety Science* 49 (2011), pp.616-624.
- 7. Regona, M., et al. "Opportunities and Adoption Challenges of AI in the Construction Industry: A PRISMA Review." Journal of Open Innovation: Technology, Market, and Complexity (J. Open Innov. Technol. Mark. Complex.), 8 (2022).
- 8. Sonkor Semih et al. "Operational technology on construction sites: A review from the cybersecurity perspective." *Journal of Construction Engineering and Management* 147.12 (2021): 04021172.
- 9. Turk, Žiga, et al. "A systemic framework for addressing cybersecurity in construction." *Automation in Construction* 133 (2022): 103988.