

EXPLORING THE POSSIBILITIES AND CHALLENGES OF INTEGRATING ARTIFICIAL INTELLIGENCE INTO CONSTRUCTION

Despite the fact that construction is a major sector of the global economy, the pace of its development lags behind other sectors, as the total economic output per employee remains at the same level. The urgency of the problem stems from the fact that the construction industry is one of the most under-digitalized in the world and is slow to integrate innovative technologies.

Of course, integrating new technology is a difficult task, but it can be simplified by using machine learning and artificial intelligence, which will help create efficient workforces and save money on their training. Artificial intelligence solutions that have proven effective in other industries are beginning to show themselves in the construction process.

Artificial intelligence (AI) is a general term for factors where a machine imitates human cognitive functions, such as problem solving, key factor recognition, learning, etc. It has the ability to process a large amount of input data in a short period of time, which indicates the potential for use in construction production. Let's analyze the main advantages of using AI in construction:

1. Optimization of the building design process. Information modeling of buildings and structures is based on a 3D model, which allows construction and civil engineering professionals to increase the efficiency of design and manage the process. In order to plan and design construction, 3D models must take into account architectural plans, structural features, engineering systems, and the sequence of workflows. The challenge is to ensure that different models do not conflict with each other. The industry should use machine learning in the form of generative design to identify and eliminate conflicts between different models that are likely to be created by different organizations during the planning stages to minimize rework.

2. Risk reduction. The risk of each construction project manifests itself in many forms: quality, safety, and excessive time and money costs. Large projects can be the riskiest because a large number of contractors interact at construction sites. Today, there are artificial intelligence solutions that general contractors can use to monitor and prioritize risks during the workflow.

AI is used to automatically prioritize and make a value judgment, so that construction managers can work together to minimize risk.

3. Prevent unnecessary spending. It is known that most projects go beyond their budget, even though they have the best "players" among the contractors. Artificial neural networks are used in construction to make predictions about cost overruns based on the following factors: project size, project managers' competence, workers' qualifications, and contract type. In addition, AI allows workers to familiarize themselves with real-time training materials related to a particular project. This reduces the time required to attract new resources.

4. Solving the problem with labor force. Construction companies can increase their productivity by analyzing data in real time. Machine learning and AI allow for better planning of the distribution of personnel and equipment between jobs. Project managers will be able to instantly assess the progress of work and the location of machinery. This means that it will be possible to immediately decide where there is a need to hire additional labor, which will eliminate the possibility of falling behind schedule. Construction works will increase their level of autonomy.

The problem lies in the fact that, along with a conservative view of innovation, artificial intelligence in construction has too little data to work properly, so there is a lack of materials to support the machine's deep learning process. Creating such "safe databases" requires a lot of time and money, at least for the AI to be able to analyze photos and learn to distinguish between "damage" and "no damage." There is also no possibility of conducting research on generative design (in terms of visuals). For civil engineers, this topic is unlikely to remain relevant due to the need to manually check some of the results of structural calculations.

The biggest obstacle to integration remains the low level of readiness of the construction industry to fully utilize digital technologies. The lack of an understandable interface and a certain degree of transparency in the entire planning and production chain is impossible to achieve with digital tools alone.

Thus, the involvement of artificial intelligence in the construction industry can bring significant benefits to construction companies, reducing costs and the number of problems related to human resources policy, risks, and process optimization. However, these benefits become available only after a number of problematic issues are resolved.