AI in Construction Is Paving a Path to a More Sustainable Future - With Human Help

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USING AI IN CONSTRUCTION, WITH TECHNOLOGIES LIKE MACHINE LEARNING AND NATURAL LANGUAGE PROCESSING, COULD BE KEY TO SOLVING THE INDUSTRY'S URGENT CHALLENGES.

AI in construction planning helps the industry solve its biggest challenges by providing real-time access to essential data to complete projects safely, efficiently, and on time.

Using AI and machine learning, teams of all sizes can predict onsite safety and quality risks, provide accurate bids and estimates, reduce administrative processes, and forecast maintenance requirements.

Autodesk's director of BIM 360 Enterprise products, Pat Keaney, believes AI and machine learning will soon become commonplace within the construction industry.

Machines that are programmed to perform like humans have become more mainstream than ever, and they're revolutionizing how people do business. AI has already pervaded industries like retail, health care, and manufacturing; now construction is beginning to follow suit. AI in construction includes technologies such as machine learning that use computer programs to glean insights from past data, while natural language processing (NLP) helps create models that mimic human linguistics. Both use mined data to create algorithms that generate output to complete specific tasks, making construction much more efficient and, yes, better.

An AI approach to Construction Project Planning

Keaney believes that AI and machine learning will soon appear across all aspects of construction and construction technology. "There's a lot of knowledge in the construction industry," says Keaney. "The problem is most of that knowledge is locked up in the head of a superintendent who's been doing it for 30 or 40 years. If we can capture that knowledge and turn it into an assistive app to hand over to a young, bright, college-educated person who's interested in construction, we can help them be more effective. We can set up the industry for the next generation, and we can also address the labor shortage."

While construction remains one of the least digitized industries globally, companies are warming up to the idea that AI may be the solution to the industry's greatest challenges. AI's streamlining capabilities and potential to minimize onsite

hazards are unparalleled, helping save significant time and substantially reduce overhead. Many organizations are already using AI in construction planning for project control, budget estimations, scheduling, and onsite management.

No one sets out to overspend, but the reality is that most big projects go over budget, despite having competent teams in place. This is usually due to unanticipated circumstances such as changes to the initial scope, unreliable time estimates, communication disparities, design flaws, administrative glitches, and unforeseen conditions. Simply put, there's a lot of room for human error with so many moving parts and different stakeholders. Making accurate cost and time estimates on large projects is virtually impossible without adequate data insights.

To this end, some companies have started using artificial neural networks (ANNs) to predict things like cost overruns. ANNs are subfields of AI that are modeled after the human brain. In construction, these ANNs use historical data to envision realistic timelines for future projects based on aspects like project size, contract type, and the competence level of managers. AI can also give staff access to real-life training material remotely to uplevel their skills in real time. This reduces new resource onboarding time and allows large teams to collaborate efficiently, expedite project delivery, and meet budget requirements.

BIM to the Rescue

When older employees and superintendents retire or leave organizations, legacy information is often lost. AI can be a collaborative resource for a new generation of workers to leverage data that's been uploaded to the cloud. Building information modeling (BIM) data is organized in a way that makes it particularly useful for AI in construction, and the more structured information a machine has access to, the more intelligent it becomes. AI can also strengthen BIM by detecting clashes, analyzing models thoroughly, and recognizing potential areas of failure.

BIM has already had a significant impact on AEC projects' cost and time management. AI-assisted BIM has the potential to save organizations millions of dollars when considering the scale of large construction projects. Drawing on datasets

from past projects, AI has the power to suggest scheduling efficiencies and flag potential safety risks.

Benefits of Using AI in Construction

The construction industry can reap the benefits of AI and machine learning in a multitude of ways. Here are some key areas where organizations can leverage this technology:

1. Aiding the design and bidding process. By performing analyses of data such as bidding documents and commodity prices, machine learning can help C&I teams generate much more accurate estimates. This has the potential to reduce timeline deviations by as much as 20% and engineering hours by up to 30%, according to recent Deloitte predictions.

2. Predicting safety and quality risks on jobsites. By providing real-time insights, AI can help predict site risks before they materialize into threats. For example, models can forecast events such as storms and other plausible construction hazards. By implementing computer vision, AI can be used to analyze image and video data that tracks real-time interactions of workers, machinery, and objects, alerting supervisors to potential safety issues anywhere onsite.

3. Reducing administrative processes. AI may be able to help reduce and automate administrative processes using handwriting recognition algorithms and natural language processing to review work orders and other paperwork. These types of technologies can potentially reduce construction costs by up to 15%.

4. Build maintenance and supply chain forecasts. Sensors can be added to systems to monitor and collect data about their operations to perform demand forecasting and predictive maintenance, analyzing the health of processes, machines, and equipment. These kinds of analytics-enabled initiatives can help teams and operators reduce failures - and actually predict them before they occur. These initiatives have the potential to generate as much as 20% in operational cost savings.

Addressing Challenges of AI Adoption in Construction Projects

Unlike manufacturing, construction environments are constantly changing, so new technology needs to be carefully tested before it can be implemented. Consequences can otherwise be catastrophic and, in extreme cases, fatal. Concern over safety is one of the primary roadblocks to industry-wide adoption of AI. Other factors involve slow internet connectivity, high entry costs, a lack of AI experts in the construction field, and security challenges.

In construction projects AI often relies on real-time information from devices and machines such as sensors and actuators. Connected construction sites have obvious advantages in this context, but onsite telecommunications and internet connectivity are sometimes unreliable or nonexistent. This presents numerous challenges since machines such as robots and site monitoring systems need stable, reliable connections.

For successful AI implementation in construction, experts must collaborate with researchers and other industry-specific experts in AI to come up with new innovations that meet industry needs. Those processes cost time and money.

Since AI is still a new and relatively untested technology, its use raises safety concerns. Particularly on complex construction sites laden with hazards, it's important to understand where AI benefits from human oversight. When AI takes complete control of specific processes, there must be minimal, if any, safety risks. Falls, for example, are the most common accidents in construction. AI can help, but if an embedded system programmed to complete manual tasks malfunctions, the consequences can be costly and dangerous. "It's not just about improving the quality of a construction project," says Manu

Venugopal, a senior product manager at Autodesk. "It's also about making sure we can identify safety problems and safety hazards on jobsites."

While these challenges need to be addressed by organizations before AI technology can be adopted and implemented, solutions are steadily becoming more viable. 4G communication technology has already solved the connectivity issue to a large degree, while 5G provides even greater reliability and better system capacity. To meet the current talent shortage, governments can start to spend more on science, technology, and engineering education. Further, regulations for AI governance are already being established by governments, which will address the safety concerns. Finally, technologies such as blockchain can help improve overall transparency. When all is said and done, the time and cost savings that AI in construction has the potential to achieve is game-changing.

AI in Construction Paves the Way for a Smarter & More Sustainable Future

Construction may be the last major industry to get onboard with the digital revolution, but jobsites are beginning to transition from paper to digital workflows. The timing couldn't be better, as AI lets stakeholders mine new data and improve efficiency by leaps and bounds.

"Machine learning is a technique within the broader umbrella of artificial intelligence," says Keaney. "For example, if our customers have a thousand quality issues on a construction jobsite, no human being could or would want to read them every single day." Machine learning models, however, can look at a list of data and provide meaningful insights in seconds.

There's also the industry-wide issue of inadequate risk management - an elephant in the room that's difficult to ignore. Autodesk Data Science Manager Shubham Goel shares that in 2017, there were 971 construction fatalities in the U.S. alone. With AI in construction, this number can be drastically reduced. "Being able to understand the risk before something bad happens on a jobsite can prevent some of those injuries and fatalities while keeping the folks on the jobsite safer," says Goel.

Right now, roughly 55% of the world's population lives in urban areas, and that number is expected to climb toward 70% by 2050. The global population is projected to grow 25% in that time, driving a critical need for infrastructure investment. Smart cities like Singapore are already normalizing AI-driven solutions in everyday life with digital health care systems and sensors that monitor environmental cleanliness and crowd size, among other factors. One of the UN's 17 Sustainable Development Goals is "sustainable cities and communities," but this objective cannot be achieved without transforming how urban spaces are managed and built.

AI in construction is paving the way to a smarter, cleaner, and more sustainable future. While machine learning and robots will never replace humans entirely, this technology has the potential to transform the industry in big ways. "I want the next generation to think of construction as a really exciting place to work," says Venugopal. "I have a young daughter, and I want her to be excited about construction 10 years from now. This is where we see a great opportunity to help change an industry while making it a much better place."

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