Artificial Intelligence and Its Potential Impacts on the Construction Industry
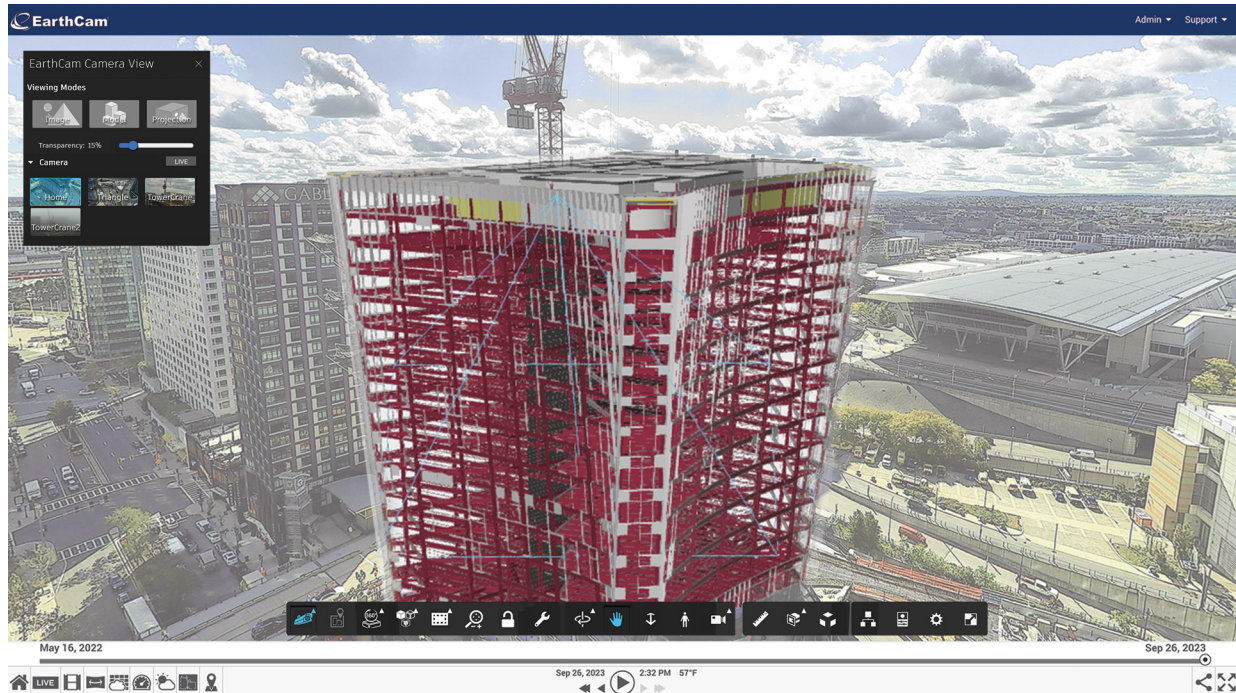
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Artificial Intelligence (AI) is a broad field in computer science that involves creating smart machines that can perform tasks that otherwise typically require human intelligence. AI can be used to perform tasks including learning from experience, recognizing patterns, and understanding natural language. Although AI is in its nascent stages of development, it is changing the construction industry in the United States and abroad in a number of ways:

Project Planning and Management: AI can analyze years of historical data including project type, downtime averages, scope of work, delivery methods to optimize resource use, and project timelines. AI is being used to analyze project specifications and compare them to historical data to recommend potentially missing submittals–which saves on costs, avoids potential schedule delays, and leads to overall project efficiency.

AI Powered Design and Simulation: AI can analyze building codes, environmental regulations and other requirements to quickly identify code compliance, building permit requirements, and required methods for construction. AI can also be used to act as a virtual project manager keeping trades on all suppliers, construction workers, consultants, and subcontractors.

Construction Automation and Robotics: AI-driven construction robots and autonomous vehicles can perform repetitive tasks, such as bricklaying, concrete pouring, and material handling with greater precision and speed. Incorporating AI into construction projects can promote improved human safety, help reduce labor costs, and potentially accelerate project timelines.

Building Information Modeling (BIM): BIM is a digital representation of a building's physical and functional characteristics and can be used for building operations and maintenance. AI is used to determine the best way to carry out maintenance and repairs by visualizing when and where problems will occur. AI can assist facility teams to optimize space and monitor critical metrics, such as energy usage and maintenance needs. AI can also help streamline implementation processes by automating tasks and provide a common platform for stakeholders on a project. This can help provide more accurate representations of the project, improve collaboration between relevant stakeholders, and reduce errors and rework.

Predictive Maintenance: AI-based sensors and monitoring systems can use real-time data to track and monitor the condition of equipment and infrastructure. This enables proactive maintenance and helps prevent costly downtime or predict catastrophic equipment failures.

Safety and Compliance: AI can analyze construction sites using cameras, drones, and other sensors to analyze the construction environment and alert workers to potential dangers, hazards, or unsafe practices. AI can also be used to monitor workplace safety, equipment, and ensure compliance with OSHA and other workplace safety regulations. Using photo recognition, AI can detect safety hazards, including workers not wearing protective gear, and can be trained to point out improperly performed activities. This can help prevent accidents, improve worker safety, and reduce liability risks.

Supply Chain Optimization: AI-powered tools can help provide back-office automation for document processing, warehouse automation, automated quality checks for products, inventory management, and inventory optimization. AI can also analyze and

predict demand for construction materials, optimize procurement processes, and streamline logistics. The COVID pandemic's disruption to the global supply chain demonstrated the need for companies to improve their supply chain strategies to become more resilient, sustainable, and collaborative with customers, suppliers, and other stakeholders. Increased investment in supply chain technologies like AI, analytics, and robotic process automation may be necessary for companies in the future to save on costs and reduce delays caused by material shortages or supply chain disruptions.

Document Management: AI can automate document sorting, indexing and retrieval, making it easier for teams to manage, access, and collect important project documentation.

Communications: AI-powered chat bots can be used to answer client or trade personnel questions providing project updates, answers to inquiries, and assist with routine communication tasks.

As AI continues to develop, its impact on the construction industry in the United States and abroad will likely grow. AI is currently being implemented in projects through software, such as Autodesk's Construction IQ, ClickUp, EarthCam, OpenSpace.ai, viAct, Fieldwire, Constru, PlanSwift, DroneDeploy, and StructureSite. As we have seen with ChatGPT, the input of data really improves the output from AI. Using AI and machine learning on construction projects can lead to increased efficiency, cost savings, and improved safety. Many companies and stakeholders should keep an open mind regarding AI's potential capabilities as it continues to influence the future of construction.