Integration of Artificial Intelligence and Computer Vision can Help Reduce Delays and Losses

The construction and infrastructure industry is a critical piece of the global economy with over $10 trillion in annual spend, according to IHS Insights. Yet the industry has been lagging behind other industries in core areas such as productivity, safety, and digitization for years. The largest and most complex construction projects in the world require such massive amounts of resources and work to be completed on a daily basis that it can be nearly impossible for project managers to grasp all that is occurring on-site. The intricate nature and lack of visibility into these projects has contributed to, according to McKinsey, 98% of all megaprojects incurring cost overruns or delays. The challenges of the global construction industry are especially critical as demand is growing in part driven by increasing population and urbanization. However, the recent explosion of investment in construction technology and applications aims to change the way the industry designs, manages, executes and maintains projects to stay on budget and on schedule. A Built World Venture report revealed that this year alone over $1 billion of investment will be poured into construction technology firms with the goal of giving contractors the tools to boost productivity by controlling the biggest risks that cause delays and losses on projects.

The wave of diverse start-up firms entering the industry is transforming all stages of the project lifecycle. Solutions such as management software, robotics, IoT/wireless sensors, artificial intelligence and more are all being developed and deployed to help eliminate the productivity deficit. One solution allowing project managers much higher levels of visibility into projects is the integration of computer vision and artificial intelligence (AI) science with construction modeling software such as Building

Information Modeling (BIM). Understanding that these trends are of interest to industry stakeholders, Aon has created the Technology Corner to profile different construction technology companies to raise awareness about different technologies that could help reduce risk and inefficiencies. In this article, we will bring a greater focus on companies in the computer vision and AI space. Companies, such as Doxel, are applying this science to scans and other site imagery to get ahead of project inefficiencies by tracking both quality of work and productivity. Cameras attached to autonomous vehicles are used to inspect the site, both indoors and outdoors, on a daily basis. Algorithms then inspect installation quality and provide real time feedback on productivity. Other outfits are using drone imagery to construct 4D models of the site that display reality versus planned by overlaying the imagery captured with BIM modeling and the project schedule. Construction progress, productivity rates, and risk for potential delays are then communicated to the construction team.

Computer vision is the process of using computer systems to understand and analyze imagery. The science allows the systems to see in a human-like nature by compiling pixels contained in an image and processing them to form objects and shapes. Through continued exposure to images, deep learning algorithms teach the system to interpret and analyze what it sees. Eventually the system is able to take an image and distinguish materials, equipment, components and other structures seen on a job site based off factors such as color, shape, size, and location.

The computer vision capabilities are then leveraged by applying AI to perform analysis and make

decisions based off what the system sees. AI is the computer system's ability to perform tasks that ordinarily require human intelligence. By overlaying the imagery captured with BIM and other project models, the system is able to apply its artificial intelligence capabilities to detect and highlight inconsistencies between the imagery and the models. This ability gives insight into deviations from design and incorrect installations, how current developments stack up against the project schedule, as well as daily progress. The technology allows project managers to be aware of issues as they occur and empowers them to make decisions and predictions on possible deficiencies in real time instead of months later. Ultimately this reduces rework and unneeded expenses while boosting productivity.

Rework is a prevalent problem in the construction industry that hinders project cost and schedule performance. A recent PlanGrid and FMI Corp survey revealed that $177.5 B in labor costs are spent annually fixing mistakes, looking for project data, and managing conflicts while another $31B is spent on rework due to miscommunication and inaccurate data on the job site. Technologies applying computer vision and AI to project imagery and models allow contractors to manage this risk by highlighting and alerting managers of nonconforming work. Having defective design and workmanship go undiscovered can lead to massive amounts of rework and possible claims against contractors for professional errors and damage to the asset throughout its lifecycle due to the contractor's negligence. These technologies allow for immediate detection of issues, eliminating time and money spent reverting backwards to fix problems. Instead resources can

be deployed to keep the project moving forward to ensure the deadline and budget are met.

These technologies also have the capability to compare the current state to the planned schedule of the project. According to McKinsey, large scale projects across asset classes typically take 20% longer to complete than scheduled and are up to 80% over budget. With such technology it is no longer a secret of how the budget and schedule are performing. Project managers have insight into when the project is falling behind, enabling them to locate the pain points as to why. Mitigation and go forward strategies may then be deployed accordingly to keep the project on course and within budget.

The use of time lapse scanning and other tools embedded in the software allow for the tracking of daily progress and earned work. This grants project managers transparency into what is actually accomplished by contractors in a given time frame. The technology aids in averting the risk of overpaying contractors for the actual work completed. When the time and money spent far outweigh what is expected for the given work, the project can quickly exceed the budget and lead to potential default.

Along with the ability to keep projects on schedule and budget, the technologies' potential to reduce risk can also impact key insurance policies. By being able to deter risks such as construction defect, cost overruns, contractor default, and project delays, the probability and severity of losses associated with corresponding coverages are greatly diminished. The positive effect on a contractor's claim and loss history can potentially lead to lower insurance premiums and the opportunity

to procure more favorable coverage terms and conditions going forward. Insurance policies and coverages affected by these technologies include:

- Surety

- General Liability/Product Liability

- Subcontractor Default Insurance

- Professional Liability

- Builders Risk

- Inherent Defect Insurance

- Wrap-Up Liability

- Cost Overrun/liquid damages cover

Overall the construction industry has seen a surge of new technology enter the space with the goal of revolutionizing the outdated processes currently being used to help fill increasing demands for construction and infrastructure across the globe. The computer vision and artificial intelligence science that allow computers to see and make decisions in a human nature is being utilized to gain instant visibility into projects. Technologies are integrating this science with BIM and other project plans to prevent two of the industry's biggest issues, project delays and cost overruns, by alerting contractors of non-conforming work and productivity issues in real time. By deterring these risks, the use of these technologies also has the potential to help reduce insurance claims and give contractors leverage to procure more favorable prices and terms. As a result, project outcomes are more easily managed and productivity is boosted allowing projects to be delivered on time and on budget.

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