

Connected construction in action

Analytics, the IoT, and computer vision capabilities are transforming construction processes.



New digital capabilities and Industry 4.0 solutions are transforming how engineering and construction projects are scoped, designed, planned and delivered – and they couldn't arrive at a better time. In many ways, most construction projects are managed by methods that haven't changed in decades.

Meanwhile, engineering and construction companies are often constrained by razor-thin margins and persistent talent shortages. Many of their clients' expectations are changing, too – builders and building owners are increasingly seeking the same real-time visibility into complex projects they enjoy elsewhere in their lives. If they get hourly updates on the progress of items being shipped to them, or if their credit card provider automatically warns them about “surprise” expenses, why shouldn't they expect to benefit from the same level of visibility into construction projects, where even minor issues can drive major delays?

A digital solution to construction management

Ongoing supply chain disruptions and labor challenges have had a real, immediate impact on the costs and timing of construction projects. In turn, these challenges are making it more difficult for engineering and construction companies to meet heightened expectations while driving continued improvements in their own businesses.

What can help leaders at these companies navigate these challenges and expectations? Data. Existing project data, new data from new sources (including Industry 4.0 solutions), and everything in between. By using the data that is already stored, managed, and produced by digital tools, as well as the raw, unstructured data that is not currently being tracked or collected, firms can open up new opportunities to improve the way construction projects are monitored and managed, improving the construction team's ability to stay on time and on budget, at minimal risk. This shift is enabled by recent major advances in IoT-enabled sensors, computer vision analytics, cloud capabilities, and more, which are introducing entirely new capabilities into construction management.

Collectively, this is referred to as connected construction. Read on to learn how SAS and Deloitte Consulting's Connected Construction team partnered to create a solution that takes a powerful data- and analytics-enabled approach.

Construction projects can be managed more efficiently by using data that is already stored, managed and produced by digital tools.

Using computer vision, digital twins and advanced analytics to track construction progress remotely

In this application of a Connected Construction solution (one of many), construction teams use advanced computer vision technologies to monitor and measure construction progress against a digital twin, providing regular, user-friendly updates to project managers, who are then able to make more informed, timely decisions regarding the project plan.

Step 1: Computer vision-enabled data intake

This first step relies on the ability to capture digital images of construction progress routinely and consistently as the project advances. Today, this critically important job is handled by workers or project engineers with cameras, who take notes on construction progress as they go. Afterward, they must take the time to upload and store both the photos and the notes to central project management folders. Not only

is this process time-consuming and error-prone, but depending on the construction project – bridge and tunnel construction, building in uncontrolled environments, etc. – it could be dangerous to capture photos in the first place.

Robotics and computer vision capabilities can address these issues. For example, a robot could be used to traverse the construction site, using a 360-degree camera to take photos of work and materials. The robot could be guided by QR codes that have been tagged onto the construction site by site administrators, which could allow the robot to orient itself and assign attributes and observations to specific areas of the site. A robot is only one possible mechanism for gathering images – helmet-mounted cameras, drones or other technologies could also be deployed.

As this location-specific data is gathered, it is steadily fed into a central analytics hub for computer vision analysis, eliminating most of the time, risk and effort required to track this data manually.

Step 2: Measuring against the project's digital twin

The digital twin is a highly-detailed virtual, digital version of the structure that is being built, brought to life with a building information model.

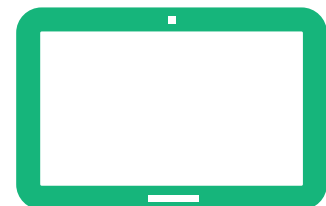
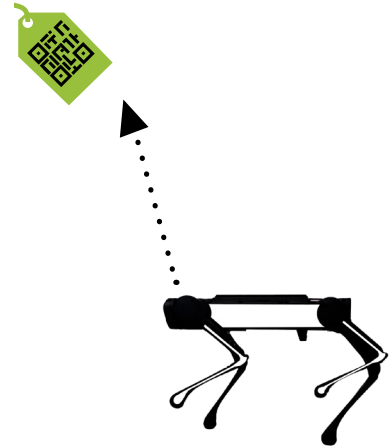
As data that has been captured and translated (using computer vision) is automatically fed into the system, analytics tools are used to compare actual progress against the digital twin, noting where progress is lagging, where it's on, or ahead of schedule, and flagging materials that may be needed as progress is notched in order to keep the project moving smoothly.

Step 3: Integration with Project Management Information Software (PMIS)

Steady progress on construction projects tends to suffer from disjointed, misaligned “handshakes” between project teams, based in part on their access to current data. For example, imagine a scenario in which a project manager captures on-site data manually on a Monday. On Tuesday, all of this data is uploaded and ready for sharing... but the joint planning meeting between different team leads doesn't take place until Friday. At that point, updates are shared, materials are ordered, and plans are made to shift other resources accordingly.

These steps can be dramatically streamlined when PMIS data is augmented with computer vision-generated data streams and digital twin data. When the team has access to all this insight in one central system, they can make smarter, faster, more informed decisions to keep the project moving. The PMIS features layers of project management updates that are maintained in real time with minimal human intervention. Once site progress updates are dynamically uploaded into the PMIS, project managers can reassign engineers, workers and assets from activities that are ahead of schedule to those that are falling behind.

- “First floor ready for wall framing.”
- “Eighth floor metal stud framing 30% complete.”
- “Third floor insulation 20% complete.”
- “Second floor drywall 50% complete.”



Step 4: Project manager makes the decisions

All automation in this system is focused on site-specific insight development – all decisions regarding scheduling are still made by the project manager. But with this system, the project manager benefits from more data to inform decisions, delivered in a more timely manner – all through the same PMIS that everyone on the team is already familiar with. The project manager reviews the findings, ensures all attributes are correctly applied to the right tasks, and updates the project plan accordingly. The result? Faster, more efficient reallocation and reassignment of resources in order to accelerate project completion while minimizing costs at every turn.

Smarter construction projects

Tracking the progress of construction projects can be tedious work today – and it can require thousands of hours on any given project. Plus, in some cases it's dangerous, requiring professionals to enter construction sites that present hazards that would be better avoided. And because it's a highly manual process, this type of monitoring is prone to human error.

Deloitte Consulting, SAS and Intel are bringing the construction industry their combined experience in advanced analytics, AI, computer vision and IoT technologies to help companies make smart investments to enable connected construction.

Contact us for a demo today.

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