

WHERE THE TECH ARE WE?

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Since the Industrial Revolution, the construction industry has seen a multitude of new technologies. Things as common as updated material manufacturing techniques, power tools and diesel-driven equipment were once catalysts for rethinking the traditional. Today, however, a new wave of technology is struggling to reach its full potential.

Over the last several decades, the implementation of new technology solutions to advance the construction industry has stagnated as compared to other industries. This is odd since the construction industry dwarfs most other industries in size and stands to gain a great deal in efficiency and quality through the integration of technologies into the planning, design and building phases of projects.

According to the JB Knowledge's 2018 Construction Technology Report, there are various reasons for this lag in advancement. The study pinpoints a shortage of support staff and budget as well as employee hesitancy and a lack of knowledge and maturity of technology available. On top of this, companies must be disciplined when it comes to choosing the right technology, careful not to fall for the latest fad in the absence of clearly defined business cases to justify the spend. »

YESTERDAY'S GROUNDWORK

One area that has seen extensive business case support for technology improvements is safety. Within the last 20 years, the construction industry has become less reactionary, highly prioritizing safety. Insurance companies have helped to drive this culture among contractors to keep rates lower, and most project owners now require that firms have exceptional safety records before being considered for a project. This has reinforced the necessity of making investments in technologies and improved planning, hazard recognition, and worker behavior to increase the safety of workers on a job site.

In other areas, however, technology improvements aren't catching on as quickly.

"The industry has struggled to harness new technology to increase efficiency and quality," says Chad Kirby, a construction director at Burns & McDonnell.

"How do we improve these areas to move the needle? Even incremental improvements matter. On a \$500 million project, a 5% improvement in those areas can offer a huge difference in the end."

Several technology options being piloted today — along with some existing technologies — are ready for implementation and can improve efficiency and quality. These, combined with the potential of new technology tools that will come available to the industry within the next five years, will bring about the next revolution in construction.

TODAY'S IMPROVEMENTS

Selecting viable technology solutions from the flood of products available on the market can be difficult, as many claim to provide better efficiency on the job site. These products place a heavy focus on collecting data from various aspects of the construction process — from the number and movements of workers on-site to the utilization of personal protective equipment (PPE) — with the idea that the data can then be

used to inform better processes. But the true value of data is only realized when it is collected properly and with purpose.

"Watching dots on a screen doesn't offer much in the way of improved efficiency," Kirby says. "Tracking workers might offer some incremental improvement in safety, but the industry needs to focus on improving efficiency with tools that don't just collect data for data's sake."

Kirby also points out that there are many new project management processes being implemented at the front end of projects. By adjusting existing methods of project delivery and focusing on startup and turnover phases, these new approaches offer bigger impacts and successful end results.

Software is constantly evolving to help improve those project management processes. Effective

construction management tools use a simple, intuitive interface and are accessible from mobile devices or a desktop. They offer streamlined solutions for sharing information between people on a job site, creating more efficient

processes for requests for information and better change management. Most importantly, these tools cut down on the number of spreadsheets needed to track information, tying all project data into one system.

Another area that is seeing improvements is in the potential of combining technologies that already exist.

"Retrofitting heavy equipment with different technology that is readily available is not only effective but also costs very little," Kirby says.

"Take 360-degree cameras, which already are being utilized on high-end cars to improve safety. It's a technology that has proven its effectiveness. Adding these



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Moving Construction Turnover Forward

Within the engineer-procure-construct model, quality control and startup/commissioning walkdowns are performed as part of the process to verify correct installation and operation of the equipment before handing the project off to the owner.

As part of this process, quality assurance and quality control personnel have been known to produce voluminous turnover books filled with construction quality and startup documentation. This laborious process builds potential for errors and gaps.

Database management systems for the turnover process are addressing this paperbound issue. With a data-driven process, all the quality and commissioning turnover documents and forms are generated during the design phase using metadata from the design database. This simplifies the effort required in the field and allows for timely information on the progress of system turnovers throughout the project.

Consider this scenario: An engineer specifies a pump during the design phase of a project. The attributes and parameters of that pump, alongside the quality and commissioning steps required to put it into service, are automatically uploaded to the database. With a database management system, project teams can more accurately manage their work, giving owners much greater visibility into the process and greater confidence in the result.

“With a data-driven approach, you can know where a project is in the turnover process and make decisions based on the progress to stay on schedule,” says Chad Kirby, a construction director at Burns & McDonnell. “It’s in this way that data management can drive project efficiency. It’s not overly flashy, but it’s a game-changer for the industry.”



Designing Customized Tech Solutions

With so many technology solutions available, it's a wonder there isn't a product designed to solve every problem a construction firm might face. The harsh reality, however, is that companies often need more than a single product to fully cover all its needs.

Software product licensing is expensive, so for smaller firms the option to purchase multiple products is not always feasible. Beyond the cost restrictions, finding a series of products that integrate with one another to make project and company data truly effective can be difficult. This has prompted some firms to consider the possibility of developing their own customized software products.

One such system, FabKinect, has been serving AZCO, a Burns & McDonnell company, in a variety of functions since the tool launched in 2017. A direct-hire, industrial constructor and fabrication contractor, AZCO needed information from several databases to track job process and status, documentation, billing and communications. With FabKinect, the data is in one place and visible across projects.

"Our data isn't siloed, processes are streamlined and we're shortening by days the amount of time it takes to complete project tasks," says Tricia Hermesen, a business application specialist at AZCO. "We're now able to use the data the system collects for estimating, scheduling and output, making our business more effective and ultimately streamlining our work."

cameras to heavy equipment has the potential to greatly improve job site safety and is now seeing widespread adoption."

Automation is another technology being utilized alongside existing tools. In a fabrication shop environment, such as for orbital welding and material handling, automation is easier to manage than in the field, increasing the overall value of prefabrication. In another example, one major construction equipment provider has recently tested skid loaders retrofitted with self-driving technology adapted from self-driving cars to move materials from the laydown area to installation crews in the field.

TOMORROW'S ADVANCEMENTS

"The development of technology is not a linear scale," says Woods Denny, manager of technology innovation at Burns & McDonnell. "Instead, it's more of an exponential scale, and we're on the inflection point in the construction space. I believe things are really going to start getting crazy active in the next five years."

The construction industry can expect to see a huge influx of technologies during that time. In safety, tracking workers on a job site and video monitoring will take existing processes to the next level. Triax,

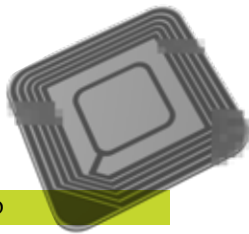


SmartVid.io and their successors are examples of tools that will offer construction teams new ways to improve workflows by monitoring the number and location of workers on a job and identifying trades and PPE with artificial intelligence.

Denny has been testing a Triax safety monitor, wearing it at work.

“If I were to fall off a platform or if there was an emergency, I can press a button to notify the system,” he says. “Each unit is monitored throughout a site by a wireless mesh network, so something as simple as common worker movements can be tracked.”
(For more on mesh networks, see page 54.)

A big push also is being made to develop tools that assist in materials management. The handling of materials to and on a job site is one of the biggest areas that could benefit from these improvements. RFID scanning for managing materials already is offering the ability to track when materials are being shipped, when they arrive on-site and where they are located in the laydown area, but scanning technology in general continues to offer new applications and opportunities.



The industry also can expect to see more use of 3D printing for a variety of needs, and the implementation of 5G bandwidth for the use of remote-controlled and automated equipment. This eventually will set the stage for fully robotic construction.

“There’s some work to be done with these technologies,” Denny says. “Substrates, materials and equipment have to get more affordable for 3D printing. Cars, or possibly the shipping industry, will

likely be first to automation, followed by construction. But there’s no reason why we can’t get there.”

CONFRONTING THE FUTURE

Over the past decade, the industry has worked to clearly define each part of a project and the responsibilities of those performing the work. This has increased the potential for lack of project cohesiveness by allowing team members to focus solely on their own roles and technology tools.

“The concern is that we are creating specialties within projects,” Kirby says. “This can be an effective way to divide work, but this division is also a potential pitfall. Technologically speaking, this division creates the perceived need for multiple pieces of technology, diluting the end goal while requiring greater spend on additional solutions.”

While costs will remain a hindrance to technology adoption, the greater challenge to overcome might be accounting for the IT foundation required to connect and run the mix of new technologies.

“You can sign up for many of these products or services today, but you need the hardware, network and storage solutions to make the most of them,” Denny says. “New network connectivity opportunities on job sites could be an answer, as they are becoming cost-effective and feasible for lots of different applications.”

More than anything, the rise of data management will continue to improve efficiency and quality in the construction industry. But until there is a reliable solution with a solid business case to support it, the industry must continue to be aware of the issues associated with untested products while still looking ahead at potential future technologies. ●



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