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PERSPECTIVE

Tech is bringing changes to construction

By Scott M. Wornow

Digital technologies are disrupting the construction industry, which has been a notable laggard in technology adoption. For an industry that until recently has relied primarily on hardcopy versions of blueprints, excel spreadsheets to schedule subcontractors and track inventory, and old fashioned measuring tape to ensure the proper fit of building materials, the times "they are a changing'," and quickly, as the song goes. And those changes demand new legal perspectives and more contemporary assessments of legacy agreements and contractual frameworks.

Sponsors and participants in new development projects have the opportunity to integrate new and emerging hardware and software technologies that will enhance productivity and increase visibility into the construction and development process, building performance and management, ongoing maintenance and future repair. Mobile applications can now deliver real-time, onsite access to digitized blue prints, punch lists, field progress reports and related data. Software platforms can enable online project bidding, vendor qualification, real-time inventory management and cost tracking. Building Information Modeling can provide 3-D digital representations of the physical and functional characteristics of facilities to architecture, engineering and construction professionals, eliminating future "guesses" about the location of mechanical, electrical and plumbing systems when maintenance is required. 3-D printing can allow onsite casting of concrete and steel objects, reducing transport and storage costs. Advanced building materials can enable the introduction of new building functionality and offer improvements in realizing sustainability objectives. Drone technology can permit remote inspection, measurement and monitoring of critical infrastructure assets, including dams, bridges and distant roadways. Embedded sensors can monitor and wirelessly report stress loads on building infrastructure. Modular construction and pre-fabrication techniques can compress project timelines, mitigate waste, reduce rework requirements and enhance coordination among subcontractors. Artificial intelligence and machine learning will offer further automation and potential efficiencies to industry participants.

The global construction industry accounted for about 13 percent of global GDP in 2013 and is expected to increase to nearly 15 percent of global GDP by 2020, representing trillions of dollars of investment. Despite the significant percentage of global GDP generated by the construction industry, the World Economic Forum reported that between 1964 and 2012, U.S. non-farm business labor productivity increased by 159 percent compared to a decrease in labor productivity of 19 percent in the construction industry over the same period. In 2015, the McKinsey Global Institute noted that the construction industry was second to last, above only "agriculture and hunting," of the 24 industries it surveyed in the use and adoption of digital technologies. These statistics suggest not only the immediate need for the construction industry rapidly to accelerate its adoption and use of new (and, in many cases, now readily available) technologies, but confirm the tangible opportunities that exist within the sector to improve efficiencies, to improve safety and to increase return on investment.

While adoption of new technologies has been slow, the venture community has recently identified a significant opportunity within the construction sector. Investment in construction technology start-ups increased from about $4.5 million in 2008 to nearly $1.5 billion in 2018. Similarly, merger and acquisition activity has risen substantially. At the end of 2018, Autodesk Inc., a leading software services provider for the architecture, engineering and construction industries, spent more than $1.0 billion to acquire just two construction technology start-ups with relatively modest revenue streams. Venture investment, technology adoption and acquisition activity will continue to accelerate in 2019 and beyond. Increased digitization of project plans and construction-related information; increased availability and collection of construction-generated data; increased access to project analytics; increased industry transparency; increased use of advanced materials; and increased retention and dissemination of industry "know-how" — these and other advances made possible through the use of construction-focused technologies are fundamentally and forever changing expectations and outcomes for all stakeholders within one of the world's oldest industries.

But, as those expectations and outcomes evolve, industry participants need to reconsider legacy contract terms, standards of performance and the implications for risk allocation. Contractors, vendors, architects, designers, financing sources and other constituencies must assess how, or whether, possible disruptions or failures of newly-adopted technologies have been effectively addressed in "off-the-shelf" forms of project agreements used for decades. They must evaluate how the use of these technologies may have influenced professional practices and how they are influencing expectations regarding the standards of professional conduct and care moving forward. Risk assessment and risk allocation, considered in the light of fundamental changes in business practices brought about by technology, must become an essential predicate to the design and planning stages of construction projects, and not simply an afterthought. Contractual passthrough provisions, like those routinely imposed by prime contractors on subcontractors, must be reevaluated to assess the varied effects that new technology solutions may have within the traditional construction ecosystem and on its participants.

What happens if a third-party software platform used to manage project scheduling, purchasing and inventory tracking suddenly crashes? Who is re-

sponsible if the platform stops working and construction comes to a halt, results in unforeseen delays or causes vendor payments to be missed? Who provides software platform support and to whom? What happens if blueprints that have been digitized become suddenly inaccessible or have inaccuracies? What happens if those digitized blueprints, or other digitized project information, is taken "hostage" through a ransomware attack and cannot be accessed for an extended period? Does construction stop? Do contractors need to obtain cyber insurance as the tools of their trade transition to the "cloud"? If project management software collects vendor data, where is that data stored and who "owns" the data? Since project "metadata" may offer valuable insights into regional purchasing trends and labor activity, among other things, who, if anyone, can mine and "monetize" that data during and after the project?

Technology adoption will also inevitably affect the post-construction phase. Connected devices are being embedded in new buildings to record performance loads and torque levels, to adjust room temperatures, to turn lights on and off based on the presence of tenants and even to change the tint of exterior windows as the day progresses. Embedded sensors are transitioning formerly static facilities into software platforms that will collect, analyze and store real-time data generated by both the building and its tenants. As sensor and similar technologies proliferate, owners, facilities managers, construction firms and other stakeholders must also consider the privacy, reliability, usability and related issues that will arise. Has patent indemnification coverage flowed through to protect a building owner sued for an alleged infringement tied to embedded sensors? If an in-building network is hacked, how is responsibility allocated among the manufacturers, installers, owners, managers and users of the network? To whom were relevant representations and warranties made with respect to the affected technologies? Were there third-party beneficiaries of licensed technologies employed in the construction process?

As digital technologies take hold within the construction industry, prudence requires a reassessment of legacy agreements and legal arrangements. Contracts that fail to account for the use, integration and permanence of advanced technologies, or that fail to reflect the terms, conditions, conventions and practices of the technology sector, are likely to result in undesirable or unanticipated allocations of project risk. The issues associated with increased adoption of construction-related technologies are not unique. Rather, they require the rethinking of traditional business methods and practices among industry participants through the lens of a technology user. And, they raise the need for heightened sensitivity, and indeed awareness, to the implications of technology adoption, to the terms on which technologies are purchased, licensed and used, to the ways in which technologies are integrated into industry processes and to the varied effects that these technologies may have, directly or indirectly, on construction industry stakeholders.

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