

Going Digital: Imagining Construction's Digital Future

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Two years ago, management consulting firm McKinsey & Company published an industry-defining paper titled “Imagining construction’s digital future.” It challenged the construction industry head-on by suggesting that it was time for change. It pointed to poor productivity, delayed projects, low margins, increased competition, and poor business processes as driving forces for change. McKinsey suggested that “construction productivity has actually declined in some markets since the 1990s; financial returns for contractors are often relatively low—and volatile.” As a result, according to McKinsey, “the world will need to spend \$57 trillion on infrastructure by 2030 to keep up with global GDP growth.” This amount of capital is staggering and shows that it is time of considerable change. When it comes to technology and business processes, the construction industry has been slow to adopt innovations – lagging far behind other industries like ICT – or advance manufacturing, faring only slightly better than agriculture. McKinsey prescribed five ways that the construction industry can embrace change to modernize.

Two years later, when digital workflows and lifestyles are ubiquitous, we ask: how far has the construction industry come on its digital journey? From an industry perspective, the answer is simple: not far enough and not fast enough. We need to accelerate the pace of possible. First, however, let us look at the current state of the industry by considering the McKinsey report.

One of the major challenges facing the industry, and primarily project delivery firms, is the geographically dispersed nature of project teams. Poor productivity and inefficient processes are unsurprising consequences that impact project performance, as access to the same information can be a challenge, as well as a disconnect between the office, the jobsite, and the field. The handover process is often not satisfactory to the owner-operator, as information is incomplete, lost, or unconnected. According to McKinsey, “projects are ever more complex and larger in scale,” which further challenges industry leaders to break down barriers and find solutions. The headwind for the industry is its slow methodical adoption of innovations, implying that it has not completely invested in reskilling its workforce or nurturing the next generation of digital natives.

Progress has been made in some areas, however. New methods of sharing project responsibility between owners and contractors look set to accelerate the “going digital” journey to combat late delivery, budget excesses, and poor visibility into performance. Digital project delivery helps improve visibility for owners, as contractual integration across design, build, and construction processes enables better alignment and collaboration. Collaboration is further galvanized through digital workflows, as project performance can be better managed at different phases of the lifecycle and in construction. The use of a building information modeling (BIM) process is not limited to a professional’s specific discipline or phase of the project. To maximize the benefits of a professional’s contribution to a project, a connected data environment offers not only digital workflows to share work packages, but also provides automation and insight by improving collaboration across the supply chain and throughout the lifecycle phases. Industrial-strength cloud services can also be enabled by a connected data environment as contractors and owners look to best practice approaches and better information mobility.

McKinsey’s five prescriptions are realistic for construction firms to adopt today. They are not futuristic, unachievable, or even expensive outlays, but are “practical and relevant.”

The practical experience of construction firms has enabled digital workflows, digital components and digital context to advance infrastructure.

McKinsey's prescriptions are:

1. Higher-definition surveying and geolocation
 - » Rapid digital mapping and estimating
2. Next-generation 5D building information modeling
 - » Design platform for the future
3. Digital collaboration and mobility
 - » Moving to paperless projects, from the office to the worksite
4. The Internet of Things and advanced analytics
 - » Intelligent asset management and decision making
5. Future-proof design and construction
 - » Designing materials and methods for the future

These five firms are examples of organizations that have addressed these key prescriptions as a part of their "going digital" journey.

Higher-definition surveying and geolocation

The Leighton-Chun Wo Joint Venture was responsible for the USD 1.08 billion, 90,000-square-meter passenger bridge connecting Hong Kong, Zhuhai, and Macao. With BIM review technology, more than 3,000 clashes were solved before, and during, construction. Reality modeling technology was employed to continuously monitor and survey ongoing progress. To avoid discrepancies, the survey team compared the 3D design models with point cloud models on a continuous basis, creating accurate as-built models.

Next-generation 5D building information modeling

The Sabah State Administrative Centre in Malaysia commissioned a complex comprising of one 33-story office tower and 9-story office building in this MYR 388.7 million project. Bin Puri Sdn. Bhd implemented BIM advancements to visualize and coordinate the buildings' elements through an integrated design and construction effort. Models were prepared for 5D construction planning to aid the site surveyor and accurately map the project.

Digital collaboration and mobility

The Thames Tideway Tunnel is a GBP 4 billion design-build project to resolve the problem of overflow from London's Victorian-era sewers. Mott MacDonald is the lead designer for this

project. The team uses a connected data environment to connect more than 15 locations throughout Europe to better manage design work packages. Digital workflows enabled better design and document delivery.

The Internet of Things and advanced analytics

Danish-based Danfoss introduced its Smart Store Solution to allow customers to remotely monitor and control operations at over 5,000 locations. The solution would ensure a 24/7 system running mode, without asset failure, unplanned downtime, or escalating energy costs. The operational analytics platform provided real-time data for proactive operations and maintenance, which included temperature reporting to ensure refrigeration units operate within set parameters, saving energy without compromising food safety.

Future-proof design and construction

Shell's pioneering floating liquefied natural gas (FLNG) facility, Prelude FLNG, has been deployed hundreds of kilometers off of Australia's coast. With decks measuring 488-by-74 meters, the facility is comprised of sections fabricated at multiple yards and brought to Geoje, South Korea for final assembly. Construction management tools were employed to visually plan and execute work safely by delivering work packages through early pre-fabricated processes.

Conclusion

While the construction industry still lags in digitalizing its processes, there are clearly areas of improvement. A focus on digital workflows, digital components, and digital context is helping contractors, their supply chain, and owners improve visibility into project delivery and the ongoing asset performance. As the industry continues its "going digital" journey, more examples will change not only the perception, but also the reality of digital project delivery.