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Catalyst for change

AI is leading the construction industry through digital transformation.
By **Sonali Singh** and **Geeta Pherwani**

Until recently, the construction industry had been slow to digitalize. Lack of repeatability and standardization across projects made it difficult to embrace digital transformation. The pandemic and the growing need to find digital ways of communicating in order to bring together dispersed project teams and enable them to collaborate seamlessly and efficiently has changed all that - and kick-started a process of change.

Where are you on your digitalization journey?

In the NBS' Digital Construction Report 2021 the majority of built environment professionals surveyed said they have been on a digital transformation journey for some time, with 17 percent well on the way to completion. Two percent even believe they have reached their destination.

Covid-19 has however clearly hastened this process. Sixty-nine percent of survey respondents said the coronavirus pandemic had accelerated their adoption of digital technologies and ways of working, creating a need for solutions that enable digitalization.

Technology as an enabler

AI is enabling the process of digitalization. The C-suite is prioritising AI to reduce setup and programming overhead that is typically required for individual jobs. Unlike before, AI is allowing the construction industry to apply data from previous projects or other standards to set up technology quickly and efficiently across each project.

We are already seeing a growing number of examples of AI-driven digitalization bringing benefits to the construction industry. Here, we look at some areas where the latest advanced technology is having the most significant impact for industrial plants.

Streamlining the design and planning phase

AI will support early investments in fully fleshing out the engineering approach to a project, the constructability of a design, and the planning of how materials, labor and equipment are organized at the worksite. Early planning such as this has proven to reduce construction costs and accelerate schedules.

Major decisions about the engineering approach, equipment selection, plant layout, and materials of construction define how much the plant will cost, how much energy it will require to operate and how it will successfully meet the owner's objectives for the next 30-50 years.

We are seeing capital projects, where AI is utilized to rapidly develop 3D plant layout options in which construction packages are defined to study optimal construction sequences and schedules. A Path of Construction is forming as an early-stage deliverable to drive optimal construction plans. A global chemical owner operator has standardized construction work package definition and nomenclature to utilize on all future CAPEX projects. By leveraging these standards, they can generate Path of Construction plans earlier in the project lifecycle. This customer has validated that this updated work process optimizes the construction plan, accelerates time to market, and can reduce delays at the site.

Assessment of risk and best-case scenarios

Use of first-principle models for defining and predicting performance and outcomes is standard in the process industries. However, there are some processes that are more

difficult to predict. Today, these processes are often managed through less-precise techniques such as operator experience or rules of thumb, resulting in suboptimal performance.

0AI, however, can simulate thousands of design options to quickly narrow down the options that not only best meet the owner requirements, but are the safest, most environmentally friendly, and cost effective. A new capability, known as multi-case analysis, offers engineering, procurement and construction (EPC) companies an opportunity to transform the way these early decisions are made. Previously, engineers would define these critical parameters using limited data from just a handful of potential operating cases and conditions. Imagine designing an iPhone with such a limited set of data, never mind a complex, bespoke, $5 billion process plant. And yet that's been standard practice in the past.

Multi-case helps to optimize these early design decisions based on consideration of hundreds or even thousands of operating conditions and cases. Leveraging AI and high-performance computing (in the cloud or on the desktop), designers can now rely on a significantly broader set of data to fine-tune their designs.

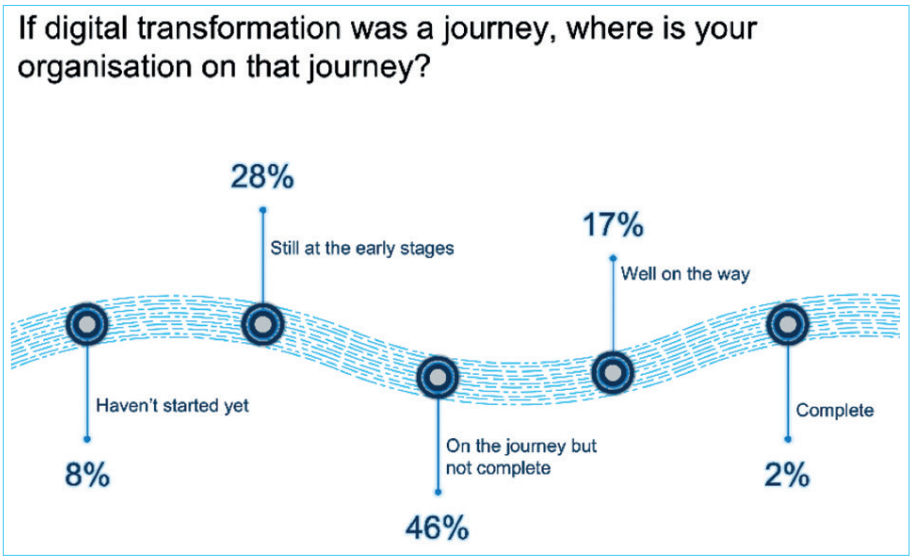
From varying ambient weather conditions to the many different grades of crude oil, this improvement in understanding how a potential design would perform in real-world conditions can result in across-the-board improvements: from materials of construction and equipment sizing to the type of utilities and even the location of the plant. These decisions often significantly impact the plant's capital and operating costs, risk analysis as well as the overall fit for its intended purpose.

Digital twin technology for ongoing asset management

The benefits of advanced technology in this sector don't stop with the construction process itself but can be extended on into the subsequent operations and ongoing maintenance phases of the asset lifecycle.

The use of digital twin technology, in particular, can bring high value to clients as it captures real-time data from the asset once it's in operation. Digital twins paired with hybrid models is a crucial step in understanding and predicting how specific processes will behave with respect to safety and efficiency.

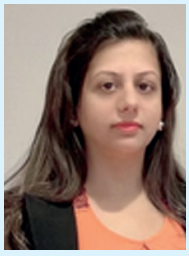
Hybrid models are a powerful paradigm that combine the best of AI with domain expertise, providing broad access to more comprehensive and accurate models, and setting the guardrails for safe operations, across all the phases of the asset lifecycle. As assets and their systems have increased in complexity, higher predictivity of AI driven models paired with real time data have become essential to design, operation and maintenance. Technip Energies uncovered gains of over $100M/yr for a European refinery with a capacity of 200,000 BPD by identifying and implementing operational improvement opportunities using hybrid models.



Future thinking

As we look positively ahead to the future of construction, the onward march to digitalization looks set to continue apace across the sector. Deep-rooted change was already well under way long before Covid but the pandemic has acted as a further catalyst. In this new environment, the construction firms that will succeed will be those that embrace advanced technology and the latest AI tools in particular, to drive operational efficiencies across the end-to-end value chain, make themselves into leaders not laggards and stay ahead of the pack.

For the sources used in this article, please contact the editor.



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