

5 AEC Industry Trends

Design Project Leaders
Need to Watch



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Your Industry Is Changing – Are You?

Designers and contractors have traditionally been at the forefront of modernization movements. From the Parthenon of ancient Greece to New York City's transforming skyline, each generation of builders has succeeded by implementing sophisticated design and construction techniques.

Yet, over the past few decades, the industry has fallen behind. It clings to manual processes, rendering it only about half as productive as the total economy [[McKinsey & Company](#)].

The best way to get ahead of the curve? Look at the latest trends.

If your goal is to be an innovator and deliver your best results, you must embrace change and digitization rather than accepting the status quo. If you do not, delivering successful projects will only become more difficult.

This whitepaper outlines major trends that are molding the engineering and construction (E&C) industry for design project leaders, along with ones to watch in the future.

Megaprojects



Megaprojects are large scale, complex undertakings that typically cost USD 1 billion or more. However, these megaprojects are defined by more than just their steep price. They often take several years to complete, involve multiple public and private stakeholders, and have the potential to impact millions of people.

The need for megaprojects continues to grow, as global infrastructure is in dire need of improvements and the demand for modern infrastructure continues to grow in developing countries. In fact, by 2028, megaprojects are expected to increase to 24% of the global GDP, according to futurist Thomas Frey of the DaVinci Institute [\[PMI\]](#).

Impact on the Industry

Megaprojects are influencing how the industry delivers projects, and the prize for successfully executing a large-scale project is significant in this competitive market.

These modern marvels not only have a lasting impact on the owner and stakeholders, but they can influence wider industry issues and the regulatory landscape. If successful, they may pave the way for future projects. But if these projects are unsuccessful, that failure will stop other projects from ever occurring, as organizations will be hesitant to fail and lose out on the investment.

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[\[PMI\]](#)

When Brendan Bechtel, chairman and chief executive of Bechtel Group, Inc., spoke at the 2016 Construction Industry Institute conference, he claimed, “For megaprojects, 98% experience cost overruns or delays; the average cost increase is 80%, and the average schedule slippage is 20 months.” [\[ENR\]](#) He further explained that the problems plaguing megaprojects also beset smaller projects. Being complacent will result in quickly falling behind. Better-managed, better-resourced competitors must focus on quality, safety, customer service, and proactively evolving to be better equipped to face an ever-changing environment.

The Takeaway for E&C Firms

Whether your E&C firm is pursuing megaprojects or scaled-down versions, projects are becoming much larger and more complex. With an increase of project teams that are distributed across geographies, disciplines and organizations, firms must leverage new technologies and best practices to successfully adapt and remain competitive.

New Contract Models



82% of owners feel that they need more collaboration with their contractors.

[KPMG]

Contracts are getting more intricate to bid, tougher to win, and more multifaceted to implement, which creates new challenges for management teams. One of the reasons for these changes is the clients' shift to new contract models, such as lump-sum turnkey (LSTK), public-private partnerships (PPPs) and integrated project delivery (IPD).

LSTK contracts benefit clients who are increasingly informed as to how much a project should cost. This situation often includes breaking up larger projects into smaller elements, creating greater competition and garnering a better price. While clients have more project management responsibility, these unbundled contracts also prevent E&C firms from subsidizing weaker and less profitable elements of their operation with stronger ones.

On PPPs, despite needing to make improvements to roads, bridges, dams, airports, schools, and other assets, government agencies often do not have the funding, causing PPPs to play a vital role in these projects. Because E&C firms must invest capital to participate, they accept greater financial risk for the project but also gain deeper rewards for its success, such as new project opportunities and a share of the project's operational revenue.

“In order for collaborative contracting to work, contractors must be willing to provide clear visibility into project cost drivers, including subcontracting costs.”

[McKinsey & Company]

Lastly, the IPD approach is sometimes referred to as a “contract cure” because it tackles compensation and risk as a collective approach. Team members from different organizations cohesively work on a project – like a virtual company – and everyone has a vested interest in the project's success.

Impact on the Industry

These contract models have necessitated that E&C firms actively seek ways to work proactively with owner-operators. Open, collaborative discussions can happen at each stage of the project's lifecycle, from gauging capabilities and risk tolerance to assisting with developing the project scope and schedule [McKinsey & Company]. Additionally, to win new business, contractors must demonstrate that they follow leading best practices to manage projects. Once a project is won, they then need to proactively manage risk to preserve their margins, necessitating greater transparency with financial strength, compliance, safety, and performance history.

The Takeaway for E&C Firms

The days of traditional contracts are gone. To meet the requirements of the new contract models, E&C firms need to implement collaborative contracting practices to improve project outcomes today and be a viable future partner. Contractors, once they demonstrate adherence to leading best practices, need to preserve their margins by proactively managing risk and becoming more transparent throughout the project lifecycle.



The term “big data” refers to the increasingly enormous volumes of information collected and stored for projects. As the complexity and scale of projects increase, big data has become an integral part of the project lifecycle. E&C firms that can effectively manage this data and leverage it to gain greater insights for improving project performance are at clear competitive advantage.

Greater quantities of robust data provide valuable information that design professionals need to make informed daily decisions to keep projects on time and budget. The effective generation, management, and transmission of project information will be instrumental in developing strategies to become more efficient across all operations and deliver better results.

Impact on the Industry

Because of the enormous volume of project information that E&C firms need to process and manage, big data presents a huge challenge for the industry. A [2018 FMI report](#) noted, “Some of the largest infrastructure projects require an average of 130 million emails, 55 million documents and 12 million workflows.”

95.5% of all captured data goes unused in the E&C industry.

[FMI]

To complicate matters, data sources are heavily siloed or stored in incongruent places, oftentimes making effective data integration a challenging undertaking. Recent research showed that 30% of E&C professionals stated that none of their applications are integrated [[JB Knowledge](#)]. If data disarray persists, it will significantly impact a firm’s productivity, communication, and collaboration efforts, as well as the quality and bottom line.

The Takeaway for E&C Firms

Understanding which data can be useful and how it translates into business intelligence requires strategic planning and a clear understanding of your organization’s overall goals and vision. To be successful, firms not only need to break down information silos to centralize data and make it easier to access, but they also need to advance their ability to combine and analyze data into actionable insights to improve project performance. These practices require investing in the right data architecture, applications, and processes for storing, managing, and analyzing project information.

Digital Transformation



Within 10 years, full-scale digitization could lead to savings between USD 700 billion to 1.2 trillion (13% to 21%) in design, engineering, and construction efforts.

[World Economic Forum]

Digital transformation is happening, yet, the AEC industry remains one of the least digitized industries [[McKinsey Global Institute](#)]. A few strong barriers keep E&C companies from fully embracing the digital transformation.

- With hundreds of applications on the market, it can be difficult to narrow down the one that will best address today's pain points and serve future needs.
- The industry is fragmented, with multiple private- and public-sector owners, investors, contractors, architects, and subcontractors. Each situation differs in capabilities and management approach, making it challenging to implement a digital solution across a job site for multiple, geographically dispersed sectors.
- Today's contract models often burden E&C companies with risk, creating a fear of project delay or even jeopardizing the fulfillment of contractual obligations. Companies may have little incentive to test out new technologies and processes.

Despite these barriers, investment in technology has doubled in the past decade [[McKinsey & Company](#)]. Savvy E&C firms recognize the big-picture value of adoption: operational agility. These solutions can provide real-time insights into project performance, alongside creating greater access to project information and team collaboration throughout the project lifecycle.

The McKinsey Global Institute estimates that the industry will need USD 57 trillion in infrastructure by 2030 to keep up with global GDP growth.

Impact on the Industry

While technical challenges have accelerated the AEC industry's pace of digitalization, adoption is still behind where it needs to be. Projects will only continue to become larger and more complex, which, coupled with higher expectations to more efficiently deliver top-quality projects, means that traditional practices must change.

The [McKinsey Global Institute](#) estimates that the industry will need USD 57 trillion in infrastructure by 2030 to keep up with global GDP growth. This situation provides a massive incentive for E&C firms to identify solutions that will boost productivity and project delivery using technology to improve practices.

The Takeaway for E&C Firms

It is crucial that leading firms successfully leverage digital innovations to deliver projects faster, and with less risk and cost. E&C companies should establish an implementation plan with milestones that describe how the process will flow, which can be measured and adjusted over time. Companies that do not, or delay this process, face competitive disadvantages that will be expensive and difficult to overcome.

Artificial Intelligence



While machine learning has been around since the 1950s, the use of artificial intelligence (AI) in the E&C industry is now exponentially advancing, largely due to the growth in big data and the expansion of the Internet of Things (IoT). It has also been motivated by industry issues such as skilled labor shortage, government regulations, and desire to enhance safety and productivity.

“Because the impact of AI is contingent on having the right data, E&C leaders cannot take advantage of AI without first undertaking sustained digitization efforts.”

[[McKinsey & Company](#)]

AI assists in the planning and design phase of construction. AI-operated machinery can survey the site to gather data required to produce 3D plans in a fraction of the time. Rob Otani, chief technology officer at Thornton Tomasetti Inc., noted that while he does not recommend AI’s use for final design decisions, he estimates that between 20% to 30% of engineering workflows can be automated using AI [[Construction Dive](#)].

Impact on the Industry

[McKinsey & Company](#) states, “In the immediate future, we expect AI’s proliferation in the E&C sector to be modest.” The organization also says that a shift is coming, as stakeholders – including contractors, operators, owners, and service

providers – can no longer ignore the important role that AI technology plays across the project lifecycle.

The AEC industry is already seeing gains when using AI to reduce the time that engineers spent on mundane tasks and use their talents on creative problem solving.

The Takeaway for E&C Firms

AI will alter business models for the AEC industry. E&C firms should proactively look for areas within their design process – such as collecting building site data and deploying advanced analytics – where AI can have the biggest impact short term.

A Look into the AEC Industry's Digital Future



As the AEC industry gets more competitive and profit margins shrink, the opportunities grow for innovative firms. Those firms that embrace new technologies gain a leading edge – not just with streamlined operations but by becoming visionaries in the industry.

Below are a couple of the up-and-coming trends that will soon impact the industry.

4D Construction Modeling: 4D construction modeling, a combination of 3D models and the extra dimension of project planning, scheduling, and controls, exists to replace and upgrade traditional analog-based 2D approaches. This new modeling approach goes beyond simple record history or contract compliance to drive the delivery of successful construction projects. Enabling 4D modeling improves results and provides greater profit margins through the competitive advantage and efficiencies that it generates.

[F]irms that embrace new technologies gain a leading edge – not just with streamlined operations but by becoming visionaries in the industry.

Mixed Reality (XR): A combination of the best of both virtual reality (VR) and augmented reality (AR), mixed reality is the merging of real and virtual worlds to produce new environments. Not just for gamers anymore, mixed reality is making a strong impact on the AEC industry through the dynamic visualizations and insights that they provide.

As one example, mixed reality is being used to help detect design flaws. Teams can “walk through” the site together to examine details without needing to travel to it, making it possible for greater collaboration across various geographical locations. This ability alone reduces rework and improves the overall flow and quality of the project.

Digital Twin Technology: A digital twin is a digital representation of a physical asset, process, or system, along with the engineering information that allows us to understand and model its performance. Typically, a digital twin can be continuously synchronized from multiple sources, including sensors and continuous surveying, to represent its near real-time status, working condition, or position. A digital twin enables users to visualize the asset, check status, perform analysis, and generate insights to predict and optimize asset performance.

Using digital twins in construction means accessing as-builts and as-designed models synced in real time, so E&C firms can monitor progress against the schedule. Project digital twins provide a risk-free way of simulating construction, logistics, and fabrication sequences with the supply chain. They also optimize design for passenger flows, enabling stakeholders to visualize emergency evacuations and resilience against flooding and/or extreme weather conditions.

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