Capital projects: Creating digital-first organizations

A new organizational structure and talent strategy can accelerate digitization in capital projects.

Steffen Fuchs, Kevin Kroll, and James Nowicke

A wave of digitization is sweeping through engineering and construction (E&C), with companies applying new tools in everything from design management to field productivity. These early efforts have produced significant value for certain project participants, from owners to material and component suppliers, but they've also caused others to question whether they have the right approach and capabilities. Some struggle to move from the pilot stage to company-wide rollout or find it difficult to develop a comprehensive, integrated approach to digitization. These obstacles make them wonder if they'll ever be able to scale digital innovation. Often, the field force greets initiatives with skepticism. And most companies have difficulty sorting through available digital solutions and identifying the best tools for addressing their major pain points.

Our experience with capital-project companies—both owner and contractor organizations—suggests that many players struggle because they don't establish an operating model that supports digitization and innovation. Rather than considering digital initiatives as part of their core strategy, companies treat them as separate endeavors. The work processes and organizational structures remain unchanged, even though they're not well suited to digitized environments. Few top leaders truly champion digital initiatives, and employees don't get the training required to deploy new tools, troubleshoot problems, or oversee digital implementation. Lacking broad digital capabilities and teams, companies can't sustain even the most promising initiatives.

Countering these problems will require major shifts in three areas: organizational structure, talent management, and corporate culture. Although these changes may be difficult, advanced analytics, robotics, 5-D building information modeling (BIM), and other digital-construction tools are clearly worth the effort. One recent McKinsey analysis suggests that such solutions, when applied comprehensively and efficiently, can reduce overall project costs by as much as 45 percent—and that means they represent the most powerful value lever within the industry.

Creating an organizational structure that supports digitization

Every capital-project company has an IT function, but most of these groups still focus on old-school activities, such as installing new software and hardware systems. They're often only remotely involved with the new digital-construction tools used in E&C projects. In many cases, leaders simply don't ask IT teams to explore innovative digital strategies to reduce costs or improve productivity, nor do they request that IT teams provide new services to their customers. And many companies don't emphasize the need to mine insights from their vast stores of data that are distributed across different groups, such as information on project cost and schedule (both estimates and actual numbers), cross-project field-productivity metrics, and person-hour data. Without this information, companies lose a chance to differentiate themselves from the competition.

To deliver differentiated digital value, companies should create teams that support an agile way of working in which core operating units are integrated with the IT organization and augmented by a set of new digital roles that assist with value creation during projects. The overall goal of these teams is to support innovation and value creation in core business activities.

Our experience shows that the most successful digital teams focus on three priorities. First, they perform analytics to assess operations and performance, and then they take action based on the insights. They also rapidly test and deploy new hardware and software—for instance, an innovative

project production system software or a new autonomous piece of site equipment—following agile principles. Finally, teams concentrate on developing and deploying new digital processes and products for field and back-office operations, all of which can be standardized and scaled across organizations. (Of course, they must ensure that innovation does not disrupt the core project.) Beyond these tasks, the digital team must periodically evaluate innovations after their deployment. If the new solutions aren't adding value, the digital team should phase them out or replace them.

Accomplishing these tasks will require three essential roles on digital teams:

- *Data professionals.* These employees take the lead in collecting, cleaning, and analyzing real-time data, including information on past bid results, historical costs, and productivity metrics. They also build databases, models, and performance dashboards to give other employees easy access to insights.

- *Technology and infrastructure engineers.* These employees must identify third-party solutions, including hardware and software, that will best meet their company's needs and test them before deployment. They'll also provide project leaders and top management with perspectives on situations where the new solutions could provide value.

- *Process developers (commonly referred to as "translators").* As their job title implies, these employees create new work processes based on analytical insights, guidance from infrastructure experts, and feedback from the field. For instance, they might write proposals that describe how a company will integrate new workforce-scheduling software into a pilot project. Typically, translators also have

operational backgrounds and help bridge the gap between the digital team and the field team.

Placement of digital teams

In some cases, a digital team may sit in a stand-alone digital business unit with its own profit-and-loss metrics (exhibit). Capital-project companies have considered this approach to both limit risks to ongoing operations and to provide a transparent way to monitor the unit's performance and quantify the benefits of digital activity to the organization. If leaders take this route as a short-term solution, they typically create a long-term plan to develop a common operating model for digital and conventional teams.
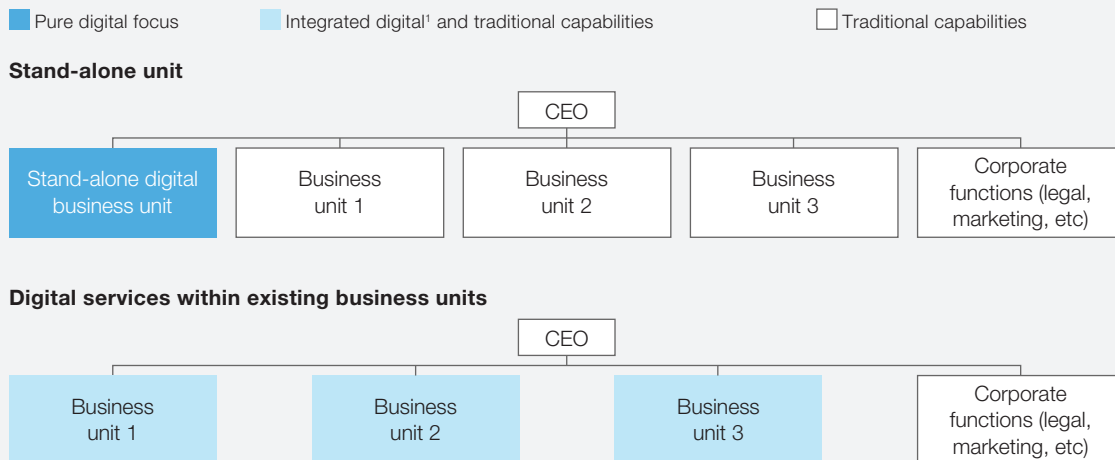
Recently, more companies have been moving away from stand-alone digital business units. Instead, they're integrating digital roles and services within existing business functions, where they complement existing staff. Frequently, this integration increases organizational buy-in and improves long-term scalability. If necessary, companies can build their digital teams in phases, adding staff as they introduce more tools.

Companies typically consider their current organizational structure, operating model, size, and portfolio structure when deciding where specific digital roles should be located. For instance, a relatively small company might not have enough staff to deploy multiple digital teams across business units, while a large, global player may be better positioned to do so, even though more operating units and regions would be involved.

No matter where digital teams are located, capital-projects companies must be prepared to devote significant resources to them. In a review of other industries that are further advanced in digitization, we found that the only companies that succeeded in driving innovation were those that made a meaningful

Digital teams may be in stand-alone units or incorporated into existing business units.

■ Pure digital focus   ■ Integrated digital[1] and traditional capabilities   ☐ Traditional capabilities

Stand-alone unit

		CEO		
Stand-alone digital business unit	Business unit 1	Business unit 2	Business unit 3	Corporate functions (legal, marketing, etc)

Digital services within existing business units

	CEO		
Business unit 1	Business unit 2	Business unit 3	Corporate functions (legal, marketing, etc)

[1] Digital capabilities include customer analytics, operations analytics, and maintenance of technology infrastructure.

investment in their teams. A digital transformation is a massive undertaking, and it requires a large and competent team to serve as its engine.

Building an innovative workforce

Many capital-project companies don't have enough data professionals, technology and infrastructure engineers, or process developers to staff their teams, or else they lack them completely. As they try to remedy this problem, many companies find themselves in a chicken-and-egg situation. To innovate, they need talented individuals with a passion for technology to fill new roles on the digital team. They must also help staff members in traditional roles develop their digital skills. But it can be hard to attract tech talent and build strong digital capabilities at a company with a reputation and history of "analog" operations.

To escape this conundrum, capital-project companies should identify core digital skills that they want to develop within their organization and then build a management tool, such as a dashboard, that tracks the number of employees that possess them. From there, companies should create a long-term plan to recruit, develop, and retain people with very specific capabilities to address any gaps. The desired talents could relate to specific tools, such as 5-D BIM, or they could involve more general skills, such as data analytics or field-technology implementation.

Improving recruitment of new digital talent

Companies outside high tech, including capital-project companies, can't wait for tech talent to walk through their doors, since competition for data scientists and related roles is steep. In fact, these businesses will have to make a greater effort to win the best employees, since they have less experience targeting hardware and software experts than their counterparts in high tech. Moreover, their industries are usually not on the radar of top emerging tech talent.

Like other companies outside high tech, capital-project players should turn their outsider status into an asset when looking for core digital staff. For instance, they could emphasize that the E&C industry offers greater opportunities to create new digital processes and products than sectors that are further along their digital journey. (For more information on the opportunities available, see "Navigating the digital future: The disruption of capital projects," October 2017, on McKinsey.com.) The breadth and depth of the available opportunities might appeal to the entrepreneurial bent that many tech employees possess.

In many cases, digital talent will be attracted to roles in which they can have a meaningful impact on society as a whole. Companies should thus stress how an employee's digital skills will translate into widespread improvements across the community. Building a new subway system could help millions of commuters, for example, or a new office park or airport could improve the local economy. In addition, companies should emphasize that digital teams may be able to generate dramatic improvements in a relatively short time within E&C, since some of the simplest solutions have yet to be implemented.

Actively managing traditional employees

Capital-project companies won't always find sufficient employees with digital skills on the job market, and time-tested manual processes like planning work flows or estimating costs won't disappear overnight, even if a digital alternative is available. That means experienced capital-project employees shouldn't feel obsolete, even if they don't have a technical background. But companies that want to enable innovation must ensure that all employees in traditional roles start developing digital capabilities that complement their existing skills.

Some leaders may question whether such efforts are needed, since digital teams will structure data, conduct analyses, and extract insights that allow them to solve problems or make better decisions. But traditional employees on field teams must understand where the data comes from and how it's used. Without this information, field teams might resort to work-arounds that limit the flow of information, such as shutting off sensors on equipment or manually tracking rework, instead of using a digital program.

At the management level, capital-project companies must guarantee that field leaders can launch and manage new technologies quickly, in keeping with agile development principles. That's especially true if teams repeatedly encounter the same pain points. For example, if companies consistently experience problems with document-version control, field leaders must be able to diagnose the root cause, collaborate with the digital team to identify potential technology solutions, and oversee the transition to the selected document-management software.

Capital-project companies can foster awareness about new digital-construction tools through workshops, field-and-forum learning opportunities, and corporate communications. They could also encourage traditional employees to take off-site classes. To lighten the burden, it helps to reward the successful completion of such programs with higher compensation, formal recognition, or other rewards.

In other industries, field teams with a strong knowledge of data and their many uses have contributed to the creation of additional tools or innovations. Companies have also moved some of the top field staff to translator positions or other digital roles that allowed them to work closely with senior leaders on a broad array of priority projects. If capital-project companies follow the same approach, their best employees may begin to view digital capabilities as essential to advancement.

Finally, companies can demonstrate their commitment to digitization by revising job

descriptions and performance-assessment criteria for traditional roles. Consider project managers, who typically manage the overall schedule and budget, as well as communication among trades. Companies that want to pursue a digital agenda could also ask these managers to use construction-productivity software to predict delays, avoid cost overruns, and improve collaboration. Similarly, companies could create new performance-assessment categories that measure these capabilities or that provide incentives to master new areas—for instance, specifying that strong digital skills are necessary for project managers to be promoted.

Building a digital culture, from the front office to the field

Too often, transformative digital opportunities fail to generate traction in the field—and that's true across all industries, not just capital projects. In a recent survey of more than 2,000 business leaders from multiple sectors, 33 percent reported that cultural and behavioral challenges were the greatest impediments to meeting their digital priorities.[1] A lack of understanding of digital trends came in second at 25 percent. One problem is that many companies simply undertake digitization efforts because of some vague belief that they're important; they don't meaningfully tie the new initiatives to specific business-performance objectives.

In our experience, capital-project companies that are slow to address cultural issues never gain the momentum needed to launch and sustain large-scale digital programs. Field leaders and other frontline workers, who frequently lack a deep technology background, often remain skeptical about the value of the new technologies they're being asked to implement—such as devices connected to the Internet of Things, drones that capture images, and lidar systems that provide additional real-time information about execution. Some leaders, for instance, continue to fill out crew time cards by

hand even though their companies provide digital-construction tools that could automate this task.

To challenge the status quo, top managers must make it clear that digital leaders and translator teams have responsibility for ensuring that projects deliver the desired business outcomes. Achieving these goals may require new processes in all areas: planning, material management, quality assurance, and quality control. Traditionally, craftspeople would review static drawings on paper—a slow process that reduces time on tools and often results in conflicting interpretations when design requirements aren't clear. What if leadership mandated the use of 3-D modeling and augmented reality instead of static drawings—tools that would help achieve business goals related to better and more accurate designs? Managers might encounter some initial skepticism and bumps in the road, but workers would quickly see that the new tools improved productivity, eliminated ambiguities inherent in paper designs, and reduced rework. For instance, craftspeople could simply look at a wall while wearing safety glasses that showed where a pipe hanger should be welded. That's a lot faster and easier than reviewing an isometric.

Beyond technical knowledge, digital staff will also need diplomatic skills, especially when dealing with reluctant crew leaders, who set the example for other field staff. If these leaders don't welcome the increased push for innovation, it's unlikely that their crew members will. Since the divide between digital teams and traditional staff could seriously inhibit progress, capital-project companies should prioritize tact and collaboration—qualities that were not always major concerns in the past—when appointing leaders.

Learning to take risks

Although companies should never compromise safety, they must take risks in other areas to drive

innovation. To create a culture in which all workers are comfortable with change and uncertainty, top leaders must empower teams to make decisions about digital strategy, after providing guidance about goals and timing. In other industries, such as financial services, companies have helped operations leaders navigate uncertainty associated with new tools and strategies by having agile coaches serve as their partners. With this assistance, leaders could quickly assess the value of new solutions and make revisions.

Leaders can also encourage staff to take judicious risks by explaining that occasional failures are acceptable—and even inevitable—when companies attempt to innovate. If teams make some missteps when applying digital solutions, managers should focus on lessons learned rather than try to assign blame.

■ ■ ■

Digitization is the future of capital projects, and companies that don't adapt now may find themselves falling behind the competition, following a pattern already seen in banking, retail, transportation, and other industries. The best path forward involves investing in an "at scale" transformation approach—one in which companies display their full commitment to innovation by revising the organizational structure, talent management, and corporate culture. The changes that we've described won't come easily or quickly, but the companies that resolve to address them first will likely emerge as digital leaders. ■

---

[1] Julie Goran, Laura LaBerge, and Ramesh Srinivasan, "Culture for a digital age," *McKinsey Quarterly*, July 2017, McKinsey.com.

Steffen Fuchs is a senior partner in McKinsey's Dallas office, **Kevin Kroll** is a consultant in the Chicago office, and **James Nowicke** is an associate partner in the Houston office.