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Daring to digitize: Improving productivity on capital projects

With digital solutions poised to disrupt capital projects, companies must overcome their long-standing reluctance to apply these tools. Here's how.



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Construction's under-digitization has become a well-known industry lament—as have the resultant lags in productivity and delivery. The root causes are many but one looms large: all stakeholders in the capital-projects ecosystem—project owners, contractors, and subcontractors—have resisted adopting digital tools and platforms.

Their reluctance does not stem from an absence of solutions—construction-technology firms garnered \$10 billion in investment funding from 2011 through early 2017. Instead, the problem lies with planning and execution. Some companies limit their investment in digital solutions because they cannot identify tools that address their major pain points. Others struggle with implementation, often losing momentum after the pilot stage. But leaders can overcome these issues through a new approach to digital strategy that emphasizes business value.

A multi-faceted approach to digital innovation

In a recent analysis of 22 major industries, construction came in second to last for overall digitization. This troubling statistic largely explains why the sector's productivity is now about half that of the total economy. But our research shows that if companies begin using available digital tools, they could reduce project costs by up to 45 percent—not enough to close construction's productivity gap, but enough to make significant strides.

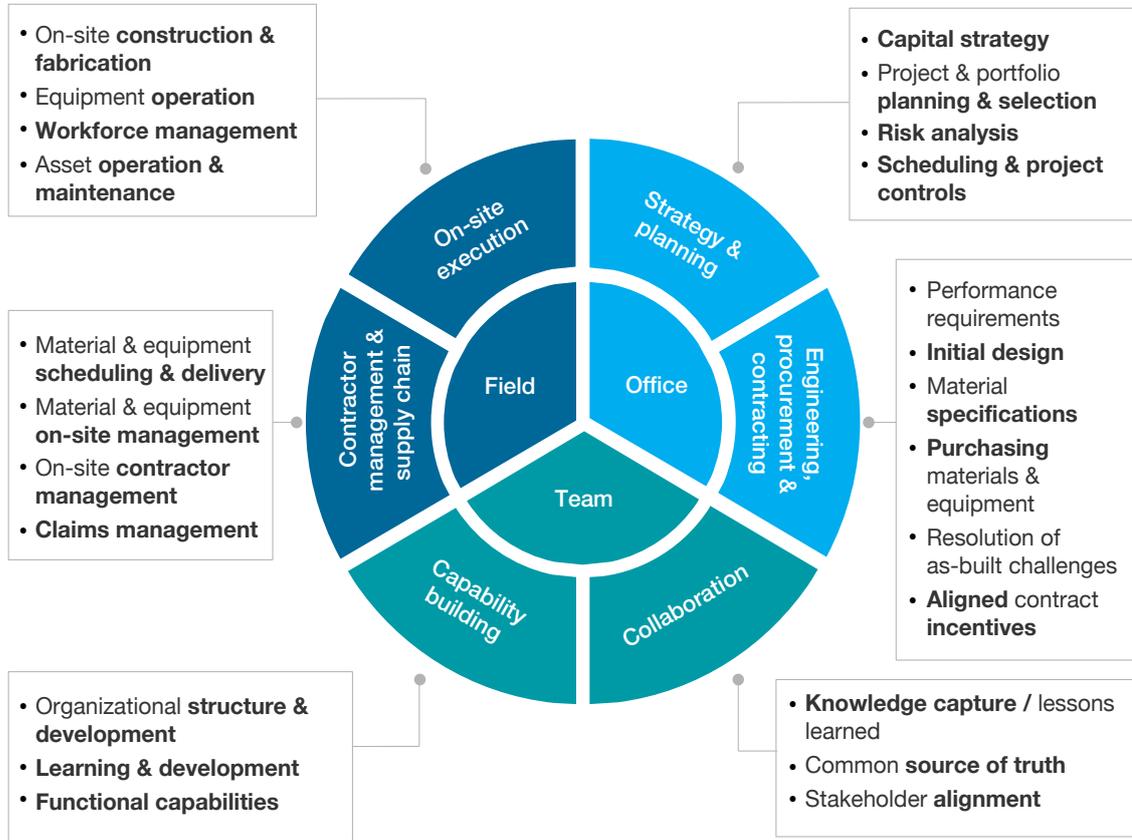
As leaders wade through the wealth of digital offerings at their disposal, they should first determine their most acute pain points, as well as the opportunities they would like to pursue. Managers should then classify tools on two levels (Exhibit 1):

- **Clusters.** Most digital tools fall into one of three clusters: on-site execution, back-office integration, or digital collaboration. As their names suggest, tools within on-site execution and back-office integration are used to add value in these settings, while collaboration tools can be used in any setting.
- **Tasks.** Within each cluster, companies should take the categorization a step further by classifying tools based on the specific improvements that they facilitate. Tools will again fall into major groups: within on-site execution, for example, most tools assist either with execution in the field or with tasks related to contractor management or supply-chain management.

Although owners and engineering and construction (E&C) companies face unique challenges that will influence tool selection, solutions in five areas can benefit virtually all organizations:

- **Digital-project controls and work-front management.** Delays and cost overruns often happen because stakeholders monitor performance based on different data sources, resulting in conflicting progress reports. A cloud control tower helps eliminate these issues by providing real-time information about critical activities in a central database that all employees can access.

Companies should adopt a two-level system for classifying digital tools.



- **Capital-portfolio management.** Software programs can assist with portfolio management by tracking expenditures, monitoring progress, and flagging potential issues that could raise costs or extend timelines. Some software programs also help with decision making, such as those that compare projected results for two potential portfolios.
- **Next generation 5-D building information modeling (BIM).** Contractor management is difficult because documentation and project data tend to be scattered across disparate sources. 5-D BIM—the combination of 3-D physical models of buildings with cost, design, and scheduling data—can improve execution. For instance, 5-D BIM reduced construction time by three to five months at an airport project by providing faster clash detection and better visualization of the proposed structure.
- **Advanced analytics.** Machine learning, data-ingestion engines, and innovative pattern recognition enable managers to rapidly sort through millions of data points. With this capability, companies gain greater insight into both performance drivers and risks. In some areas, advanced analytics may produce savings of up to 25 percent.

- **Next-generation surveying and prefabrication analysis.** Virtual-reality tools help users view and interact with designs and prototypes as if they have already been constructed. Similarly, advanced surveying tools help users understand as-built conditions and compare them with designs.

These five capabilities provide many benefits, but companies may not capture maximum cost reductions from digitization until they implement complex solutions that require greater digital skills, including those that rely on autonomous vehicles, automated construction processes, and 3-D printing.

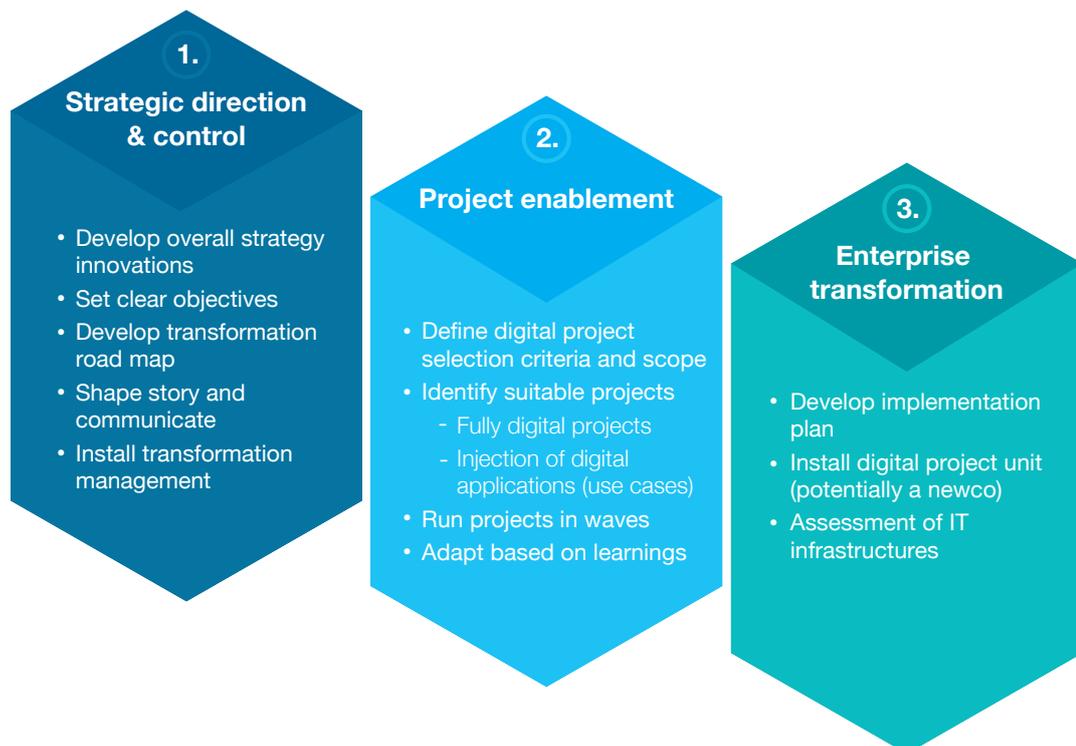
Three building blocks for digital leadership

Digital initiatives often fail because project leaders in the field are reluctant to implement new technologies, believing that they will increase costs and risks while conveying few benefits. To counter this perception, a company’s CEO and board members must take ownership of the digital transformation from the outset, focusing on three building blocks: strategy (linked to business value), project enablement, and enterprise transformation (Exhibit 2).

1. Strategic direction and control

CEOs and board members should create a comprehensive digital strategy, communicate it throughout the organization, and develop a transformation road map with tangible

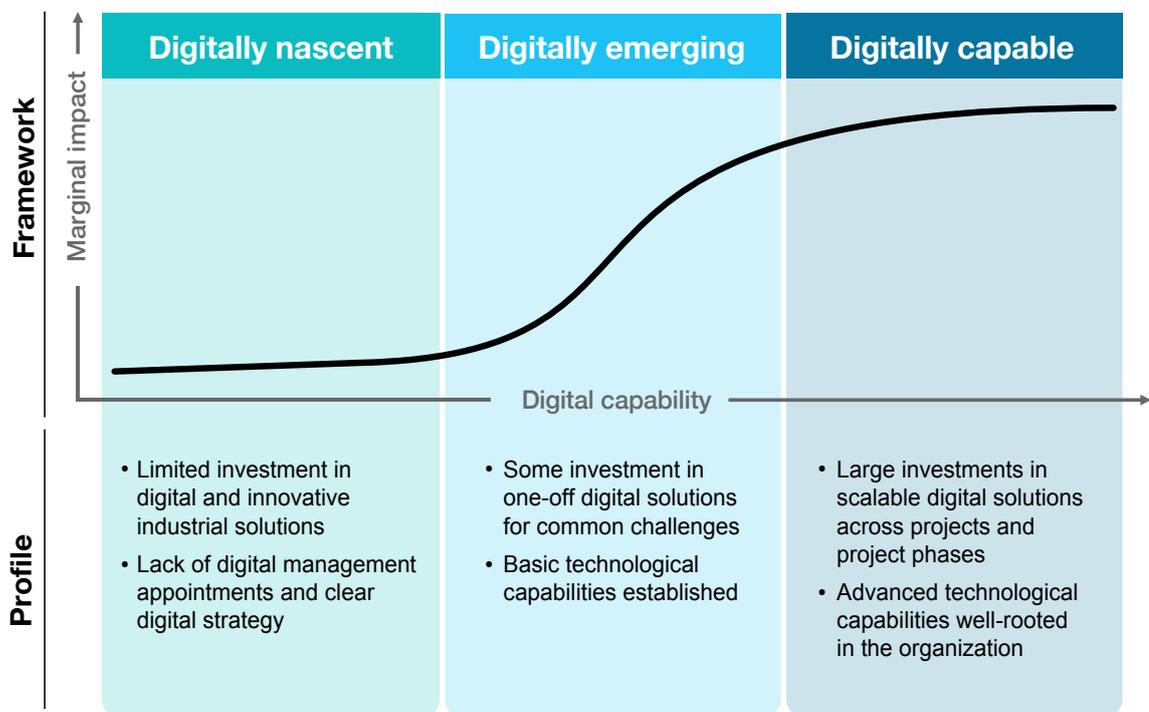
Exhibit 2 In a digital transformation, leaders should focus on three building blocks



objectives. They should also install a transformation management team that has decision-making authority and the full support of senior leadership.

When evaluating potential solutions, companies should prioritize investments that address their greatest needs. They must also realistically assess their company’s digital capabilities—an analysis that will prevent them from selecting tools that grab headlines but are too complex for their organization to implement. Generally, companies fall into one of three categories based on their investment levels and experience: digitally nascent, emerging, or capable (Exhibit 3).

Exhibit 3 Companies must understand their current digital capabilities to design a digital journey that will address their key challenges



A company’s digital maturity will help determine near-term priorities. For instance, a digitally nascent company might deploy basic tools that increase collaboration and transparency about a project’s progress, while a digitally mature company might focus on field tools that fundamentally change operations, such as on-site 3-D printing or autonomous vehicles.

2. Project enablement

To avoid overburdening staff or budgets during the early wave of a digital transformation, companies should focus on a limited number of projects. Managers should define and

manage the scope of each digital initiative, noting specific areas where it should generate improvement. After the first projects have launched, companies can embark on additional implementation waves that encompass more projects and generate greater impact.

3. Enterprise transformation

Comprehensive digital transformations—those that reach all business units and levels—are difficult to launch and maintain across project teams. To generate value without disrupting the core business, companies should consider establishing a “Newco,” a business unit with the specific skills and resources to facilitate digital change across multiple projects. Newcos—successfully used by the banking and finance industry to transition to digital—can ensure that agile and lean processes are in place to support new tools, and they can scale up innovative programs quickly. As other groups see the value that Newcos generate, they will be more likely to appreciate and accept digitization.

Strong management will be essential for any digital initiative, and companies may choose different approaches. Some may appoint a chief innovation officer to handle all initiatives, while others may delegate responsibility for different tasks to business-unit leaders.

Another crucial prelaunch step involves creating implementation plans that describe how the first few digital projects should proceed, with specific performance indicators and milestones. While developing these plans, companies should reassess their technology infrastructure and determine if it will support their desired goals.

Finally, companies must consider new pricing strategies. They may need to emphasize the benefits of digital solutions and innovative approaches to customers at the project-proposal stage. Without buy-in from all major stakeholders on the client side, it will be difficult to drive adoption.

Tips for maintaining momentum

To stay on track, capital-projects leaders should create new organizational structures and processes that promote innovation—either within a Newco or within the existing business. Leaders should assign responsibility for developing and coordinating execution of the digital strategy to specific groups or individuals. In tandem, they must shift performance-management and capability-building processes to place more emphasis on digital skills. Outside hires, such as chief technology officers or data scientists, may be essential to fill some talent gaps.

Many businesses will also need to revise their long-standing processes and timelines. For example, most companies complete the project planning phase relatively quickly, but they may now need more time to get cloud control towers and other tools up and running.



Digital tools are not a silver bullet for construction's productivity issues, but they represent the greatest improvement lever available. Companies that are slow to digitize, or that lack a well-structured transformation plan, could soon lose ground to bold leaders and fast movers who aggressively support digital programs. 

Read an extended version of this article on McKinsey.com: [*Navigating the digital future: The disruption of capital projects.*](#)

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