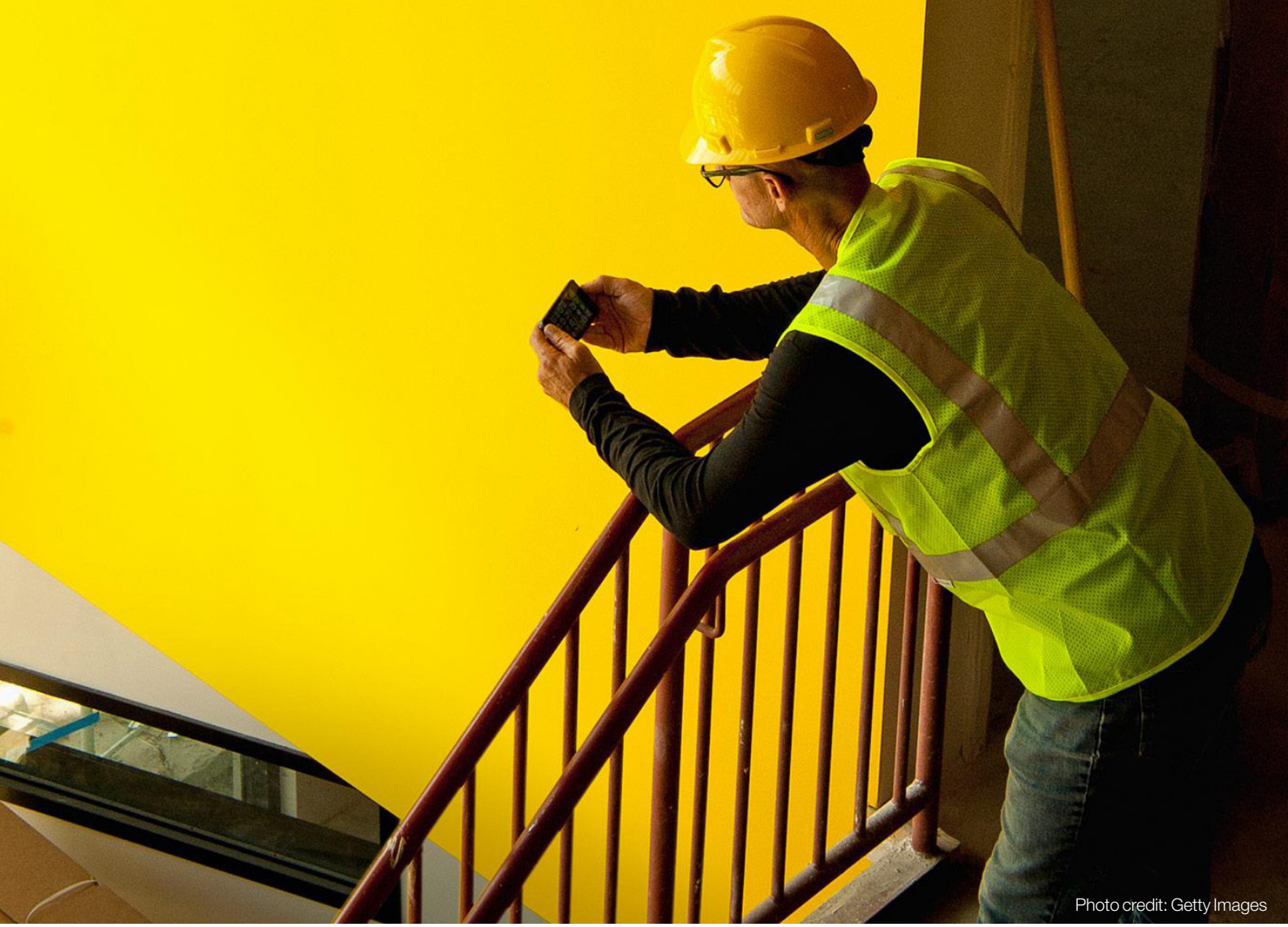

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Improving construction productivity

McKinsey research finds seven levers can fix construction's productivity problem, but they require a new approach from all players. We heard from industry leaders about which barriers to change are most likely to fall first.

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The McKinsey Global Institute (MGI's) *Reinventing Construction* report, released in February 2017, found that the construction industry has an intractable productivity problem. While sectors such as retail and manufacturing have reinvented themselves, construction seems stuck in a time warp. Global labor-productivity growth in construction has averaged only 1 percent a year over the past two decades, compared with growth of 2.8 percent for the total world economy and 3.6 percent in manufacturing.

The report confirmed many reasons for this persistently poor performance, including stringent regulations and dependence on public-sector demand, informality and sometimes corruption, industry fragmentation, and mismatches in risk allocations and rewards. In addition, project owners reported that it can be hard to navigate the opaque construction marketplace—particularly when they do not frequently manage major projects. This struggle often results in subpar project management and execution, inadequate design processes, and underinvestment in skills development, R&D, and innovation.

Since February, we have discussed the findings with diverse stakeholders around the globe—in roundtables, our recent Global Infrastructure Initiative Summit, and more—and we have heard from nearly all that change is both needed and possible. There's a sense that the industry is on the verge of disruption, and industry players are actively working on new approaches. How organizations are preparing to deal with the disruption varies greatly—though most recognize that failure to adapt could result in being left behind. To cope with disruptive pressures, some have taken incremental approaches to adopting best practices by establishing small, discrete programs. Others have created transformational agendas designed to work within the current confines of the industry. Still others are making significant strategic bets to radically restructure the value chain or establish manufacturing-like systems of mass production. It is unclear which approach will win in a given market segment—but understanding the challenge and the opportunity to address it is a crucial first step.

The construction sector has much to do

To disrupt its own way of thinking, working, and building, the construction industry can learn from successes in other industries, as well as from pockets of excellence within subsectors of the construction industry and around the world. Change is underway, but many approaches that have been discussed for years have yet to be adopted at the scale needed to transform the industry.

Abundant gains are at stake. MGI's research found that if construction productivity were to catch up with that of the total economy—and it can—the sector's value added would increase by an estimated $1.6 trillion, adding about 2 percent to the global economy. Such a gain is equivalent to about half of the world's annual infrastructure need.

We identified seven ways that innovators are successfully addressing current market failures and improving productivity. With widespread adoption of all seven, we estimate that the sector's productivity could increase by up to 60 percent.

1. *Reshape regulation and raise transparency.* Too often, regulatory complexities hinder productivity. At one roundtable, a participant noted, "Rules and regulations are the scar tissue for past transgressions. Just like scar tissue, they eventually limit what you can do." Indeed, nontechnical risks, including political risks related to regulation and transparency, are often cited as proximate root causes behind poor outcomes, even more so than technical factors. Both government agencies and industrial companies can ensure robust nontechnical risk management programs are in place to help proactively manage nontechnical risks on their projects. Governments can help reshape regulatory environments by streamlining permitting and approvals processes, reducing informality and corruption, and encouraging transparency on cost and performance. Many governments also allocate grants for innovation and training.

   As project owners, government agencies can also help encourage innovation and new approaches by prescribing means and methods of delivery or requiring use of certain technologies.

2. *Rewire the contractual framework.* Many in the industry shared case studies demonstrating that when interests are aligned and aimed at well-defined outcomes, projects are more likely to meet schedule and cost targets. To align interests, the industry must move away from the hostile contracting environment that characterizes many construction projects to a system focused on collaboration and problem solving. For example, procurement can be based on best value and past performance rather than cost alone, and contracts can incorporate performance and alignment incentives. To move toward best practice, alternative contracting models such as integrated project delivery (IPD) help build long-term collaborative relationships.

   The issue of trust came up in many forums, and it will take time to build the level of trust needed to collaborate and transparently share data in a way needed for proper incentive structures. Yet owners were keen to start incorporating some aspects of IPD into their traditional models to increase focus on making the best choices for a project, encouraging innovation, and reducing variability. Managing those contracts will also require changes in behavior, attitudes, and skills.

   Many owners, particularly in the industrial space, have adopted contracting frameworks that aim to transfer financial risk to contractors under transactional lump-sum contracting frameworks. At their worst, these structures often provide incentives for structural failure in the multistakeholder collaboration process. Companies would be better served by considering the full spectrum of options from purely transactional contracting to purely relational contracting. This deliberation will go a long way to ensuring a collaborative working approach is established at project inception.

3. *Rethink design and engineering processes.* There is a major opportunity to improve productivity by institutionalizing value engineering into the design process and pushing for repeatable design elements. Only 50 percent of MGI Construction Productivity Survey respondents said their firms currently have a standard design library. In asset classes such as deepwater oil and gas for which standardization might not be the

panacea, the opportunity for parameter specification rather than individual company specifications is significant.

Nearly everyone we spoke with agreed that change will only be achieved if owners and contractors alike can shift mind-sets from custom scopes for each project to more standardization and repeatability. Building up libraries of optimized designs can support this undertaking.

4. *Improve procurement and supply-chain management.* The construction sector ranks in the lower range of sophistication in McKinsey's Global Purchasing Excellence Survey, suggesting ample room for improvement. A combination of best practices seen in other industries and innovative, digitally enabled approaches can improve reliability and predictability. Digitizing procurement and supply-chain workflows will enable more sophisticated logistics management and just-in-time delivery.

   More strategically, owners, contractors, and material suppliers are also exploring ways to learn from industries such as automotive and aerospace when it comes to building longer-term supplier and subcontractor relationships.

   In industrial companies, final investment decision (FID) is often a misnomer, as the decision tends to be a foregone conclusion given the incremental financial commitment that has already been made to procure long-lead-time stocks pre-FID. Supplier development programs that aim to reduce lead time through the application of lean supply techniques can help restore the integrity of FID and help owners avoid obsolescence issues.

5. *Improve on-site execution.* In our discussions, stakeholders voiced several challenges with on-site execution, including inconsistent use of best practices across all sites, projects, and staff, as well as difficulty finding and developing talented project managers. In addition, many struggled to identify and use hard data to baseline project (and project managers') performance rather than anecdotes about the difficulty of a project.

   To truly transform on-site execution, owners must implement change across all three aspects of a project: management systems, technical systems, and mind-sets. Four key approaches, though well known in the industry, have not been universally adopted. First, a rigorous planning process can help ensure activities are achieved on time and on budget. The use of integrated planning tools on a large-scale oil and gas project, for instance, achieved a 70 percent increase in the project's productivity. Second, companies should agree on key performance indicators (KPIs) and use them at regular performance meetings. It is critical to complement common KPIs with forward-looking metrics to identify, and subsequently reduce, variance. Third, project owners can improve project mobilization by ensuring all prework, such as approvals, is completed prior to starting on-site work. Fourth, careful planning and coordination of different disciplines on-site, along with the application of lean principles, can reduce waste and variability.

6. *Infuse digital technology, new materials, and advanced automation.* Construction lags significantly behind other sectors in its use of digital tools and is slow to adopt new materials, methods, and technology. Significant advances being deployed or prototyped today can transform the effectiveness and efficiency of construction in three areas: digital technologies, advanced materials, and construction automation. Digital technologies—from 5-D building information modeling to advanced analytics—have spread rapidly. Our survey revealed that more than 44 percent of respondents have adopted some type of digital technology, and planned adoption within the next three years is expected to reach 70 percent.

   In our discussions, stakeholders voiced several challenges in deriving more value from digital tools, such as maintaining accuracy in transitioning to virtual models: Today, frequently, there is no consistent "digital-twin" of a structure, but rather digital models are being printed for use with suppliers, who make changes and optimizations without feeding them back to the models, and there are substantial differences between as-built and plans that make optimizations in supply chains, work processes, and lifecycle management difficult to capture.

Read the biggest ideas that emerged from our roundtable discussions in Houston, London, Los Angeles, and Washington, DC.

   Given constrained R&D funds, industry players are using pilot programs to test innovations while minimizing risk. In a few leading cases, owners and contractors are pooling resources to overcome capital constraints. The Crossrail Innovate portal, where owners and contractors share ideas, is one example of effective cross-industry innovation.

   Technology alone will not address poor productivity. We heard nearly universally that a fundamental culture change is needed alongside adequate systems, processes, and buy-in from the field to embrace these solutions.

7. *Reskill the workforce.* Change cannot be achieved without investment in retooling a workforce that is undergoing major demographic shifts, from aging managers to increasing numbers of migrant laborers. Apprenticeship programs can train frontline workers in core skills that are currently underdeveloped and new technologies to help increase workforce stability by breaking seasonality and cyclicality.

   Collaboration is key; funders, educators, and public officials who run workforce-training programs should collaborate with contractors and trades to ensure skills programs match the industry's needs. Megaprojects should be seen as long-term catalysts to work with local workforce boards or nonprofits and develop regional training programs.

Beyond these seven ideas, parts of the industry could make a more radical change by moving toward a manufacturing-inspired mass-production system, in which the bulk of a construction

project is built from prefabricated standardized components off-site in a factory. Such a system would negate most of the market failures that are currently holding back productivity; the experience of firms that are shifting in this direction suggests that a productivity boost of five to ten times is possible.

While stakeholders have mixed views on the experience of precast building parts from the 1950s and 1960s in terms of cost and building quality, many are building up new capabilities today based on different, lighter-weight materials that are easier to ship and integrating more complex sustainability aspects into prefabricated components such as solar technology, rainwater harvesting, and high-quality building insulation.

The time to act is now

The pressure to act is rising. Demand is soaring. The scale of players and projects is increasing, making a more productive system more viable. The price of productivity-enhancing technology is falling, making it more accessible. There is increasing transparency in the market, and disruptive entrants are bringing a new wave of competition and increasing the urgency of digitization.

After decades of stasis, the industry appears to recognize the pressures bearing down on it, and these forces are motivating owners and contractors to change. As pioneering organizations transform, they will create best practices that can be emulated across the industry. Players that don't rethink their approaches may be left behind in what could be the world's next great productivity story.

We intend to continue to collect case studies and best practices from across the globe, and we hope to share them with the Global Infrastructure Initiative community. Please click here to share yours with us.