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THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA
Quality People. Quality Projects.



MANAGING RISK

IN THE DIGITAL AGE



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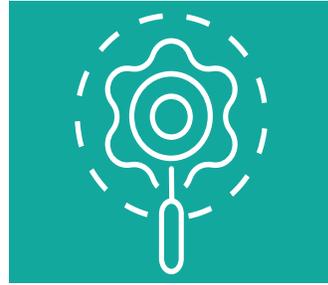
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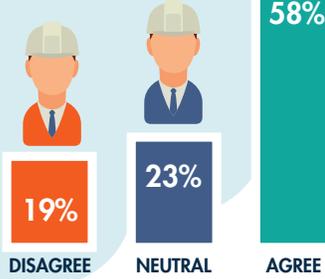
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Appendix

Key Statistics Around Innovation

58% of respondents expect to see more change in the built environment within the next five years than there has been in the last 50 years.¹



Top-three market sectors expected to be disrupted in the next five years.²



Technological Challenges



UNCLEAR NEEDS



BUYER CONFUSION



POOR IMPLEMENTATION



LACK OF SYSTEM INTEROPERABILITY

Six Steps to Manage Change



UNDERSTAND RESISTANCE



UNDERSTAND LOSS



ACT WITH INTENTIONALITY AROUND CHANGE



COMMUNICATE REASONS FOR CHANGE



FRAME THE CHANGE



BUILD A CHANGE MINDSET

¹ 2018 AGC/FMI Risk Management Study

² Ibid.



Owners and leaders of E&C firms must not mistake a healthy, robust market as an excuse to practice business as usual. Instead, pay attention to the fundamental transformations and irreversible trends that are currently impacting the industry, look carefully at how you're operating today, and then come up with ways to become more proactive about transforming your company to become even more competitive and agile in today's new and changing marketplace.

**Chris Daum, CEO
FMI Corporation**

Executive Summary

After emerging from the Great Recession and spending several years in “rebuilding” mode, the engineering and construction (E&C) industry has become one of the best-performing sectors in the U.S. economy. With plenty of business opportunities, large backlogs and a dwindling workforce, the industry is now facing a complex mix of challenges and opportunities.

Throughout North America, the demand for all types of infrastructure investment is both strong and pervasive. Broadly speaking and looking across the breadth of the built environment as a whole, and based on industry backlogs that are (on average) booked through the remainder of 2018, the next six to 12 months should be as good as—or even better than—2017.

“I think CEOs are generally positive and upbeat about growth right now, but there’s also an undercurrent about when the cycle might correct itself since this run has lasted so long,” says Scott Winstead, president of FMI’s management consulting group. “The 2009 downturn still rings very loudly in executives’ minds, so they’re looking at how to proactively address business challenges while the market is still strong.”

It is within this current environment that AGC’s Surety Bonding and Risk Management Forum—in collaboration with FMI—surveyed contractors’ perceptions of risk and opinions on how the U.S. E&C industry will change in the coming years. Specifically, what industry sectors and trades are most likely to undergo fundamental disruption; how businesses are innovating today and the top risks they face; and ultimately, how these industry trends will impact E&C risk management in the future.

Our study sheds light on big-picture industry trends and reveals the following four key findings:

- **The people factor remains one of the biggest risks** for E&C firms in today’s business environment.
- Industry stakeholders expect to see **more change in the built environment within the next five years than there has been in the last 50 years.**
- Most **survey respondents are innovating “around the edges”** and adopting technology in a piecemeal fashion (or not at all) **but not fundamentally transforming their business approaches.**
- For years, contractors have tackled risk by purchasing insurance programs and managing claims. **Today that is no longer enough.**

The E&C industry can’t just ignore technology trends and continue to do business as usual. For example, more than \$500 million in new, private capital will be designated to investment funds that back startup firms focused on innovative construction technology or service solutions. This infusion will help address our industry’s productivity and risk challenges. This is just one sign of the times and an indicator of how both new and established companies will have to embrace new business models that help them become more productive, efficient, innovative and creative in their approach to designing, manufacturing and building projects.

As we dig deeper into the study findings—and as the industry continues to evolve—AGC’s Surety Bonding and Risk Management Forum and FMI will keep you abreast of progress, while supporting the development of successful strategies and business models for today’s fast-changing and dynamic business environment.



Change is the law of life. And those who look only to the past or present are certain to miss the future.

John F. Kennedy

Key Findings

This year's study provides new insights into contractors' perceptions of and opinions on the U.S. E&C industry and how it will change in the coming years. These include insights into the industry sectors and trades most likely to undergo fundamental disruption, how businesses are innovating today, the top risks they face, and, ultimately, how these industry trends will impact E&C risk management in the future.

The study also identifies big-picture risk issues that will require further investigation over time and sets a baseline for the industry transformation that we are witnessing today. All information is based on more than 100 responses from best-in-class companies that are active in AGC's Surety Bonding and Construction Risk Management Forum. The data was collected at the end of 2017.

Key findings are grouped into the following four main themes:

- 1) Where We Are Today**
- 2) Unease About the Future**
- 3) The Struggle to Adapt**
- 4) Rethinking Risk Management**



Today's digital era demands an integrated approach to create and manage parametric processes (economics, planning, design and engineering) that directly feed and, in fact, physically control outputs (fabrication and construction). In other words, cross-disciplinary thinking is an emerging prerequisite to success.

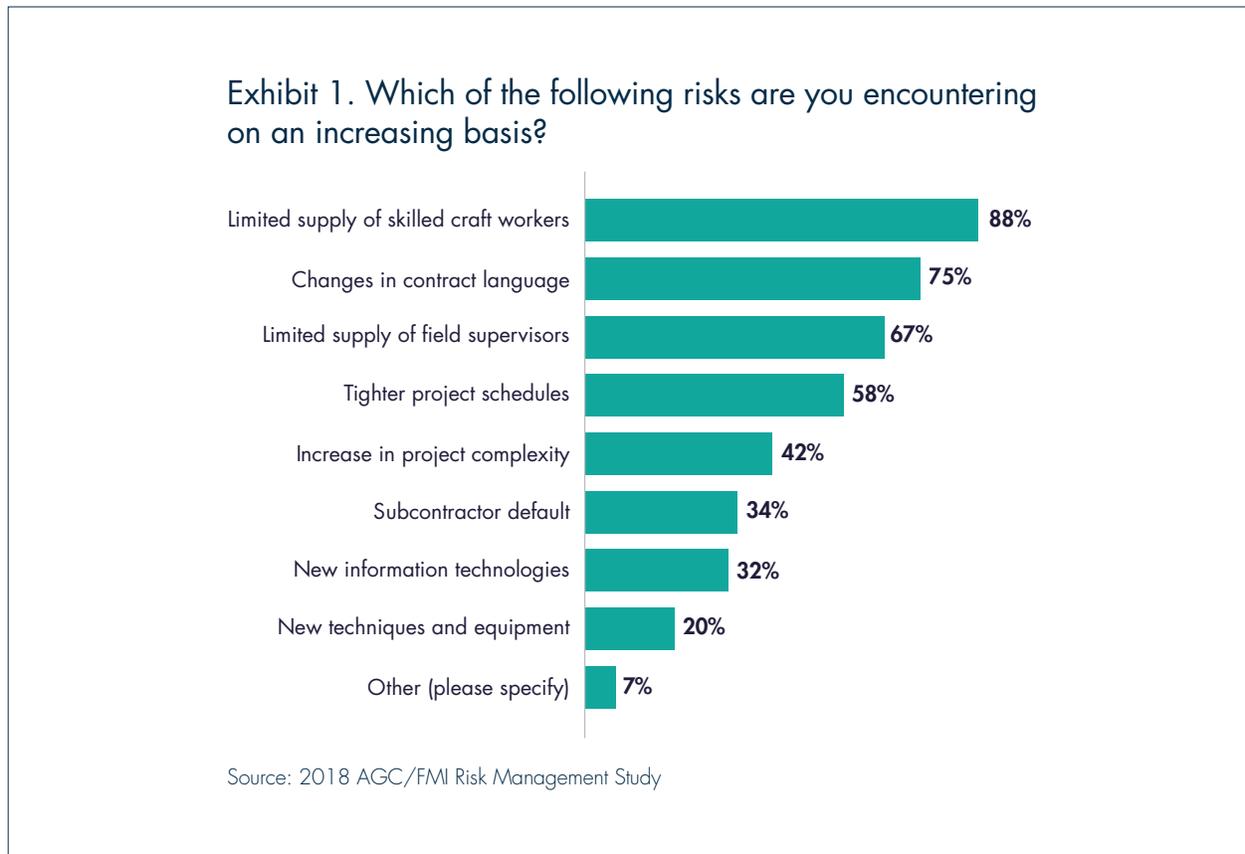
Anthony Fieldman
Sr. Vice President | Design Director
HOK Canada



Finding 1. Where We Are Today

The people factor remains one of the biggest risks for E&C firms in today's business environment.

It's no surprise that the limited supply of skilled workers remains one of the biggest challenges that companies face in today's E&C environment. According to our survey, **88% of respondents encounter risks related to the lack of skilled craft workers**, and **67% of respondents face risks associated with the limited number of available field supervisors** (Exhibit 1).



FMI's recent [talent development survey](#) confirms this trend and shows that 89% of construction firms face talent shortages across a broad range of industry sectors (82% of those firms expect greater difficulties recruiting qualified workers this year).

Although the E&C industry has been plagued by skilled labor shortages for decades, today's situation is different. With baby boomers retiring at a rate of 10,000 per day and fewer workers entering the industry, firms must do business in new ways and with less manpower. This situation is not expected to change anytime soon. In fact, [FMI's research](#) reveals that **construction firms expect to lose anywhere from 14% to 20% of certain employee groups, including executives, senior managers, field managers and project managers, over the next five years**. This represents a major loss of industry experience and knowledge that will increase E&C firms' risk profiles dramatically in the coming years.

Given that the talent shortage in the E&C industry is likely to worsen, firms are finding new ways to automate labor-intensive tasks and generally to increase productivity, reduce costs, reduce risk and accelerate project schedules. According to recent forecasts, approximately 50% of the current positions in the construction sector could be automated in the coming years.¹ With disruptive business model changes expected to have a profound impact on the employment landscape over the coming years, the push toward using more automation and assistive technologies (e.g., exoskeletons) could quite possibly be the one light at the end of every E&C firm's tunnel right now (see "Automation and Robotics: Rethinking Engineering and Construction Jobs" for more details).

The bottom line is that technology is evolving at an exponential rate and **industry innovators are learning and adopting new systems and processes for more effectively integrating design and construction.** While design and construction functions are becoming increasingly complex and require ever-more specialization, the disciplines' segregated silos are crumbling, creating space for integrated, cross-disciplinary thinking. Virtual design and construction now allow project teams to build a structure twice—once virtually and once physically. **Design activities have been horizontally integrated across disciplines, while construction activities are integrated vertically through distinct supply chain stages.** The demonstrated results include cost and time savings, enhanced project quality and improved project safety.

With the average general contractor earning a net profit margin of 1.46%,² the push is on to increase productivity and lower risk wherever possible. Integrating design and construction functions is an obvious way to achieve these goals.

Furthermore, our risk survey revealed that construction firms have been receiving less complete design documents than in the past, with **92% of survey respondents reporting incomplete design documents** (Exhibit 2).

¹ "Efficiency Eludes The Construction Industry." The Economist Group Limited. 2017.

² FMI Insights: RMA data.



Exhibit 2. Have the design documents provided to your firm been less complete than in the past?

Source: 2018 AGC/FMI Risk Management Study



In light of these trends, **nearly 40% of survey respondents reported plans to bring design work in-house, and of those, over 80% have already completed this process or plan to have full in-house capabilities within the next three years.** While we don't know how much of this trend is being driven by new business models, one thing is clear: Contractors want to reduce their risks by controlling and influencing design in-house. As such, construction risk managers and general counsels must educate themselves around new contract language and legal terms and take a more systematic approach to the entire range of risks that they face—whether those risks are insurable or not (see [“Managing and Mitigating Risk in Today’s Construction Environment”](#) for more details).

In the coming years, we expect to see design firms growing their service portfolio to include construction and, likewise, construction firms expanding their own capabilities on the design side.

As one study participant pointed out, “I think the best energy should be spent on improving relationships among designers, builders, subcontractors and customers to get a deeper understanding of how our businesses work and to get more alignment around what our objectives are. Both builders and designers maintain the customers’ interests as their highest goal. But over the years, a certain confrontational approach has evolved in our business that, to a large extent, has been exacerbated by the legal community. And I think that focusing on relationships, understanding each other better, and being supportive of mutual success among entire project teams is the right way to go. And finally, we need to set up the business deals to support everyone’s collective interests rather than writing language to defend ourselves against each other.”

Assessing Your Exposure to Design Risks

Here are three ways to help mitigate risks associated with design:

1. Keep your contract as specific as possible. GCs need to ensure that their long-term customer contracts clearly define the professional responsibilities and liabilities they intend to assume, while avoiding vague language that might be interpreted as shifting design responsibilities to them.
2. Make sure you have a broad insurance coverage. GCs need insurance coverage that’s expansive enough to pick up any professional design exposures that they accept as well as those exposures that may be imposed upon them—but not so broad as to encourage things that are appropriately addressed by other policies.
3. Don’t ignore what’s not your contractual responsibility. In today’s increasingly collaborative environment, GCs must recognize that whether or not they have contractual responsibility for a design error, allegations can be made asserting construction defects or adequacy for intended use.

For more details, see [“Assessing Your Exposure to Design Risks in an Evolving Marketplace.”](#)



The risk in remaining solely focused on the short term is that the industry will likely look and operate very differently in 10 years than it does today. Firms that choose to ignore external trends—and then adapt their business models and approaches accordingly—may find themselves on the outside looking in.

**Scott Winstead, President of
Management Consulting at FMI**



Finding 2. Unease About the Future

Industry stakeholders expect to see more change in the built environment within the next five years than there has been in the last 50 years.

Steve Jobs introduced the iPhone on January 9, 2007, at the Macworld convention. Within five years, the product was responsible for more revenue than Microsoft as a company.³ Amazon has taken the world by storm in a lightning-flash, 24-year period, disrupting multiple industries, most notably brick-and-mortar retail. Now compare that with your company's tenure in the industry and your long-term strategic plan. When we think of industry disruption, these are the types of data points that come to mind.

In truth, the future will be far more nuanced. Disruption is more of a hurricane than a tornado—destructive but offering sufficient time to respond if industry participants set 10- to 20-year visions and respond to market conditions. Disruption can happen quickly, but rarely faster than a traditional planning cycle of three to five years. Unfortunately, incumbents often fail to identify or respond to disruptive forces fast enough to stave off potential value destruction. Most often, intentional planning versus “opportunistic operating” stands to drive success in the long run.

Prospects for Disruption in the E&C Industry

Recently, the construction industry has faced deserved scrutiny of its productivity problem. A variety of sources have pointed out that the industry has seen no meaningful gains in labor productivity over the past several decades as compared to other industries. But the scrutiny comes just as interest in technology and the innovation needed to solve industry challenges is peaking, in terms of venture capital funding and the number and variety of startups focused on this market.

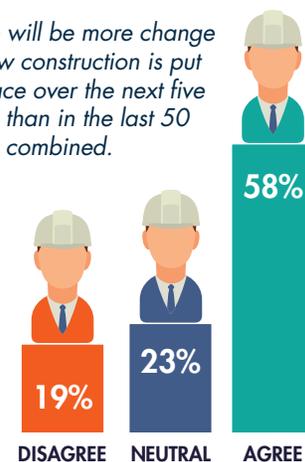
Regardless of its productivity track record, the industry has a value chain problem. In FMI's work with stakeholders from across the built environment value chain, construction is far too likely to create bad experiences for a variety of stakeholders to be insulated from disruption.

This overall sentiment of “unease” or “looming change” was also confirmed in our risk study, in which **two-thirds of respondents expected to see more change in the built environment within the next five years versus the last 50 years (Exhibit 3)**. This suggests that we are on the cusp of a transformational era that will bring both challenges and opportunities for stakeholders across the board.

As one industry stakeholder explained, “I've been in construction for almost 25 years. I've never seen the industry adopt new things very fast, but now it's finally happening. People are not very trusting

Exhibit 3. How strongly do you agree or disagree with the following statement?

There will be more change in how construction is put in place over the next five years than in the last 50 years combined.



Source: 2018 AGC/FMI Risk Management Study

³ Naughton, John. “Microsoft Once Ruled the World. So What Went Wrong?” The Guardian, Guardian News and Media, 18 Aug. 2012. www.theguardian.com/technology/2012/aug/19/microsoft-ruled-world-what-happened.

in the construction industry, and I understand why, because the liability is so great. But once project partners or owners realize that you're serious, and you have their best interest as well as your own, then they will get more trusting and will join the party. **But the level of change we're seeing is not going to slow down; it's only going to accelerate.**"

There will be more change in how construction is put in place over the next five years than in the last 50 years combined. Despite the consistently flat line of productivity that has extended for over 60 years, there are a few select but encouraging signs that the industry is finally turning a page. One can find great companies that are "built to last," and a hard look at the E&C industry reveals several firms that are already transforming the traditional E&C business models. These firms are learning and adopting new technologies, processes, systems and techniques to work smarter, faster and safer while innovating and testing forward-thinking technologies.

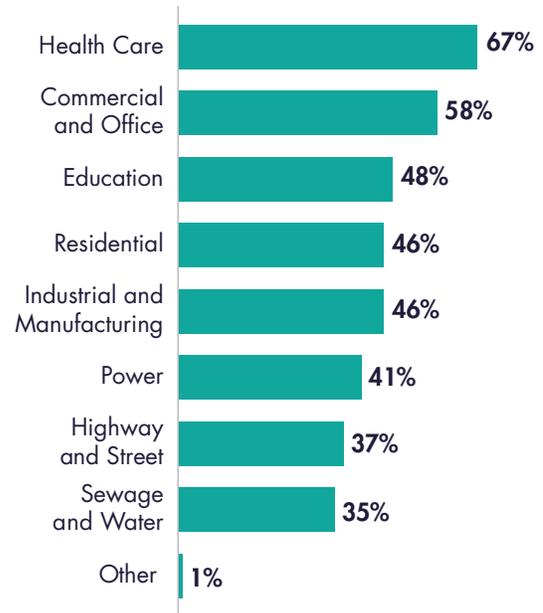
This industry transformation is already occurring across various market sectors and geographies. **According to survey participants, health care, commercial/office and education are expected to experience the most disruption over the next five years (Exhibit 4).** It is no coincidence that many E&C firms specializing in these sectors are already heavily involved in innovative offsite construction techniques, pushing the industry toward a new era of "constructuring."

Ian Howell, executive in residence at Borealis Ventures, a designX mentor at MIT and principal consultant for Built Environment Strategies, explains, "Constructuring is how the international space station was built. High-quality precision components were manufactured in factories and pre-assembled as modules, ready for transport that locked into place when they arrived at their final destination to create an entirely functional and sustainable building."⁴

To build its new Sutter Van Ness Medical Office Building, for instance, Sutter Health is manufacturing and assembling seven of the building's nine floors (equaling approximately 158,000 square feet of space) entirely off DIRT, a proprietary 3-D software used to design, manufacture and install fully customized, prefabricated interiors. "Part of the reason we chose to go with DIRT is we believe its approach can collapse our schedule by three to four months on the job site," Michael Shanahan, a Sutter Health senior project manager stated in a [company press release](#). "That alone means approximately half a million dollars in savings."

According to survey respondents, the areas of disruption will include or involve concrete, curtain walls (envelope and glazing), electrical work, steel erection, and mechanical and structural engineering (see Appendix). However, other

Exhibit 4. Which of the following construction segments will be subject to disruption over the next five years?



Source: 2018 AGC/FMI Risk Management Study

⁴ "Constructuring: An Unstoppable Trend." Ian Howell. Borealis Ventures. May 15, 2018.

areas, such as paving, site work and painting, are not expected to experience much change over the next five years. Chris Giattina, CEO at [BLOX](#), explains, “We think that we’re doing a service by rebuilding everything from scratch for each project. And I think we need a fundamental mind shift and need to start by first understanding what the program is (e.g., Marriott’s worldwide hotel program). Once we understand the program, we need to learn and detect how to remove unnecessary variation. And finally, once unnecessary variation is removed from the program, we can begin to standardize. Then we can create interchangeable parts, which allows us to build a supply chain that can work at many different levels efficiently. Only at that point can we begin to move the productivity needle.”

In short, a radical change in the way we create our built environment is required. New market entrants like [Katerra](#) are already introducing such change. Katerra’s business model is to run a construction company the same way Toyota would operate a factory—fully integrated from architectural design through fabrication and installation. This allows the company to offer services faster, cheaper and safer than a traditional E&C competitor.

While it is still too soon to declare Katerra a successful industry disruptor, it does prove the case that disruption is possible in our industry. Katerra was founded in 2015 and booked \$1.3 billion in sales in 2017. While currently operating at a loss, it recently secured \$865 million in funding to invest in R&D and new factories and expects to become profitable as soon as 2019.

From a risk management perspective, Katerra’s business model is a game changer. While it is unlikely that everyone will move to such a fully integrated business model, **increased collaboration among the parties to a project—from the onset—seems destined to become the fundamental strategy for reducing risk in the future.**

In one of Dodge Data&Analytics’ latest “[SmartMarket Reports](#)” on managing risk in the construction industry, authors report:⁵

- Nearly all (91%) agree that collaboration reduces risk.
- The most effective risk evaluation strategy (formal brainstorming with team) and most effective risk mitigation strategy (regular meetings with the full project team) help enhance collaboration.
- Two top obstacles involve the lack of communication and information flow across the project team.
- One of the top triggers for increasing use of risk management practices is the use of delivery systems/contracting methods that encourage project team integration.
- The current approach to apportioning risks in construction contracts to specific parties discourages collaborative behavior. Shared risk and reward contracts may be a way to address this issue.

The last point about contracts underscores how effective risk mitigation begins at the start, in the way projects are set up, both contractually and from a project execution/delivery strategy. With progressive E&C firms moving toward a structuring and more collaborative and integrated framework, risk management is expected to change significantly in the coming years.

⁵ “Managing Risk in the Construction Industry.” SmartMarket Report. Dodge Data&Analytics. 2017.



It is not the strongest or the most intelligent who will survive, but those who can best manage change.

Charles Darwin



Finding 3. The Struggle to Adapt

Most survey respondents are innovating “around the edges” and adopting technology in a piecemeal fashion (or not at all) but not fundamentally transforming their business approaches.

Our survey indicates that industry stakeholders are innovating across all construction phases, except post-completion. Furthermore, those firms that expect great change in the coming years are over six times more likely to innovate than those that don't feel great change is imminent.

David Boivin, president and CEO of Sto Corp., confirmed, “We've added robotics in our factories to eliminate manual material handling wherever possible to mix, fill, package, stack, store and ship items. We fully expect to see self-driving trucks available in the future to resolve the driver shortages we currently face. We've seen robotic brick masons and masonry placers. In the prefabrication world, we see robotic welders and screw machines, CNC cutting and folding as well as robotic sprayers and loaders. The list is just endless, and it keeps going.”

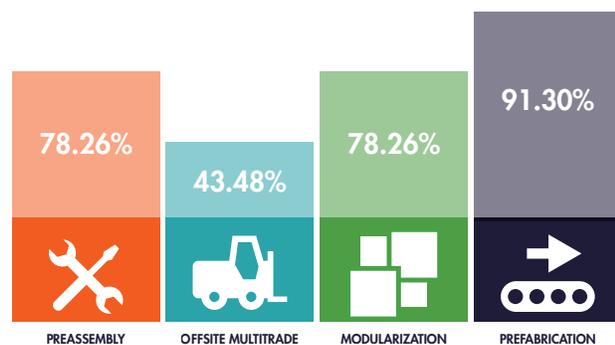
While FMI recognizes that the North American E&C industry is becoming more sophisticated and company leaders are driving innovation across their organizations, **most firms are still lagging significantly when it comes to the “digitization” of E&C.** For example, the financial and insurance sectors are digitizing at a far greater rate than E&C companies, and these sectors are adapting to the changing risk environment of disruption while others continue to do “business as usual” or innovate “around the edges.”

The limited adoption of BIM for no more than clash detection and a relatively small amount of multitrade prefabrication on projects (see [FMI's recent offsite construction study](#)) are just a few indicators that firms are still slow to adapt to the rapidly changing business landscape (Exhibit 5).

This is mainly because many E&C firms lack the necessary financial resources and know-how to “digitize” appropriately and, as such, continue to funnel only a small fraction of their overhead dollars into innovation and technology. This was confirmed in a recent [JB Knowledge construction technology report](#), in which the authors reported the following staggering statistics:

- 46% of respondents have an IT budget of less than 1% of annual sales volume.
- Almost 13% of respondents don't know the percentage spent on IT.
- Only 50% of survey respondents have a dedicated IT department.

Exhibit 5. Offsite construction method breakdown (for owner organizations)



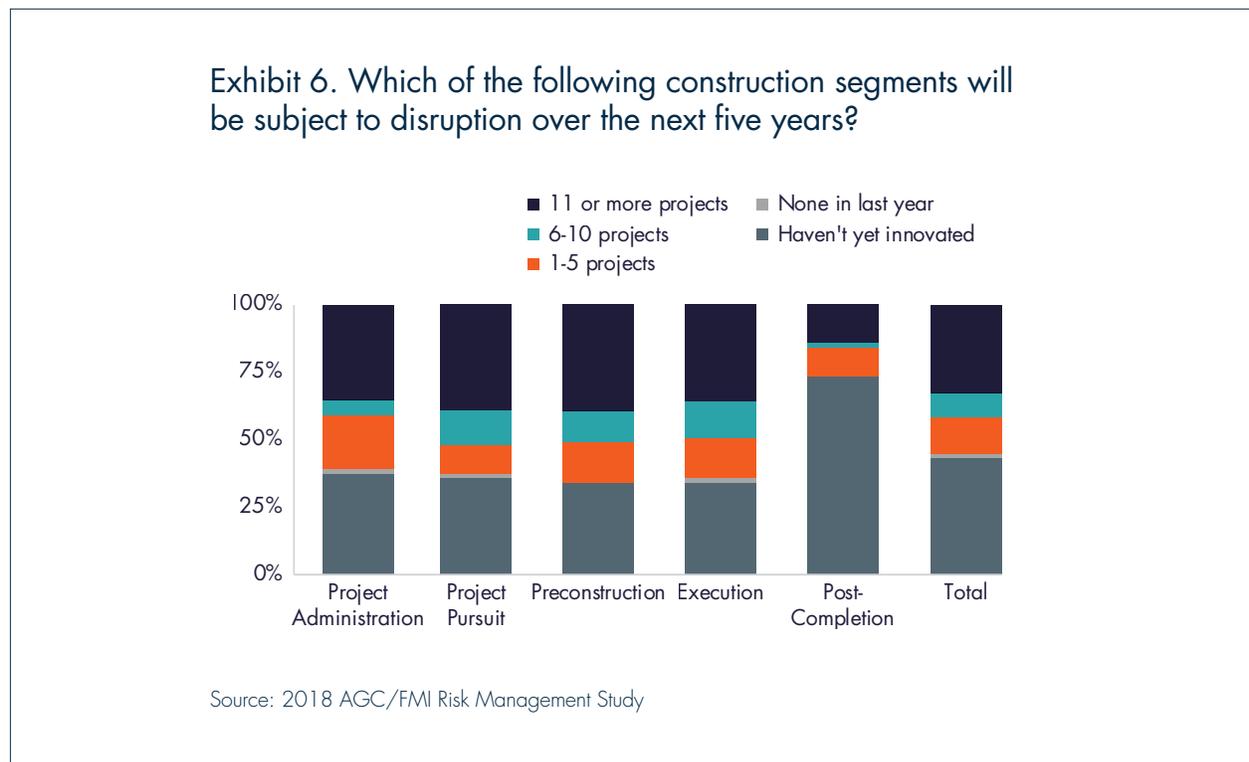
Source: 2018 FMI/CURT/CII Offsite Construction Owner Survey

In another [industry study](#) that captured feedback from more than 200 senior construction executives, the authors wrote that, “Just 8% of the companies rank as ‘cutting-edge technology visionaries,’ while 64% of contractors and 73% of project owners rank as ‘industry followers’ or ‘behind the curve,’ when it comes to technology.”⁶

“The survey responses reflect the industry’s innate conservatism toward technologies, with most businesses content to follow, rather than lead,” said Richard Threlfall, UK head of infrastructure, building and construction at KPMG. “Many lack a clear technology strategy and either adopt it in a piecemeal fashion, or not at all.”⁷

The study also indicated that “Two-thirds of survey respondents believe project risks are increasing, yet less than 20% of respondents say they are aggressively disrupting their business models.” Threlfall added, “Projects around the world are becoming bigger, bolder and more complex, and with complexity comes risk. Innovations like remote monitoring, automation and visualization have enormous potential to speed up project delivery, reduce costs and improve safety.”⁸

Our risk study also reflects some of these broader industry trends. Asked what types of innovations were being implemented in their current operations, survey respondents discussed areas of the business that are being modernized or digitized but did not suggest that their businesses were being fundamentally transformed or disrupted. For example, going paperless, transitioning to virtual design and construction (VDC), standardizing processes, using tablets in the field and dabbling in prefabrication methods were some of the items listed. However, very few respondents reported truly transforming or reinventing their business models.



⁶ “Building a Technology Advantage.” Global Construction Survey 2016. KPMG International. 2016.

⁷ Ibid.

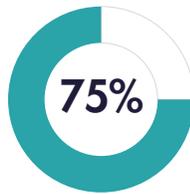
⁸ “Construction companies struggling to employ new technologies.” KPMG press release. September 2016.

Exhibit 7

Of the respondents who do not perceive change ...



... **DO NOT** innovate



HAVE innovated six times or more

Source: 2018 AGC/FMI Risk Management Study

Among respondents who expect disruptive change in the next five years, 75% have innovated six or more times in at least one construction phase. However, among those who do not foresee major changes in the next five years, 16% have failed to innovate even once in any construction phase.

Fortunately, there are ways to strategically leverage technology to drive true innovation and transformation. However, this isn't just about throwing any device or software program at the problem. In fact, thoughtlessly doing so only adds even more complexity, confusion and delays to strategically transforming your firm. For example, there is a high direct cost of implementing software platforms and devices that don't live up to expectations and that, in turn, must be "switched out" and replaced. This typically results in poor user adoption due to technology or change management fatigue (see "[Simplifying E&C Projects: Technology as an Enabling Solution](#)" for more details).

Jay Snyder, FMI's technology practice leader, adds, "By taking a proactive approach that includes planning, maximizing current resources and fully leveraging technology, E&C firms can effectively address the various levels of complexity within their projects while assuring quality and timely project delivery. Equally important is the need to fully understand these complexities and to apply a well-thought-out technology strategy that improves your company's long-term performance."

By following a specific process, E&C firms can turn technology into an enabling solution. This approach is both valuable and necessary and should include some or all of these steps:

1. Refer to your company's existing technology strategy to ensure that the initiative aligns with it. If you don't have one, develop one.
2. Develop a business use case for the technology (i.e., the business "need"), focusing on the details of the problem you are addressing.
3. Review the technology strategy to revalidate that it supports the firm's overall business strategy. If it doesn't, reconsider the business need before moving forward.
4. Determine the magnitude of the problem and define the scale that the solution must handle.
5. Evaluate the company's culture and how employees will respond to technology as part of the solution.

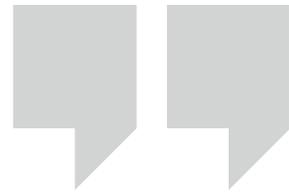
6. Assess the company's and employees' level of technology and/or innovation fatigue. For example, has the amount of change (and/or new technology or innovation initiatives) been overwhelming to the organization? Does the company have an appropriate change management process when introducing new technology tools into its business processes?
7. Consider how a new technology impacts, integrates or enhances the company's current technology stack. For instance, does the existing technology stack require the technology solution to meet certain systems criteria, interoperability or architecture?
8. Map your software selection due diligence process by asking yourself questions like:
 - What planning document templates, such as a requirements traceability matrix, will we use throughout this process?
 - How will we identify the business use case and translate that into functional and technical requirements?
 - How will the project be awarded?
 - How will we determine our list of possible tech providers for this need?
 - What additional technology implementation, change management, training, customization and follow-on support services will we need, and to what degree will we need them?
9. Consider the benefits of a technology that is compatible with your company's industry partners and clients.
10. Develop and manage the implementation/change management process to include implementation, application programming interface (API) integration, user training and phased adoption.

Exhibit 8. Technology examples that simplify project complexity and help mitigate risk

	VDC/AR	Drone Tech	On-site Automation/ Robotics	Offsite Construction	Productivity Tracking	PM Collaboration Platforms
Arch/Structural Design	✗		✗	✗		✗
Advanced Build Systems	✗			✗	✗	✗
Regulation and Social Compliance	✗	✗	✗	✗		✗
Project Planning/Site Management	✗	✗	✗	✗	✗	✗
Labor Management	✗	✗	✗	✗	✗	✗
PM and Cost Transparency						✗
Sequencing of Work	✗	✗	✗	✗	✗	✗
Evolving Client Needs	✗	✗				✗

Technological advancements are changing the retail, media and manufacturing industries, but most E&C firms continue to operate the same way they did 10-20 years ago. For example, many still use manual and redundant approaches to key activities like project management and planning.

Blending technological innovations with current business models requires a deep understanding of how technology can deliver value to customers while also building capabilities to deliver that value on a consistent basis. To do this, E&C organizations must develop compelling value propositions that have organizationwide support and that establish a clear technology strategy, with defined objectives and decision-making roles and criteria.



The competitive forces that are driving transformation and innovation inside our industry reflect a long-term trend that will continue to accelerate.

**Chris Daum, CEO
FMI Corporation**

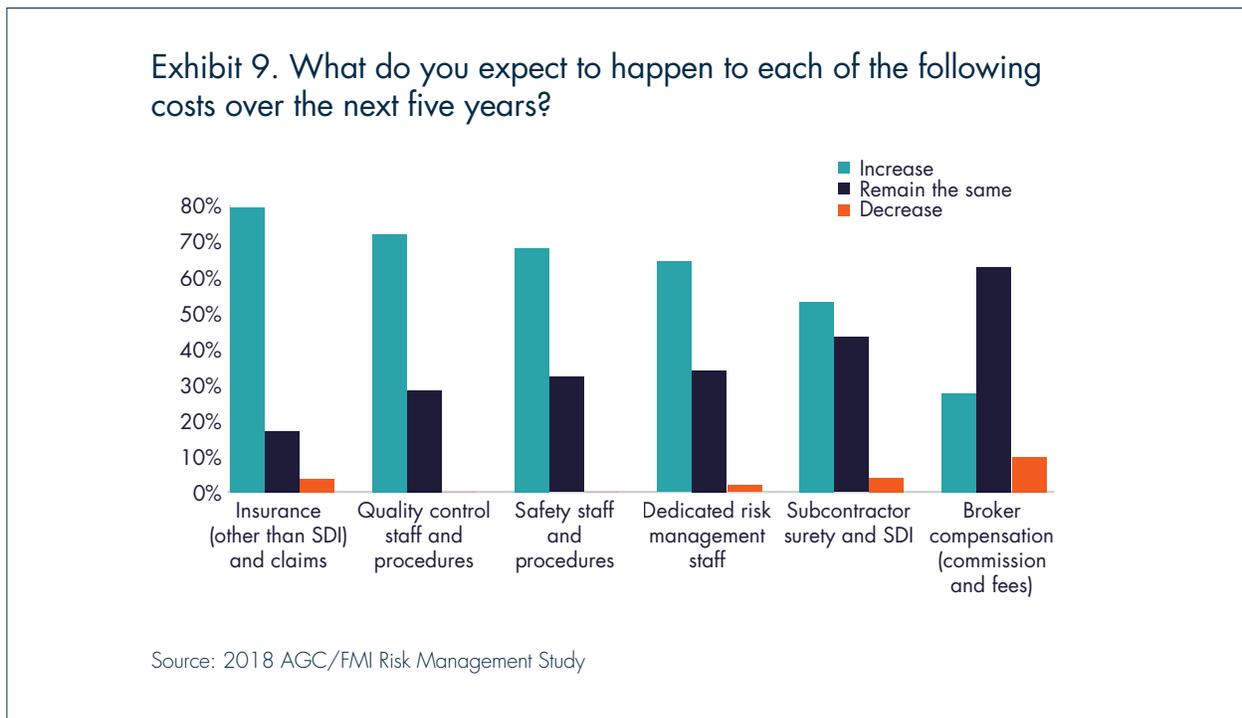


Finding 4. Rethinking Risk Management

For years, contractors have tackled risk by purchasing insurance programs and managing claims. Today that is no longer enough.

For years, contractors have tackled risk by relying on insurance programs and managing claims. That is no longer good enough in today's ever-changing and fast-paced environment. Our [2016 risk study](#) showed that the current construction risk environment is vastly different compared to what it was just six years ago. Owners are putting more pressure on project costs and schedules while modifying contract terms to place greater risk on contractors at all levels. At the same time, contractors are winning more work and staffing projects with less skilled labor and fewer experienced field supervisors. Combined, all of these factors are adding unprecedented risk to field productivity, work quality and safety, and stressing working capital.

In this year's study, participants identify fee erosion and cost escalation as the top-two "soft costs" of risk that could jeopardize construction firms significantly in the future. In addition, respondents tell us that the costs most likely to rise over the next five years are insurance-related (Exhibit 9).





These are all indicators of an industry that is ripe for disruption. In fact, new outside players are recognizing opportunities to disrupt the multitrillion-dollar E&C industry by introducing completely different business models (see the example of [Katerra](#)). In just the last few years, the industry has experienced a slew of startups entering the market that are laser-focused on developing technologies to improve project efficiencies and radically change the way construction firms design, plan and execute projects. These firms are also looking at new ways to manage and mitigate risk in the context of the “digitization of E&C.”

Seth Hausman, managing director of Kraus-Anderson Risk Innovation, stated, “In the fast-moving, complex business environment of 2018, the imperative for change has never been greater. Businesses are reviewing every policy and procedure, and risk management is no exception. Gone are the days when risk management merely meant purchasing insurance policies and managing claims. Gone also are the days when risk registers and risk matrices enabled business leaders to feel comfortable that risks are managed and mitigated within the business. We are also past the time when businesses could rely only on three lines of defense (business management, risk oversight, internal audit) as sound risk management.”⁹

Effective risk management in the near future will likely look very different compared to its current state. Many risks that contractors are encountering today, for example, are not insurable. Hausman adds, “Many business leaders equate risk management with insurance. Insured risks often include worker injury, automobile accidents, product failure and fire. It is true, the risks that are covered by insurance are part of a robust risk function, however, they only scratch the surface. In fact, since those risks are mitigated through insurance, almost all impact on a company’s profitability comes from risks that are not insured (excluding an evaluation of indirect costs). Most risk that impacts company profitability, resides in the people, process, technology and strategy of an organization.”

With more contractors offering design services, the need for adequate professional liability insurance is growing exponentially. This insurance must cover not only data theft but also business interruption, data breaches and other digital asset losses. Mitigating exposures will become even more critical as technology continues to advance. Drones, for instance, are frequently excluded from a company’s commercial general liability policy. Expect these exposures to continue to expand as contractors integrate even more technology into their design-build projects.

⁹ “4 Principles of Effective Risk Management for the Next Decade.” Seth Hausman. July 10, 2018.

It is also important to note that given today's "tech hype" and fast-changing technology environment, E&C firms must remain focused on five key organizational areas in order to navigate the unsettled external factors shaping the industry. Following is a summary of these five root causes of contractor failure that we identified in FMI's 2007 study "Why Contractors Fail" and that are **especially relevant in adapting to today's digitized world with technology disrupters at the gate**:

- 1. Poor Strategic Leadership.** This remains by far the biggest reason for failure in today's business environment, where strong leadership serves as a cornerstone for success in even the most difficult market conditions. For example, many firms ignore technology and innovation strategies in favor of the status quo and fear of change. Chris Daum, FMI's president and CEO, recently stated, "Most importantly, owners and leaders of E&C firms must not mistake a healthy robust market as an excuse to practice business as usual. Instead, pay attention to the fundamental transformations and irreversible trends that are currently impacting the industry, look carefully at how you're operating today, and then come up with ways to become more proactive about transforming your company to become even more competitive and agile in today's new and changing marketplace."
- 2. Excessive Ego.** A majority of E&C firms still refuse to believe that their markets and business models are at risk of being disrupted by new technologies and external competitors such as Katerra, a technology firm that is changing the traditional construction business model. The mindset that "my business is different and will remain relevant" and that "true disruption is not going to occur during my tenure in the industry" might put more E&C firms at risk today than at any time in recent history.
- 3. Too Much Change.** Many E&C firms are adopting technologies, new systems and processes, and going after new markets, but those initiatives are often led by new leadership with inexperienced hires. However, this adoption is occurring without the proper procedures, processes and accompanying training to facilitate change management for successful implementation. [Our research](#) shows that in 90% of the company-failure cases, "too much change" was a stated root cause and a crucial element in the actions that led up to the disaster. To avoid driving too much change in the organization and to manage that change more effectively, we suggest companies make a list of everything that's new (e.g., customers, projects, geographical targets, superintendents, project managers,

Effective risk management for the next decade includes four important principles:

- 1. Most risk is not insured.** Continue to focus on insurance and claim management, but also focus at least as much time of the risk function on people, process, technology and strategic risks.
- 2. Business leaders, not solely risk managers, manage risk.** Risk evaluation is fully integrated into daily strategic and operational decision-making.
- 3. Risk evaluations should be quantitative.** The likely impact on profitability should be better understood through data analysis. Monte Carlo simulations can turn the unknown into informed certainty.
- 4. Aspire for more than compliance.** Compliance is a critical component of effective risk management. However, it should be a basic foundational function, not an aspiration.

systems, etc.) to fully understand the current speed of organizational change. The more changes they can name, the higher the risk of failure. Therefore, it is critical to manage the rate of change on an ongoing basis, balanced with the necessity to adapt to irreversible trends.

4. **Loss of Discipline.** Successful construction firms tend to be extremely well-disciplined and well-informed in all areas of their businesses. [In our research](#), most companies that experienced failure grew from small, regional operations into national powerhouses (e.g., J.A. Jones, Guy F. Atkinson, etc.). Along the way, these firms almost universally lost their internal business disciplines, became overall bureaucratic, and started doing things outside of their core competencies. Today, advances in big data and information sharing are allowing companies to transmit knowledge across operations and place relevant information into the hands of those who need it most. Leadership teams that orchestrate effective information flow will see operational advantages—quicker decision-making, earlier identification of risks, increased employee engagement and so forth (see more details in our Quarterly article “[Technology and Operational Excellence: Catalyst or Obstacle?](#)”). Executives who don’t leverage data collection—and the associated business intelligence—to improve productivity put their firms at risk.
5. **Inadequate Capitalization.** Most firms lack the financial resources needed to compete in the digital age and, as such, continue to funnel only a small fraction of their overhead dollars into innovation and technology (see earlier comment in this report about IT investments, under Key Finding 3). Now is the time to remain laser-focused on the company’s overarching strategy and remain wary when chasing the latest technology tools or work opportunities. Even though it’s a natural inclination, this strategy can ultimately lead to greater levels of insolvency, bankruptcy and other issues for the industry. It’s almost inevitable that companies will get ahead of themselves and spend their balance sheets chasing dreams, news and promises. To avoid these traps, companies must focus on the facts and business fundamentals and keep their eye on the ball.

The only certainty today is that the future will look vastly different than it does right now. The current E&C model eerily resembles the Egyptians’ model of putting construction work in place. Technology is moving at an exponential rate, and disrupters—armed with enormous venture capital funding—are infiltrating the industry at a rapid rate. The rise in uninsurable risks, with a market unable to effectively respond in the short term, all indicate that it is incumbent on the E&C firms to respond accordingly with investments in technology and new skill sets they have not been required in the past.

This will require setting a much different vision for E&C firms to respond to the changing landscape. It will also require a much more strategic approach and mindset. Those that adapt will survive, while those that choose to conduct business as usual or take small incremental steps may find themselves playing in an antiquated sandbox.



Looking Ahead

For years, E&C firms have primarily relied on their insurance programs and claims management to contain the risk inherent in their work. Today that is no longer good enough. Our study shows that the E&C risk environment is vastly different from what it was just five to 10 years ago. Owners are increasing their pressure to cut project costs and to shorten schedules. At the same time, owners are modifying contract terms in ways that place greater risk on contractors at all levels.

And then there is the workforce shortage. Today's contractors are performing more work and staffing more projects with less of the skilled labor they have had in the past, and with fewer and less experienced field supervisors. Collectively, these factors are increasing the risks relating to labor productivity, quality, safety and working capital to unprecedented levels.

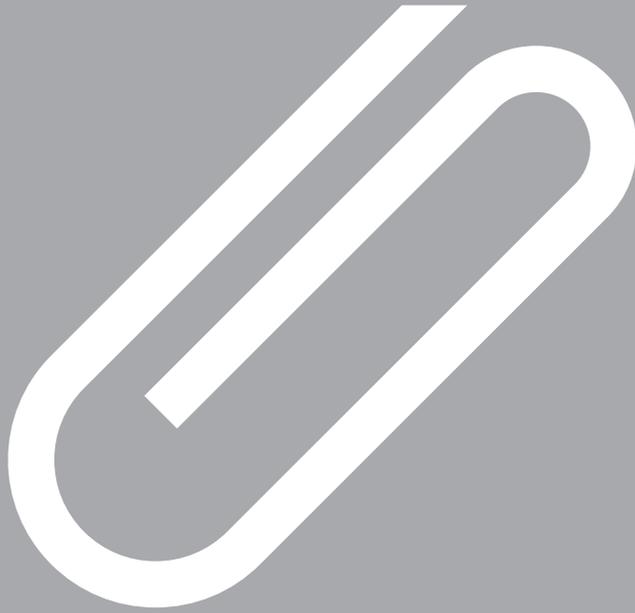
Rapidly changing technology—both a driver for innovation and a potential game changer—is also part of the mix. Today's technologies can design almost anything that owners request, and tools needed to facilitate cost-effective, efficient and safe construction are proliferating. These advances in both design and construction should reduce risk. But most E&C firms are still relying on more traditional practices and procedures—choosing to “follow” rather than “lead” their industries down the path to solid risk management.

This could change in the future, when firms may be forced to adapt or run the potentially devastating risk of falling behind the digital transformation curve. Digital analytics can, for instance, take the biases out of the contractor selection process. Inherently risk-averse by their very nature, risk managers can use these and other advanced tools to transform their departments and their entire organizations. The opportunity will challenge E&C firms, many of which lack the “digital talent” needed to move such initiatives forward.

Looking ahead, E&C companies must make a more intentional effort to understand how their supply chains are changing and how everything from design and preconstruction to procurement to delivery is evolving. Just look at what's happening right now. Construction manufacturing, 3D printing, robotics, AR/VR, wearables and drones are already transforming job sites. To compete effectively, companies must be aware of—and develop proactive strategies for managing—these shifts, and they must develop plans for participating in these emerging ecosystems. This may mean changing business models, embracing new and more efficient technologies, and reconfiguring project teams (i.e., by working with a joint venture partner) and/or acquiring companies.

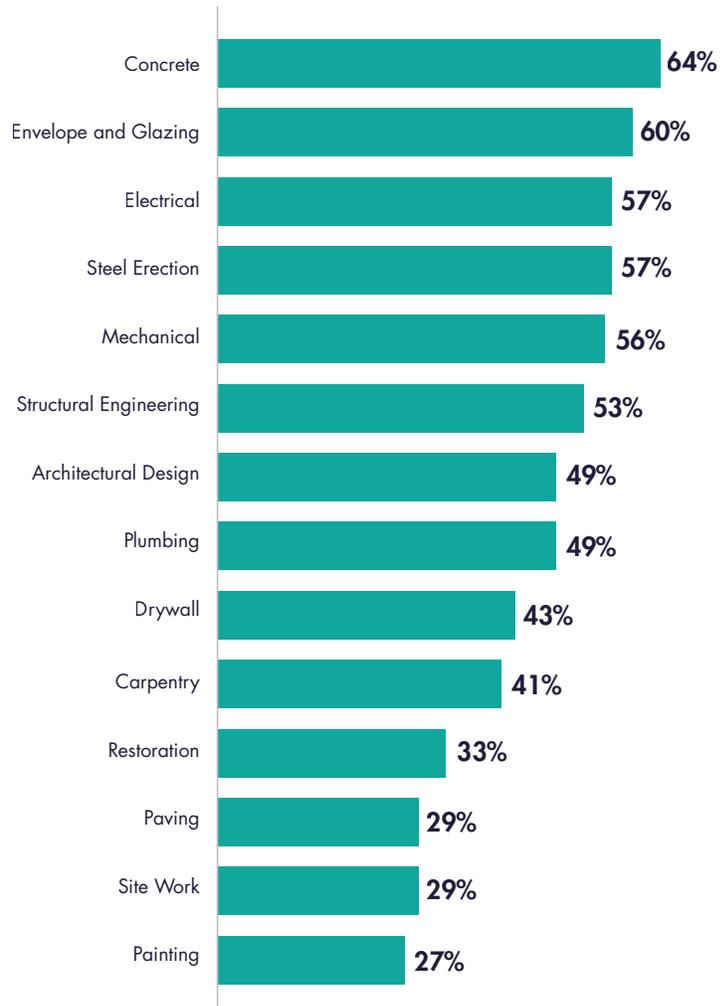
Most importantly, owners and leaders of E&C firms must not confuse a healthy and robust market with real progress or use it as an excuse to conduct business as usual. Instead, firms should pay attention to the fundamental transformations and irreversible trends that are currently impacting the industry, look carefully at how they're operating today, and then come up with ways to proactively transform themselves to be even more competitive and agile in the future.

Looking ahead, AGC's Surety Bonding and Risk Management Forum—in collaboration with FMI—plans to delve deeper into some of this year's study findings. And as the industry changes its perspective on risk management, we will continue to promote a constructive dialogue among industry stakeholders and provide insights into this critical business area on a regular basis.



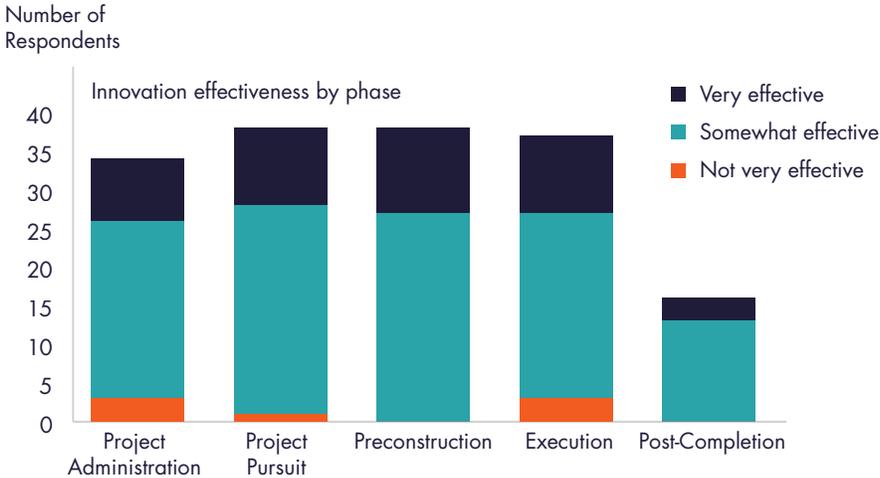
Appendix

Which of the following trades or activities will be subject to disruption over the next five years?



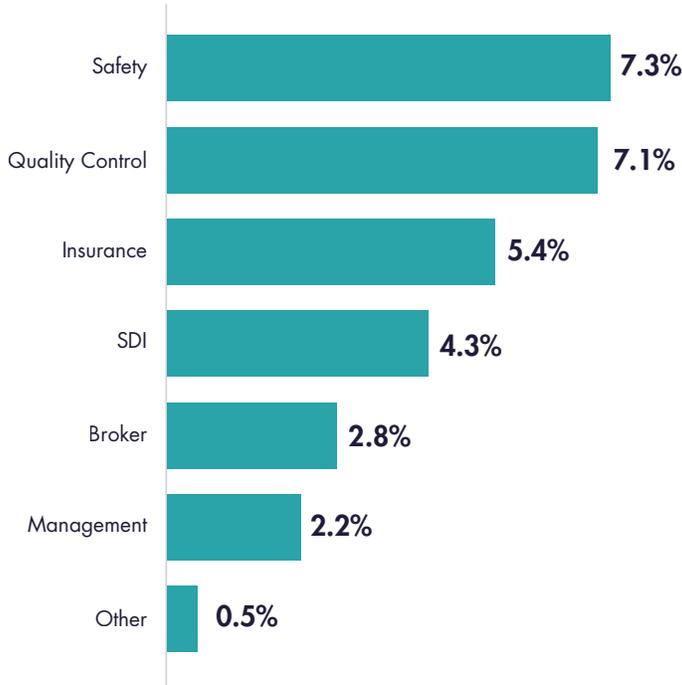
Source: 2018 AGC/FMI Risk Management Study

How effective has innovation been in each phase?



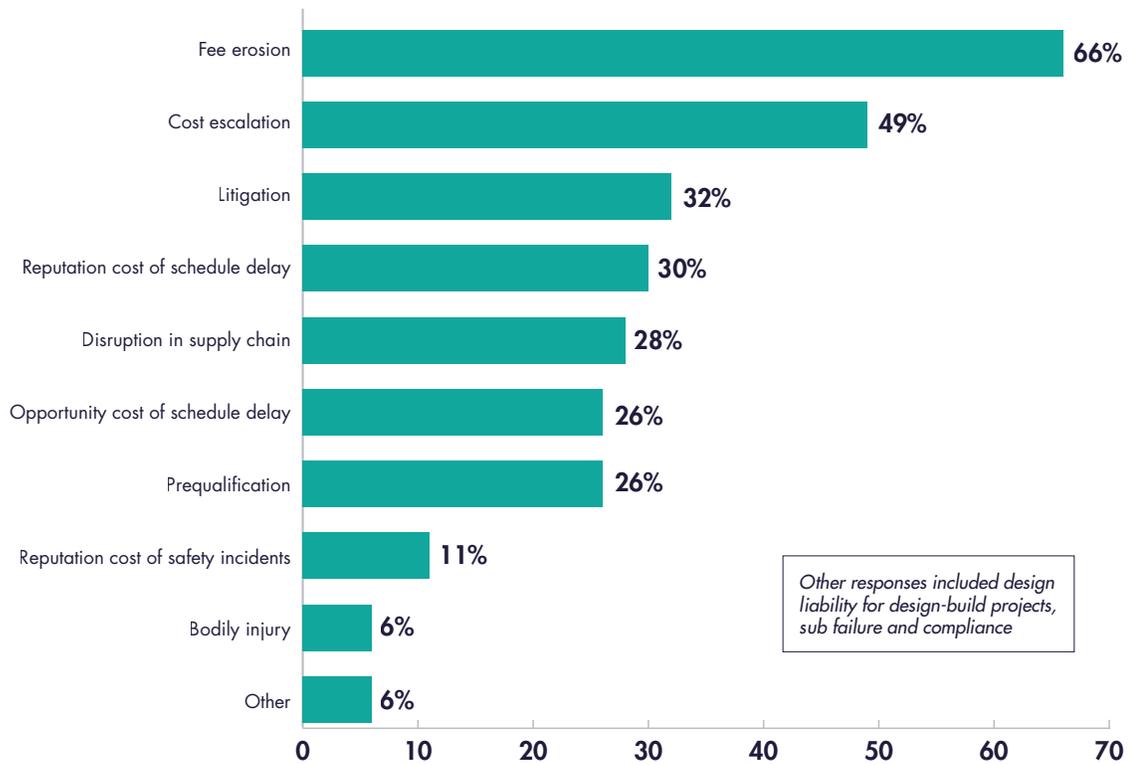
Source: 2018 AGC/FMI Risk Management Study

What percentage of total costs of a typical project is attributable to each of the following risk-related services?



Source: 2018 AGC/FMI Risk Management Study

Which of the following “soft costs” of risk pose the greatest threat to your firm?



Source: 2018 AGC/FMI Risk Management Study



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For over 65 years, FMI has been the leading **management consulting and investment banking** firm dedicated exclusively to **engineering and construction, infrastructure and the built environment**.

FMI serves all sectors of the industry as a trusted advisor. More than six decades of context, connections and insights lead to transformational outcomes for our clients and the industry.

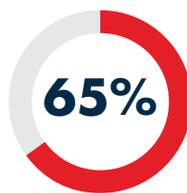
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CONTRACTORS



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