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Innovation and Transformation: Paving the Way to Tomorrow

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Innovation and Transformation: Paving the Way to Tomorrow

By Chris Daum

Advances in technology and innovation in the engineering and construction industry have been historically slow to catch on.

Today, that is no longer the case. From innovative construction materials to new processes and emerging technology platforms, every corner of the industry is feeling the impacts and pressures of these developments.

In addition to the rapid adoption of new technologies, our industry is also using new manufacturing and prefabrication techniques, both of which are starting to shape and impact all aspects of the construction value chain. One example is the changing business model of general contractors and construction management firms: These companies are reinventing themselves and looking for new ways to add value by offering innovative “non-fee” services.

The most innovative firms are taking a more proactive approach to the innovation and transformation that’s impacting the industry. Rather than being led by these changes, these firms are leading the charge in these areas. Over the years, FMI has seen several industry leaders thrive in their roles during times of highly innovative and disruptive shifts in their businesses. In this edition of the “Quarterly,” we present unique insights from such successful industry leaders (DPR, Thornton Tomasetti and the APi Group) on the different ways in which they have led innovations and positive disruptions.

Value has moved beyond bricks and mortar and traditional control processes to the totally integrated smart building and smart home. Our authors provide insights in these market sectors, where recent M&A activity indicates that many of the players are crossing over and entering adjacent markets via acquisition to gain an edge in this rapidly evolving landscape. For those companies that can stake their claim and find ways to own and influence building owners, the rewards will be great.

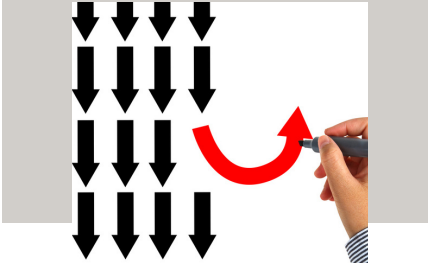
Lastly, we take a deep dive into how leaders can drive organizational success by using more effective practices in succession and leader selection. With the baby-boomer generation retiring at a rapid rate, and with skilled, experienced labor becoming more and more difficult to find and retain, E&C firms must take a more strategic approach to identifying and selecting their future leaders.

At FMI, we think that the competitive forces that are driving transformation and innovation inside our industry reflect a long-term trend that will continue to accelerate. In future editions of the “Quarterly,” we’ll continue exploring how technology, demographics, business model changes and other competitive forces are driving transformation and innovation in our industry.



Chris Daum is the president and chief executive officer of FMI Corporation. Chris oversees the management of all FMI businesses and services and leads the firm’s strategic growth efforts. He may be reached via email at cdaum@fminet.com.

Leading Innovation: Insights From Industry Executives (Part 1)



By Kim Jones and Ron Magnus

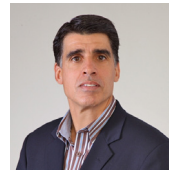
FMI often hears stories about innovations and positive disruptions occurring in and around the engineering and construction industry. These new ideas are often associated with project-related processes, systems or technologies. And while some ideas and technologies stick, many others seem to fail.

FMI's Center for Strategic Leadership (CSL) has been observing innovation trends with a slightly different lens that is focused on how leadership positively or negatively impacts the innovation process. We have seen many leaders struggle to navigate and truly lead their organizations through disruption—whether it's by introducing a change in their business processes or adopting new ways of thinking.

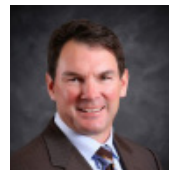
Along the way, we've discovered that the influence of leadership in this process has a more profound impact than most would think. In fact, several key leaders in our industry have thrived in their leadership roles during times of highly innovative and disruptive shifts in their businesses. Witnessing these shifts caused us to pause and reflect on what we saw. We began by asking ourselves questions like:

- What types of leaders successfully drive innovation?
- What differentiates them from their peers?
- What have they learned over the years of leading innovation?
- How can FMI help spread their knowledge to current and future leaders in our industry?

Industry Disruptor Profiles



Thomas Z. Scarangelo, P.E.
Chairman and CEO
Thornton Tomasetti



Russ Becker
CEO and President
APi Group, Inc.



Atul R. Khazode, PhD
Director of
Construction Technologies
DPR Construction

These questions led us to orchestrate an intimate, one-day “think forum” with three leading industry disruptors: Russ Becker (APi Group), Tom Scarangelo (Thornton Tomasetti) and Atul Khanzode (DPR Construction). Each of these leaders has led innovations and positive disruptions within our industry in different ways. To share what we’ve learned from our in-person conversations, we will develop a three-part series in which we will highlight:

- 1. The traits of successful innovation leaders
- 2. Lessons learned leading organizations through innovation and disruption
- 3. The influence of culture, talent and leadership in the innovation process

Trends in innovation and thought-provoking ideas from these leaders will be sprinkled throughout the series. This first article describes what it takes to successfully lead innovation in our industry. The traits, characteristics and worldviews that were discussed by Russ, Tom, Atul and FMI are outlined below.

Six Key Traits of Innovative Leaders

When people think about innovative leaders, they envision someone who has the latest technology gadgets and who constantly discusses new product introductions and trends. While this may be true in some cases, there is more to the story than just technology. To effectively drive innovation, leaders in the engineering and construction industry must focus on more than just the way they design and build structures; they must harness very different characteristics than what stereotypes and tradition would tell us. According to Russ, Tom and Atul, the following traits are common to those who lead innovation and disruption well:

- Focus on people and culture first—the rest will follow
- Identify the opportunity in every situation
- Have the courage to take a risk and face the tough questions
- Share ideas as often as possible—both internally and externally
- Continually push your own thinking
- Understand your own limitations

For the purpose of the conversation, we loosely used the following definitions to differentiate disruption and innovation:

Disruption

- Interrupting and changing the trajectory of business, processes and systems
- Challenging traditional methods
- Addressing a market or client in a significantly different way

Innovation

- Introducing a new idea, technology, method to a market or system
- Improving processes, products, services or technologies
- Creating new value (or capturing new value) for internal and/or external customers

1. Focus on People and Culture First—The Rest Will Follow

During our one-day think forum, the main focus of our conversation was on how leaders actually lead the business to drive innovative thinking and execution. There was strong agreement that a leader’s chief responsibility is to lead his or her people and organizational culture first. As we dug into this further with the group, a few common worldviews around this topic emerged:

- Spend your time, energy and resources on your organization’s people and culture. Helping them learn and grow in their thinking, experiences and competencies will pay dividends later when you need an innovative shift. Shortcutting people development never pays off.

- Recognize that the power of your culture is stronger than you think. Toxic, negative or close-minded cultures chew up new ideas and spit them out. Cultures where ideas are valued and heard provide a safe harbor for people to speak up and share different—and sometimes radical—new ideas that could forever change the trajectory of your business.
- Don't expect the leader to come up with all the innovative ideas. Every role in your business has a different perspective on how things could be done better. Provide an inclusive way for all voices to be heard—and then listen.
- Build a culture that encourages frequent conversations around continuous improvement and better ways of doing things. Create a safe place to talk about failures, learn from those mistakes and teach others in the future.
- Create space for nontraditional employees to join your team. External experiences and perspectives often bring some of the most influential shifts in our industry. Just because you don't have a traditional role for them doesn't mean they can't find a place to thrive.

2. Identify the Opportunity in Every Situation

Leaders have a choice each morning regarding what type of lens they wear to work. Some choose a pessimistic lens while others choose a skeptical lens, and few choose a highly optimistic lens. We all (Russ, Tom, Atul and FMI) agreed that leaders who choose to wear optimistic lenses each day see the business in a different light that often leads to positive disruptions in their businesses. It's much easier to focus on what is not working or what is wrong with a situation than it is to find the hidden opportunities. When we've observed innovation leaders in our industry, they are all consistently diligent (and sometimes emphatic) about balancing reality while finding the opportunity in every situation.

Tom explained how some of the most creative solutions in Thornton Tomasetti have emerged from leaders who are problem solvers versus problem identifiers. Rather than focusing on the challenge at hand, the most innovative leaders found the opportunity that solved the problem.

We also discussed how leaders find opportunities and innovative solutions during moments of crisis. Each of us has witnessed a moment of crisis where leaders were able to pause and see the situation differently than most. Russ stated, "Crisis is what drives people to change." And we all agreed that some leaders change in a healthy, productive manner and others change in a damaging and nonproductive manner. Innovation leaders don't waste moments of crisis; they see them as opportunities and act upon them accordingly.

3. Have the Courage to Take Risks and Face the Tough Questions

It's not surprising to hear that innovative leaders demonstrate the courage to take risks. In fact, one of the quintessential elements of the innovation process is venturing into uncharted territory without certainty of success. Courageous leadership in those moments is not easy, so we asked the question, "How do you do that well as a leader?" We got the following responses:

- Listen to new ideas and assess them for validity, implications (good or bad) and the opportunity.
- Clearly identify the benefit of trying something new, and then communicate it as broadly as necessary.
- Lead others well so that they can create a plan for testing the idea, learning from the outcomes and trying again. Leaders shouldn't be doing this in a vacuum.
- Clarify roles and responsibilities associated with the innovative risk so expectations are clear all around.
- After you've listened to others, ask yourself if you are willing to take the risk on behalf of the organization. At some point, you have to trust your knowledge, experience and intuition.

Innovative leaders also create a vision for innovation for their organizations. Clearly communicating why innovation is part of the organization—and what the future entails—helps clarify why risks are being taken in the first place. This communication acts as a guiding light for innovators across their organization and clarifies what risks the organization is (and isn't) willing to take.

A clear vision also helps innovative leaders face the tough questions head-on and open the tough dialogue with others, even when they'd rather avoid those conversations. We discussed how avoiding those tough conversations often leads to anxiety, doubt, cynicism and other negative behavior within their cultures—none of which is worth the risk in the long run.

4. Encourage Idea Sharing as Much as Possible—Internally and Externally

When a new concept or thought emerges, oftentimes people try to keep it as close to the vest as possible in fear that someone may steal their ideas. Ironically, Russ, Tom and Atul agreed that talking about ideas, sharing insights and building on each other's creativity are the best ways to lead innovation. Leaders who create a culture in which ideas are not shared tend to see poor results from their innovative efforts. Conversations—both internal and external—can spark a brand-new thought that would have never entered their thought process in the first place.

Innovation leaders also dedicate time to teaching their peers and other future leaders about what they are seeing and learning in the marketplace. Spreading knowledge across the industry can ignite a disruptive change faster than trying to compete with one another for ideas. The group agreed that if the industry can figure out a way to build a sense of team rather than competition when it comes to innovation, the rate of positive disruption increases exponentially.

5. Continually Push Your Own Thinking

It's extremely rare for leaders of innovative organizations to be stagnant and complacent in their expertise, thinking and leadership. True disruptors in our industry are continually evolving as individuals and as leaders of their businesses. As we watched Russ, Tom and Atul discuss their insights and lessons learned about leading innovation in the industry, it was clear that all of them consistently pushed their own thinking in these ways:

- **They Read Extensively**—They are lifelong learners. Whether it's reading daily newspapers, industry trend reports, global economic articles, books (nonfiction and fiction) or innovation publications, these leaders constantly discussed new headlines and trends they were seeing in the marketplace. Industry disruptors are all extremely well-read, and they know how to apply that newfound knowledge to their own businesses and the industry.
- **They Listen for Understanding**—They listen to stories, insights and viewpoints (both internal and external to the industry) as often as possible. They slow down enough in order to deeply understand what is being said while applying the lessons learned to their businesses and/or thinking. Slowing down to listen has spurred many new, different and disruptive ideas that have been implemented in real time for these three leaders.
- **They Discuss Ideas With Everyone**—They love to push their own thinking by discussing lessons learned, new ideas and new concepts with other people. Like sharing ideas above, they know that different perspectives and points of view influence their own leadership style and approach to innovation every year.

Pushing your thinking as a leader helps you make better decisions related to innovation. A strong foundation of knowledge and expertise in the industry can influence how you assess risk and where you invest your time, energy and resources as an organization.

6. Understand Your Own Limitations

Humility and self-awareness were glaringly obvious traits among Russ, Tom and Atul. At one point, each of them said something along the lines of, "I don't think I'm personally a disruptor in this industry." Those characteristics are not common across most industry disruptors, but we did agree that the best leaders of innovation understand their own limitations. They are willing to admit when they are out of their depth and they lean on others. They are also willing to admit when they are personally falling behind on trends in innovation or other relevant factors related to their business.

Understanding your own personal limitations creates positive boundaries around what individual leaders should or should not be focusing their energy on. They know that others around them are smart, capable individuals who can backfill where they are deficient. They also realize that their own strengths can backfill the deficiencies in others. Self-awareness, teamwork and support for one another are common traits we have all observed in innovation leaders.

The Next Step

In our conversations with these three innovative leaders, we gained valuable insights around what it takes to be an innovation leader. Like most leadership traits, the characteristics of innovation leaders discussed are teachable, which is great news for current and future leaders within our industry.

We will continue this journey in Part Two of this series, where we will outline the lessons that Russ, Tom and Atul have learned over their years of leading innovation and disruption in our industry.



Kim Jones is a consultant with FMI's Center for Strategic Leadership practice. Kim designs customized solutions that address a wide variety of leadership issues including: organizational development, cross-cultural leadership, developing strategic thinking, talent development and retention. She also serves as a facilitator at FMI's Leadership Institute and other training programs that help leaders reach their peak performance. She may be reached via email at kmjones@fminet.com.



Ron Magnus is a managing director of FMI's Center for Strategic Leadership. He founded the Center for Strategic Leadership, which has focused on developing the strategic capability of leaders worldwide. Many of the largest engineering and construction firms in the world are clients and friends of the CSL. Ron also serves on Boards as a director and trusted advisor. He may be reached via email at rmagnus@fminet.com.

Cultivating the Next Generation of E&C Technical Talent



By Priya Kapila

The E&C industry is undergoing a technology revolution that is impacting how firms find, train and retain top technical talent.

With information system innovation at an all-time high, the engineering and construction (E&C) industry is experiencing dramatic changes right now. New technological advancements, combined with demographic shifts in the workforce and owners' demands for cheaper, faster and better projects, are resulting in heightened pressure for E&C companies to continuously improve and advance.

Augmented reality, 3D printing and scanning, building information modeling (BIM), virtual design and construction (VDC), prefabrication and even unmanned drones are helping E&C companies work smarter, boost productivity and improve collaboration across project teams. But these innovations also pose challenges, particularly when it comes to finding, developing and retaining the right talent.

In this article, we explore the impact of technological influences on today's E&C labor practices, discuss what new skills and competencies will be required in the near term and provide recommendations on how to develop a workforce of the future.

The Merging of Design and Construction

Over the past decade, we have witnessed a significant increase in firms adopting BIM/VDC systems in all aspects of the design-build process. This includes modeling, customer decision mapping, estimating, virtual building, prefabrication, site analysis and coordination, construction resource utilization and field work planning, among others.

With the growing use of enhanced BIM/VDC systems comes the demand for specialists to employ these tools effectively. In one extreme example of how BIM/VDC usage is impacting the industry, we can look to Broad Sustainable Building, a Chinese construction firm that last year brought new meaning to fast-build projects by [completing a 57-story skyscraper in Changsha in just 19 days](#). While this prefabrication feat was as much for notoriety as it was to meet housing demands in south central China, the

project highlights the current prevailing expectations for efficient design-build engagements, which will rely heavily on effective BIM/VDC tools and a technically proficient workforce.

Early adopters of BIM/VDC processes now have a performance record that proves the operational gains that may be realized using innovative modeling and virtual planning systems. [Mortensen Construction](#), for example, analyzed 18 projects completed between 2004 and 2014 and identified the following benefits resulting from their VDC process:

- Average schedule reduction: 32 days
- Productivity increases: 25% and greater
- Average direct cost reduction: 2.95%

As the positive impacts of BIM/VDC are noted across the entire E&C industry, it's clear that such innovations are revolutionizing project delivery. Some of the key areas of innovation include:

- **Prefabrication.** With the ability to better plan and model construction projects, E&C companies anticipate the expansion of prefabrication work, which has the potential to significantly reduce project timelines.
- **Automation.** Where possible, firms are seeking to implement automation processes already highly utilized within the manufacturing industry. This is critically significant from a safety standpoint, as the use of robotics could limit the exposure of workers to site safety hazards.
- **Virtual Collaboration.** The ability to liaise in real time with customers and other project stakeholders using mobile devices and related technologies is increasingly cited as advantageous to project design and decision-making, particularly for health care clients.

Technical Talent Wanted

Naturally, the expanding utility of BIM/VDC tools has driven the need for specialists that can effectively apply these systems. FMI Compensation has collected staffing and salary data from E&C companies for BIM professional jobs since 2009. Our longitudinal analysis reveals several key observations:

1. Growth of the Profession

The number of companies that report having a BIM professional on staff has increased significantly over the last two years. In "[FMI's 2016 Construction Professional Compensation Survey](#)," we noted an increase of 68% in companies identifying at least one BIM professional within their workforces. Our survey findings also indicate the greatest growth of incumbents at the senior BIM professional level—a trend we expect to see continuing in the coming years.

However, our research also shows a slight decline in entry-level BIM specialists, which seems out of line with the overall trajectory of BIM/VDC adoption and deployment. There could be several explanations for this observation, including:

- Demand for experienced BIM/VDC professionals is overwhelming and leaves little motivation for newcomers to enter the field.
- The economic downturn led to layoffs and hiring freezes that stifled the recruiting of beginner BIM/VDC professionals.

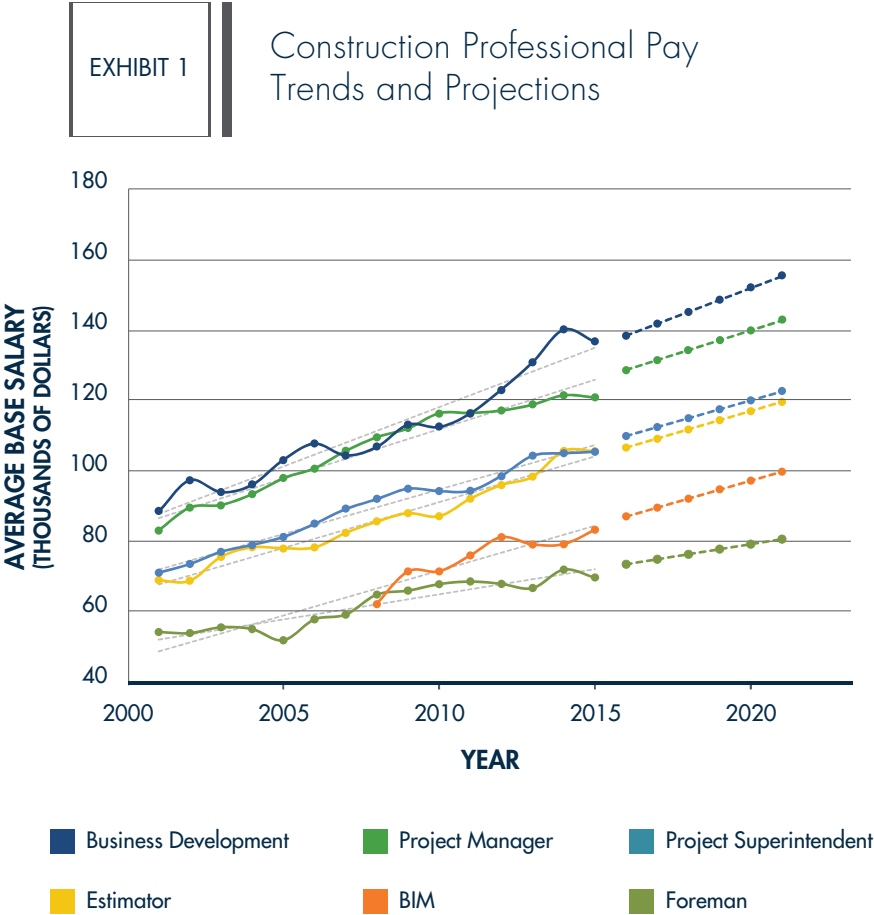
- Training efforts, as well as employer expectations for rapid skills development for BIM/VDC specialists, are great, so employees are improving their knowledge and skills quickly and, therefore, moving beyond “beginner” status to higher steps on the career ladder in short order.

2. Increases in BIM/VDC Staffing

FMI’s survey data suggests that companies are hiring more BIM/VDC professionals. In 2014, E&C firms participating in the “[Construction Professional Compensation Survey](#)” indicated that, on average, they employed slightly fewer than four individuals in BIM/VDC professional positions. In 2016, the average staff count rose to nearly five BIM/VDC employees. The largest staff increases involved higher-level roles, suggesting the increasing need among E&C firms for highly skilled professionals who can facilitate coordination and collaboration among multiple stakeholder groups on complex projects.

3. Gradual Salary Increases

For the past 15 years, FMI’s Compensation Group has been tracking six key benchmark job families, including business development, project management, project superintendent, estimator, general foreman and BIM (the latter has been tracked since 2009). Exhibit 1 shows the base pay trend for each job family and reveals that, in general, pay levels have been increasing since 2001. Although employment levels may have receded during the recession, those jobs requiring specialized skills and knowledge have experienced steady pay increases.



Source: FMI Compensation Survey Data

Table 1 below shows how national median salaries for less experienced roles (i.e., Levels 1 and 2) have grown little or declined since 2009, while salaries for more advanced roles (i.e., Levels 3 and 4) have increased.

TABLE 1

Median Salary for BIM Professionals
(Level 1-4)

	Median Salary (\$000)								Total % Change 2009-2016
	2009	2010	2011	2012	2013	2014	2015	2016	
BIM - Level 1	\$62.2	\$58.8	\$57.8	\$61.4	\$60.7	\$58.0	\$60.1	\$60.0	-3.5%
BIM - Level 2	\$71.8	\$72.9	\$72.3	\$74.2	\$69.2	\$68.5	\$70.0	\$72.0	0.3%
BIM - Level 3	\$82.9	\$84.5	\$85.9	\$90.8	\$90.3	\$91.8	\$94.9	\$94.2	13.7%
BIM - Level 4	\$105.6	\$102.8	\$109.6	\$114.3	\$120.3	\$106.8	\$110.2	\$110.0	4.2%

Source: FMI Compensation Survey Data

With the decrease in beginner BIM/VDC professionals relative to more experienced incumbents, the median salary levels reported are no surprise. As such, there is little pressure to increase wages for entry-level roles, given the lack of growth at this level, while the focus on higher-level roles is driving salary increases. That said, apart from the “BIM – Level 3” position, the rise in BIM salaries since 2009 is lower compared to general E&C industry compensation increases. It remains to be seen whether continued demand for BIM/VDC specialists will ultimately result in larger pay increases in the near future.

Developing an Effective Talent Development Approach

As BIM/VDC systems continue to evolve, so too will the roles of individuals responsible for using them. Thus, E&C companies must remain cognizant of not only how they are using BIM/VDC for projects, but also how best to utilize staff and effectively hire, develop and retain these increasingly critical employees. Here are our top recommendations for companies that want to fully leverage technological developments while maximizing their current and future workforces:

1. Conduct Periodic Needs Assessments

To ensure the right people are in the right roles, start by assessing current BIM/VDC practices as well as forecasting process updates. Then compare existing employees’ skills and competencies relative to workforce needs, given current and future practices. Knowledge of the work to be performed will be essential in determining the incumbent qualities needed to perform BIM/VDC functions.

2. Understand the Roles That Need to Be Filled

Today, BIM/VDC professionals take on a broad spectrum of roles, including:

- **Technician Versus Facilitator.** The technical BIM/VDC role is a traditional position that grew out of earlier design drafting roles. The technician role is responsible for administering systems and ensuring their effective and efficient operations. Alternatively, the facilitator role is responsible for project management and coordination related to BIM/VDC. While many firms distinguish between these two roles—namely because they tend to require different job competencies—we expect these roles to merge into one over time. This would require technical specialists to be well-versed in project coordination and bring greater efficiencies to projects through a primary, specialized point of contact.
- **Expert Versus Cross-Training.** Even while we observe growth in the number of BIM/VDC professionals, some firms want to train their existing workforces in BIM/VDC systems rather than staff subject matter experts. With the adoption of BIM/VDC integration, cross-training is a more plausible approach (versus when BIM/VDC is introduced and implemented in a short time frame). Deciding which job design approach to pursue will depend on the extent to which BIM/VDC systems are utilized on projects, who uses those systems and in what capacity, and how well various project team members learn BIM/VDC operations.

3. Evaluate Recruitment Initiatives

E&C firms must determine how to staff the BIM/VDC function, given the results of a needs assessment. Desired job roles should be reflected in the firm's recruitment strategies. For example, if a company finds that experts are preferred, it may need to provide a premium compensation package to effectively attract experienced talent.

Based on the demands for talent and review of recruitment effectiveness, E&C firms may require outreach initiatives to expand the population of BIM/VDC professionals. This may be particularly true, given the diminished number of entry-level specialists.

4. Sharpen Retention Efforts

As the labor market becomes constrained, companies that have successfully established high-functioning BIM/VDC teams will need to assess optimal staff retention approaches. Potential strategies may include:

- **Professional Development.** Given the targeted growth among experienced BIM specialists, it is mutually beneficial for employees to expand their skills and knowledge in BIM/VDC and for employers to invest in their employees' long-term development. Career development offerings are also a key contributor to engagement among employees, according to FMI's Industry Survey, "[Millennials in Construction: Learning to Engage a New Workforce](#)." It is routinely recognized that engaged workers are more likely to remain with their employer long-term.
- **Career Tracks.** Clearly defined advancement opportunities can help BIM/VDC professionals recognize their long-term employment possibilities. Many E&C firms began with just one BIM individual-contributor position, but today, many larger companies are building complete career paths that are similar to those in project management. For instance, one FMI compensation survey participant indicates that the following job descriptions have been drafted for BIM/VDC positions: specialist, engineer, manager, regional manager and director.

What's Next for BIM?

Looking ahead, we expect to see continued innovation across BIM/VDC systems where prefabrication, automation and virtual collaboration will begin to take center stage as the industry's use of technology expands and matures. To best leverage these trends, E&C companies must sharpen their talent management pencils in a way that ensures the recruitment and retention of the right level of technical talent. That talent must be able to leverage advanced technologies and work even smarter in 2017 and beyond. For this and other reasons, a competitive pay strategy serves as a cornerstone of any good human capital investment approach.



Priya Kapila is the compensation practice leader with FMI Corporation. Priya is responsible for leading the compensation consulting practice of FMI Compensation. Services provided to clients are primarily focused on the areas of executive compensation, organizationwide salary structure development, and short-term and long-term incentive plan design. She can be reached at pkapila@fminet.com.

Finding the Right Leader: How to Disrupt Your Leader Selection Process



By Jake Appelman, Emily Livorsi and
Lauren Ramsay

How to break out of the traditional leader selection mentality and utilize a more strategic approach to building future bench strength.

Jim Collins famously wrote, “*The first most important decisions are people decisions. The corporate leaders we studied who ignited transitions from good to great practiced the discipline of “First Who”: First get the right people on the bus, the wrong people off the bus, and the right people into the right seats, and then figure out where to drive the bus. [Until] you have 90% to 100% of your seats filled with the right people, there is no more important priority.*”¹

While Collins’ principles hold true, they often fail to survive the realities of the engineering and construction (E&C) industry—an industry frequently understaffed and underskilled in human resources and talent development. It is also an industry where leaders tend to make selection decisions “from the gut” and where key people decisions often come from a single leader or small group who controls most of the equity. In a business that tends to weigh projects over organization building, great companies view leader selection with the same rigor and discipline as business decisions, like project go/no-go or the evaluation of a potential joint venture.

The need to get the right people in the right seats may be one of the top challenges facing our industry’s executives. Internal factors such as pending retirements, new strategic initiatives and rapid growth, combined with external dynamics, often all demand infusion of talent into new or existing roles.

“I’ll know the right person when I see him or her.” “I’m a great judge of character.” “I use my gut to make the best hires.” We often hear these phrases when leaders are referring to their talent selection process. And while we all want to believe that we know what we need from people in order to make our businesses thrive—and we think we can use our intuition to make that determination—even the best leaders are notoriously bad at predicting an individual’s future success in a role and fit within the company’s culture.

¹ Collins, J. C. (2001). *Good to great: Why some companies make the leap ... and others don't*. New York, NY: Harper Business.

Let's look at an example to illustrate this point. Decision-making scientists asked engineers at two large organizations how they would rate their own performances. Nearly 40% of those surveyed suggested they were performing at the top 5% of their organizations.² As human beings, we are inherently biased to be overly optimistic and overconfident about our abilities. This logic extends to selecting future leaders for our business.

When selecting the right talent using gut instinct alone, on average, predicts 1% variability in future leader performance.³ That is next to nothing. Yet most leaders in the engineering and construction industry rely exclusively on their intuition, limited data and minimally effective hiring tools to make leader selection decisions. This approach brings great risk in the form of promoting people before they are ready and losing talent due to perceptions of an unfair and biased selection process. While large, publicly traded companies can often recover from these mistakes, the majority of companies in the E&C industry are closely held and have most of their value tied up in just a handful of key people. To build a great and enduring future for the industry, this outdated model of leadership selection must be disrupted.

A Flawed Approach

The industry's intuitive and reactive method for selecting leaders, coupled with an already thin bench of internal leaders to draw from and only a few individuals at the top making key leader decisions, is due for disruption for a few critical reasons:

1. Selecting the wrong leader can be costly.
2. Using the wrong tools to select leaders can open your organization up to legal risks.
3. Using our own unconscious biases can make people decisions extremely difficult.

While the construction industry has made great strides in improving risk management from a financial and operations perspective, methods and practices for leader selection remain astonishingly outdated and put companies at risk.

The Financial and Legal Impact of Bad Selection Processes

A single bad hire at the executive level can be costly for an organization on several fronts. For one, it is estimated that the wrong executive hire could cost anywhere from \$240,000 to millions of dollars.⁴ This data will resonate with many executives who see the cost of putting the wrong PM or superintendent on a job and yet that same recognition often fails to inform the even more critical decision-making of executive selection. While the exact cost of putting the wrong candidate into a strategic leadership role in your business is a function of several unique factors, there are several direct and indirect costs that will come into play.

The cost of a bad hire includes lost opportunities for the organization, poor performance or weakened customer relationship effects as well as culture and morale disruptions. And the second-order effects, such as loss of confidence in the executives making leadership selection decisions and a feeling of "I can't get ahead" because of bias toward favored employees or family members, can be even more damaging. These issues may generate greater damage than the more commonly discussed costs associated with recruitment, including the executive's compensation, severance pay and the cost of hiring a replacement.

² T.S. Zenger, "Why Do Employers Only Reward Extreme Performance? Examining the Relationships among Performance, Pay, and Turnover," *Administrative Science Quarterly* 37, 1992: 198-219.

³ Schmidt, F. L., & Hunter, J. E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin*, 124, 262-274.

⁴ <http://www.forbes.com/sites/falonfatemi/2016/09/28/the-true-cost-of-a-bad-hire-its-more-than-you-think/#177e65ae71e2>

At its core, leadership selection is a deeply personal, even emotional process and, as such, brings out all the devils of unconscious bias and perception unmoored in fact—all wrapped in the pressures of high-risk decisions that can impact a company for years. With this in mind, a rigorous and objective process is not just recommended; it is required.

Biases Get in the Way

As leaders, we would like to think we are unbiased in our decisions, that we weigh information fairly, and that we make rational decisions about people. We are all subject to biases. Our brains are great at devising shortcuts and creating rules of thumb about how the world operates and how people operate in it. If you doubt this, consider how many times you have heard: “I just had a bad feeling about that person,” or “I knew they would be a star from the moment I met him or her.” For the most part, this serves us well. These mental shortcuts help us learn quickly and operate effectively in an environment that places an ever-increasing importance on our ability to think deeply and process information.

But in the case of leader selection, our biases and mental shortcuts can backfire, leading to costly decisions. The following biases are especially relevant in our industry’s talent landscape and can interfere with the leader selection process.

First Come, First Served. In an environment where great talent is hard to come by, we are naturally drawn to those candidates who are available, familiar and willing to take on the work in question. In most cases, those candidates who appear “next in line” or who apply first for the role may not be the best fit—even if they seem like the most obvious choice. This bias can get in the way of thinking more strategically about succession. Those with tenure and a history of technical and operational excellence (i.e., great project execution) are often considered first for key executive roles. However, while these candidates may be perfectly suited for the current phase of the business, they may be spectacularly unsuited to lead in an unpredictable and volatile future.

Just Clone Me. In our industry, executive selection and succession are often managed by a narrow group of people, usually determined through ownership. This can result in a fallacy that those who are “like me” are the best fit for the business and role. In this way, CEOs and hiring managers at the top may have narrow views regarding the best fit for the role and often end up selecting someone like themselves. This can be problematic for a few reasons. First, your current leader may be overestimating his or her effectiveness in the role. Second, the future, strategic needs of the business may require a vastly different approach and a new set of competencies.

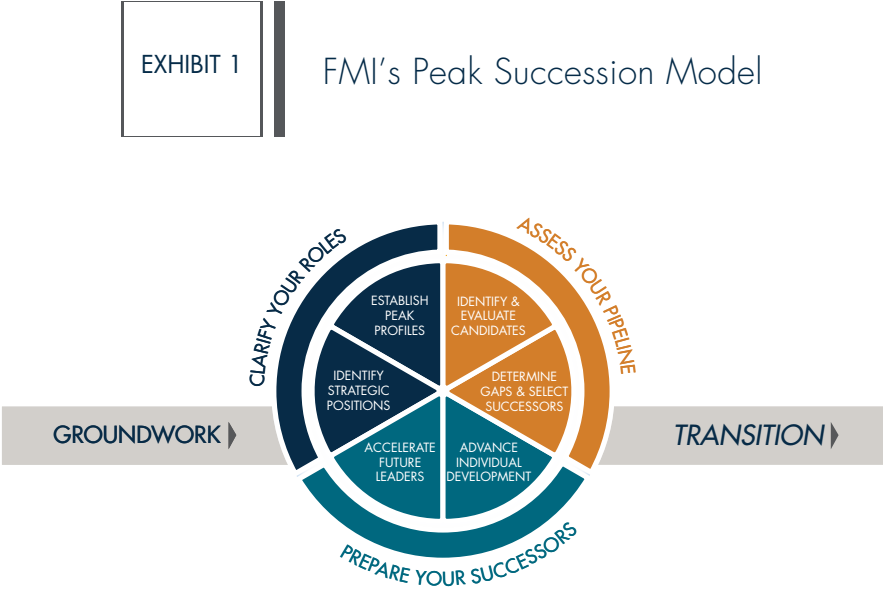
If It’s Not Broke, Don’t Fix It. As businesses evolve, they move through somewhat predictable life cycles, each of which requires a different leadership style. For example, during the business’ startup period, leaders must be highly entrepreneurial, willing to take risks, hands-on and highly sales-oriented. Not surprisingly, later life cycles require more of a systems builder, discipline and a process approach. For example, if a retiring CEO born into an entrepreneurial environment searches for someone just like himself/herself, the results can stunt future organizational growth and health.

Time Is On Our Side. Leader selection is one of the most critical aspects of a transitioning leader’s legacy. The ultimate test of a successful leadership transition is when the next generation is ready to take the reins and move the company

forward on a successful path. And yet, time and time again, we hear, “It’s not like I’m retiring next year.” The planning fallacy is the tendency to underestimate the time required to do something well. Transitioning someone into an executive role with sufficient time is critical because it 1) helps new leaders ensure they have a true understanding of the role and expectations, and 2) gives new leaders a head start in the new role.

A New Approach

Leaders can drive organizational success by using more effective practices in succession and selection. The following outlines key areas that FMI has identified through in-depth industry research and that are part of a broader approach to succession management (see Exhibit 1).



Source: Model is based on in-depth industry research

Set the Groundwork:

Start Early. It may seem premature, but effective succession planning begins five to 10 years before the actual transition happens. In fact, the processes at play for succession should always be in motion. In effective succession planning, for example, leader evaluation and talent reviews are consistent and part of the regular rhythm of the business. In this model, organizations have access to many data points on internal candidates and can bring a variety of perspectives about an individual’s fit for a new role. Furthermore, in this model you can identify future gaps that will need to be filled externally at some point and start networking and creating powerful recruitment strategies to find the right fit versus the immediate fit.

Clarify Your Ideology. Executive transition is emotional, deeply personal and challenging for those individuals who are transitioning out of the business. Transitioning executives often wrestle with how to capture the essence of the

organization and preserve its core even as the organization grows, changes leadership, tackles new strategies and explores new markets. Crystallizing the soul of the organization can help clarify what type of leaders will fit with the culture.

Establish Your Goals and Strategies. Clarifying the organization's near- and long-term goals helps executives better understand the competencies needed to capitalize on these strategies. For example, consider the company that's moving from public markets and into private markets. The competencies relating to relationships, interpersonal influence and negotiation must change significantly. A leader who will execute on strategies related to team and talent development will likely need competencies around interpersonal sensitivity, motivating and inspiring, and mentoring and coaching others.

Clarify Your Roles:

Establish Peak Profiles. In our industry, leaders tend to overestimate the level of technical skills and background needed for a leadership role while underestimating the need for softer skills and competencies. The reality is that deficiencies on either side can derail a leader. FMI recommends a process of defining the role requirements, technical skills, minimum qualifications and required competencies to succeed in the role. Put simply, role requirements define what you do, technical skills and minimum qualifications define what you need to know, and competencies are sets of behaviors that will define how you do it. Competencies play a critical role in leader assessment and selection and can help align talent with your organization's strategic direction.

Criteria for Great Competencies:

- They align with organizational values
- They align with your vision for the future and your strategies for success
- They differentiate an average performer from a star player
- They should be concise and focused

Assess Your Pipeline and Evaluate Candidates:

Use Structured Interviews. In most organizations in the E&C industry, interviews are a collection of arbitrary questions, including some personal favorites among hiring managers. Through a more rigorous, structured interview approach, companies can better predict future performance. In structured interviews, interviewers utilize an organized discussion guide that is closely tied to the actual job profile or a "Peak Profile." The interview guide also includes recommendations for rating and scoring candidates. Using this method, selection specialists train interviewers on how to ask questions effectively and rate candidates objectively.

Add Objective Assessments. In addition to structured interviews, assessments that have been validated for the use of candidate selection (internally or externally) help remove biases and shed light on blind spots or hidden strengths. When choosing the correct assessments, organizations can identify areas where their candidates align with the Peak Profile and areas where candidates may fall

Characteristics of A Structured Interview

- Interview questions grounded in Peak Profiles measure skills and behaviors related to future job performance more accurately.
- Using this method makes the hiring process more legally defensible and reduces biases in decision-making.
- Interview questions tend to be more challenging compared to unstructured methods.
- Once developed, the interview guide becomes easy to use.
- Structured interviews also incorporate questions to assess a candidate's alignment with the company's core values.

short. Assessments will also identify red flags that hiring managers may want to probe or explore in more depth during follow-up interviews. A selection specialist can ensure that the assessment tool chosen is both valid and maps well to your Peak Profile.

To be validated, assessments must be interpreted as being relevant to the job while also reliably predicting future job performance. In addition, the organization's selection assessments must not adversely impact protected groups such as women or racial/ethnic minorities. Assessments are being utilized more commonly to weed out ill-fitting candidates quickly and with less bias. Some of the more advanced assessment tools, like Pinsight Leader Simulation, use online platforms to simulate an executive's experience, assessing leader behaviors in real-time and determining fit and readiness for executive roles. Drawing from the science of behavior and personality, and insights from tools like Pinsight, selection specialists can provide readiness timelines, an assessment of future potential, cultural fit and alignment with the organization's strategic goals.

Examples of Valid Selection Assessments

Pinsight Leader Simulation
The Hogan Battery
The Watson-Glaser™ II
Critical Thinking Appraisal

Examples of Assessments to Avoid for Selection

Myers-Brigg Type Indicator (MBTI)
The DiSC Personality Assessment
Emotional Quotient Inventory (EQ-i)

Getting the Right People in the Right Seats: The Succession Priority

With the baby-boomer generation retiring at a rapid rate, and with skilled, experienced labor becoming more and more difficult to find and retain, E&C firms must take a more strategic approach to identifying and selecting future leaders. Fundamentally, leadership selection decisions are the ultimate privilege and responsibility of senior executives. These choices arguably do more to shape an outgoing leader's legacy than any other business decision. That is why these decisions are so difficult and why any seasoned executive can tell many stories about the wins and losses when it comes to identifying the right leaders. While a rigorous and objective process for selection will never fully ensure the right choice, it does greatly improve the chances of success. In the face of a market that puts an increasing premium on talent and employees who rely on leaders to make accurate and informed decisions about their careers, disrupting the traditional selection model is not just a business imperative, but it's also the right thing to do.



Jake Appelman is a principal with FMI's Center for Strategic Leadership. He partners with architecture, engineering and contracting firms to build enduring organizations through exceptional leadership. He can be reached at jappelman@fminet.com.



Emily Livorsi, PhD is a consultant with FMI's Center for Strategic Leadership. Emily brings a solid understanding of leadership research and the latest talent development thinking to best serve a diverse group of firms in the construction industry. She can be reached at elivorsi@fminet.com.



Lauren Ramsay, PhD, SHRM-SCP is a consultant with FMI's Center for Strategic Leadership. Lauren brings deep expertise in organizational research and contributes to FMI talent management thought leadership to drive client success. She can be reached at lramsay@fminet.com.

Prefabrication: The Changing Face of Engineering and Construction



By Ethan Cowles and Sabine Hoover

For decades, industry stakeholders have lamented the inefficiencies and lack of productivity in the engineering and construction (E&C) industry.

Today, dozens of innovative companies are reshaping and transforming traditional E&C business models by learning and adapting new manufacturing and prefabrication techniques to work smarter, faster and safer. This “silent movement” is happening in pockets across the country, in different market sectors and across a range of project types and sizes. And while this may not be a sweeping transformational disruption across the entire E&C space, there is no doubt that transformation is happening.

Given that prefabrication has been around for decades, how is it influencing today’s U.S. engineering and construction environment and what—if anything—has changed since we last surveyed the industry in 2013? In this article, we provide fresh insights from FMI’s prefabrication industry study (conducted in collaboration with the BIM Forum) and offer several high-level recommendations on how to start thinking about innovation and prefabrication to prepare your company for the future.

A New Kind of Renaissance

Directly translated as “rebirth,” the word “renaissance” refers specifically to the rebirth of learning that began in Italy in the 14th century and ended in Northern Europe in the mid-17th century. It was during this time that the concept of the “Renaissance Man” was born: a man with many talents or areas of knowledge.¹ Such individuals included Da Vinci and Michelangelo, and their roles covered strategic advisor, builder, planner, designer, engineer, artist, inventor and physician—each of whom is considered a distinct profession today. These multitasking individuals were also commonly known as polymaths or “master builders.”

Several centuries later, during “The Age of Synergy” (1867-1914),² rapid industrial development blended with new technologies to advance engineering and construction

¹ <http://oxforddictionaries.com>

² Vaclav Smil called the period 1867–1914 “The Age of Synergy,” during which most of the great innovations were developed. Unlike the First Industrial Revolution, the inventions and innovations were science-based.

techniques. As a result, both disciplines became far more complex, forcing professionals to specialize in specific areas within their chosen disciplines. Consequently, the master builder’s environment splintered into many branches of specialization.

Fast forward to today: The construction industry is back on track since the Great Recession, and total construction employment has rebounded to just over 6.5 million³ workers (still a far cry from its peak of 8 million workers in 2006). However, despite being almost 20% below its 2006 peak, the industry is struggling to find qualified labor. Compounding these statistics, baby boomers are reaching retirement age at a rate of 10,000 per day, while fewer, less experienced (millennial) workers are moving into the E&C industry.

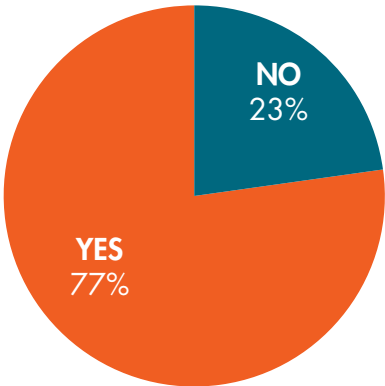
Simultaneously, the evolution of design and construction functions has taken a leap forward during the past decade, with the transition from electronic drafting to high-resolution digital modeling (also known as Building Information Modeling or BIM). Ubiquitous digital connectivity, cloud computing, 3-D printing and big data are just a few of the evolving drivers that are responsible for the current melding of engineering, architecture, fabrication, construction and other related disciplines.

Today, all of these factors are setting the stage for revolutionary change and have helped prefabrication and modular construction make a comeback at a time when low cost, resource efficiency and tight schedules are priorities. In essence, we are witnessing the undoing of 100 years of expansive industry fragmentation where contractors and designers alike are taking on the role of master builders again.

Geoffrey Golden, president at Golden Construction, stated, “We always saw prefabrication as a three-step process: Create, Innovate and Revolutionize. Create so it functionally works. Innovate so it holistically works. Revolutionize to improve the industry. It took us three years of hard work through our “creating stage,” before we started truly affecting the whole project. We currently reside in our “innovate stage” focused on making prefabrication affect the bottom line. We continue to see more and more success on our projects and look forward to transitioning into a “revolutionize stage,” impacting the industry and ultimately fulfilling our purpose to “Build People, Revolutionize the Industry.”

EXHIBIT 1

Is today’s prefabrication environment in construction different compared to three years ago?



Source: FMI/BIM Forum Industry Survey

³ Bureau of Labor Statistics. Employment statistics for May 2016.

Our recent industry research⁴ confirms that change is happening: Almost 80% of the survey respondents stated that today's prefabrication environment is different compared to just three years ago (Exhibit 1).

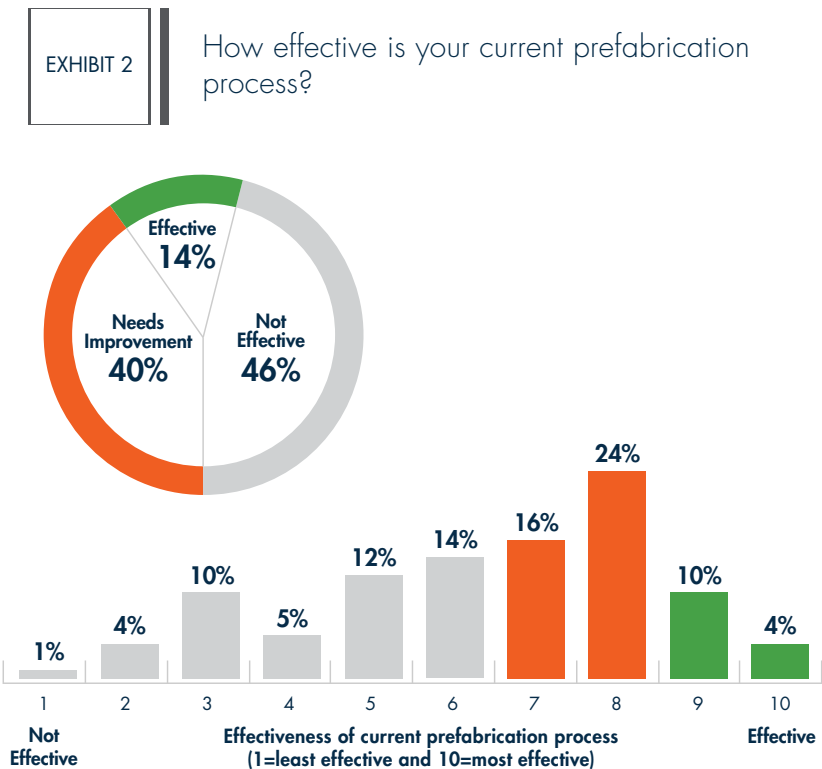
Prefabrication Today: A Snapshot

In fall 2016, FMI and the BIM Forum surveyed more than 150 contractors (both GC/CM and specialty contractors), and FMI conducted over 30 follow-up interviews with study participants to delve deeper into the survey findings. Following are five key research findings, which will be discussed in more detail in the upcoming study report:⁵

- 1. **The prefabrication environment has changed.** Almost three-quarters (74%) of study participants indicated utilizing prefabrication as a means of construction. Of those using prefabrication, almost 80% indicated that today's prefabrication environment is different than that of three years ago.

Aaron Thompson, director of operations at Corbins Electric, stated, “When you’re talking about large commercial projects, I don’t think prefabrication is going to be an option in the future. We’re seeing more and more written into the contract that off-site fabrication is mandatory, and the owners are not giving us a large laydown yard on-site. And if I’m already seeing that now, after the past three-year push, I can only imagine what’s going to happen in the next five to 10 years.”

- 2. **Most contractors struggle to make prefabrication effective.** One of the most staggering statistics in this study is that almost 90% of all survey respondents perceive their prefabrication process as ineffective or in need of improvement. Only 14% think their prefabrication process is effective (Exhibit 2).



Source: FMI/BIM Forum Industry Survey

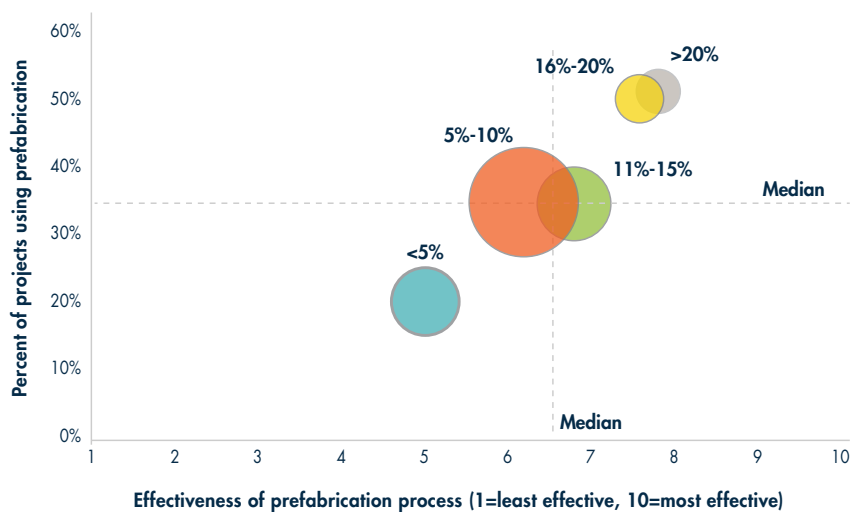
⁴ FMI and the BIM Forum partnered in fall 2016 to conduct an industry study on prefabrication.
⁵ The Prefabrication Industry Report is scheduled to be released in January 2017.

Steve Foote, vice president and operations manager at Greiner Electric, stated, “I’ve been doing prefab for almost 27 years. I’ve seen a lot of things that worked and were worth doing, but that didn’t work as well as originally desired. I refer to prefab as a “process,” in that you have to constantly evaluate it and be willing to experiment and try different things. You stay after it. You HAVE to listen to the field as they are living it, work out the problems they are communicating to you, and eventually you will hit on it just right. There are very few things we’ve ever done that were perfect right out of the gate, but you keep after it and will get there. Prefab definitely takes a vision and an unwavering commitment. The fundamental concept of prefab is solid: When done right, it will save your field forces a lot of time, and I firmly believe there will not be enough field guys in the very near future—if not already. A contractor has to ask itself the obvious question: ‘How are we going to accomplish the same results without all of the field manpower?’ There is a steep learning curve. It is huge. If you fail at prefab, it’s expensive. You have to have that mindset of, ‘Ok, that was all right, but if we had done it like this or used these parts, or done it this way instead, it would have worked out a lot better.’”

3. Practice makes perfect. Making prefabrication truly effective requires a steep learning curve. Our research findings show that contractors using prefabrication on more than 50% of their projects not only are more effective, but also expect to save over 16% of total annual field labor cost. The majority of survey respondents lie in the midrange of our effectiveness scale (around 6) and only expect to save 5-10% of total annual field labor cost (Exhibit 3).

EXHIBIT 3

What percentage of total annual field labor cost do you expect to save through prefabrication?



Source: FMI/BIM Forum Industry Survey.
Note: Bubble size represents the number of respondents

4. **Timing is critical.** Only a fifth (21%) of study participants plan for prefabricated assemblies during the design stage. Three-quarters of respondents plan for prefabricated assemblies during preconstruction (56%) or construction (15%), which might explain some of the challenges related to effectiveness mentioned earlier.

Another important aspect is the fact that prefabrication requires a completely different “control” philosophy. Guy Skillett, director of construction at Rhumbix, explained, “Construction companies are accustomed to planning, sequencing and executing their work using traditional scheduling methodologies. When you move to prefabrication, processes for production planning and control change substantially. Prefabrication relies on managing just-in-time delivery and inventory, and with traditional construction planning methods, you’re pushing your planning out into the future. The problem with that is it’s making huge assumptions about where the project, your materials and everything else will be in the future. Unless you’re paying very close attention to your schedule, updating it appropriately and monitoring at the right level of detail, these forward-looking forecasts may not necessarily be reliable.”

5. **Project inefficiencies and improved technologies drive prefabrication.** Study participants listed the following top-three factors in driving the demand for prefabrication: 1) The need for productivity improvement and lean construction, 2) improved technologies and 3) competitive advantage (in winning bids and increasing profits).

Innovating With Prefabrication: It’s More Than Just Technology

Prefabrication is not new, yet our findings show that the industry is still struggling to adapt this manufacturing technique at a broad level. With the rapid emergence of innovative technologies, such as augmented reality, 3-D scanning and printing, XD-BIM, drones, etc., it is easy to get caught up in all the technology buzz and forget about what it really takes to innovate and change.

From our work with clients and conversations with study participants on the topic of prefabrication, one thing has become very apparent: The biggest barrier to change and transformation as it relates to prefabrication is not technology, it’s culture. Getting people to embrace new ways of thinking and doing work differently is one of the most challenging (and most critical!) aspects of successful change. The following recommendations touch on some key areas that can make or break a successful prefabrication strategy:

1. **Prefabrication starts at the top.** As with all important strategic initiatives, the “business of prefabrication” starts at the top, with committed leaders who communicate a clear strategy and strong message around what it is the company is trying to achieve. Successful companies typically select a champion at the executive level to head up the prefabrication initiative and ensure that everyone is aligned with the company (prefab) vision and strategy.
2. **Wanted: A “Why can’t we?” culture.** One of the common themes across all the interviews was the challenge of overcoming set ways and old habits. Introducing an innovative concept like prefabrication takes people who are curious, tenacious, willing to learn new things and willing to take risks. It is also particularly important to develop a culture in which employees are not afraid to make mistakes and where everyone is open to learning from each other’s mistakes. As one interviewee stated, “It’s important for the field guys to

know that they can communicate the issues they're running into and that there's a willingness to hear and evaluate that feedback. Ultimately, they're the ones who have to install everything."

3. ***It's an all-or-nothing deal.*** In our work with contractors, we often come across situations whereby a project manager or superintendent might be experimenting with prefab on a project-by-project basis. Prefabrication, however, is not something you can just dabble in and expect to see big returns from. It is an entirely different business philosophy that must be a fundamental part of the corporate strategy. Otherwise, it just ends up being a very expensive mistake. As one study participant confirmed, "You have to be committed to it, because you fail more at prefab than you're going to succeed. It takes a long time to get somewhat good at it."
4. ***Leverage young talent.*** Many millennials grew up with parents, teachers and counselors who were their best friends and role models. As such, they are excellent team players and care about the company's success—not just their own jobs (see FMI's Industry Survey, "[Millennials in Construction: Learning to Engage a New Workforce](#)"). The timing for this kind of mindset is perfect: BIM and prefabrication require a high degree of collaboration within and among project teams. Having these young people focused on a common purpose, effective processes, excellent communication and solid relationships will help transform your company over time.
5. ***Do your homework.*** Before jumping into the world of prefabrication, learn the industry best practices and study some of these questions and topics:
 - a. What types of customers or work require prefabrication?
 1. How fast will demand grow for this type of work?
 2. Does this fit into your company strategy and vision?
 - b. What is different about using prefabrication? And what are the implications for your organization?
 1. For example: What are best practices for inventory controls, tracking work progress, packaging, shipping and delivery, etc.?
 - c. How do you implement prefabricated assemblies effectively in the field?
 1. What new skill sets and competencies are needed? How do you prepare your workforce to adapt to all of these changes? What are the cultural implications?

Looking Ahead

In the wake of the Great Recession, companies of all sizes have started to redefine themselves by looking at new and innovative ways to deliver projects and explore new "spheres" of the built environment. While some have made more progress than others, the industry as a whole still has a long way to go to increase productivity and overcome project inefficiencies.

However, there is a distinct undertone of emergence here that presents growing concerns and opportunities for the successful company of the future. There are new questions and problems to be tackled and solved, including:

- What will the construction/manufacturing/design firm of the future look like?

- What role will prefabrication play, and what happens if our company doesn't begin the learning curve now?
- Where will we find the talented people to work in the emerging world of integrated technologies and project teams?

The new master builders will need to solve these problems, and today's "design, engineering and construction industry" organizations will likely be positioned very differently 10 to 15 years from now.

FMI will continue to study and analyze these evolutionary trends and provide insights into this critical business area on an ongoing basis.

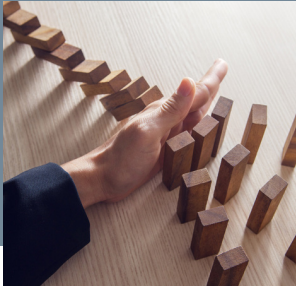


Ethan Cowles is a principal at FMI. Ethan has worked with both general and self-performing contractors helping them to develop a strong understanding of the financial risks and rewards inherent to operational issues. Ethan assists these contractors to maximize productivity and minimize risk by implementing proactive management processes. He may be reached via email at ecowles@fminet.com.



Sabine Hoover is FMI's content director and chief editor for the FMI Quarterly. She is responsible for leading and setting strategic direction for research and content development across the organization. Sabine may be reached via email at shoover@fminet.com.

From Fearless to Feeless: The Changing Value Proposition in the Construction Supply Chain



By Jay Bowman

Why some construction managers may decide to forgo fees in the traditional sense to disrupt competition.

Numerous industry evolutions—both the kind that take time to develop and those that emerge rapidly—are creating distinct competitive necessities and advantages for engineering and construction (E&C) firms. These developments could exclude certain contractors from their traditional pursuits, namely due to shifts in organizations' capital investment strategies, procurement practices and preferred project delivery approaches. For example, the influx of megaprojects (i.e., projects valued at \$1 billion or more) has reduced market opportunities for contractors that are unable to compete due to size limitations, bonding capacity and/or a lack of demonstrated experience.

In this article, we'll explore key pricing trends in the E&C industry, show how more construction management firms are relying on non-fee revenues, and illustrate how these strategies can help companies shore up their bottom lines and plan for future growth and success.

The Big Fee Squeeze

Megaprojects may be a top-of-mind issue for E&C firms right now, but price is another area that can severely limit contractors' ability to secure contracts. Although not representative of all U.S. construction markets and segments, many project owners have become exceptionally aggressive at driving down the construction manager's fees in recent years. This has forced construction managers to become more creative with revenue and profit generation, relying on more non-fee sources than usual.

Meanwhile, there's been significant and accelerated industry disruption that's blurred the distinctions between services and providers and ultimately resulted in value migration. This outsized imbalance between project owner pressure on fees and the limited revenue and profit contribution fees provide could push construction managers to forgo fees in the traditional sense altogether. In turn, these construction managers may introduce new non-fee sources of revenue and profit—a move that can improve financial engineering capabilities and help firms remain competitive (and viable). Moreover,

we may be witnessing the elimination of fees altogether in certain corners of the industry within the next 10 to 15 years.

Historically, construction management fees have ranged from 3% to 5% of construction costs. Since 2008, however, pressure on construction management fees has become increasingly acute in several markets and segments. For example, it's not uncommon for construction managers to accept fees much lower than this "traditional" range, often at 1.5% or less.

A 2014 study by the Construction Management Association of America (CMAA), for instance, highlighted examples of construction management/program management (CM/PM) fees of almost 0.5%. At these levels, fees represent a mere 10% to 30% of a typical target of 5% gross project profit margin. Moreover, assuming most construction managers operate on a 3% project overhead structure, fees at 1.5% or less alone suggest a losing proposition (without other means of generating revenue and profits to cover a firm's fixed costs).

Fees have contracted significantly over the past several years in numerous markets and segments—a trend that's forcing construction managers to use alternative revenue and profit contribution strategies to compensate for this loss. To offset the lower fees, construction managers are looking to add value in new areas of the construction supply chain—a (paradigm) shift to non-fee sources.

Today, it's estimated that more than half of a typical construction manager's revenue and profit comes from non-fee sources. Some of the key drivers of this trend include clients' tighter budgets and fewer staff members as well as advancing technologies that require expertise beyond what most owners can support.

Based on several years of industry research and client work, FMI's research team has identified the following four key areas in which innovative and progressive construction managers are adding value to remain competitive.

Four Ways to Add Value to Clients Across the Supply Chain

1. Exploring upstream opportunities. The convergence of design and construction practices and other services (e.g., master planning, program management, asset management, etc.) has disrupted the industry and is resulting in value migration (away from construction in the traditional sense). This is not unique only to construction. Engineering is experiencing the same pattern of commoditization. Consequently, value is increasingly captured at the front end of projects, even before the design phase. This makes planning and design/preconstruction services increasingly important for construction managers to offer as part of their core services.

At a recent Builders Roundtable, Andy Morgan, vice president at Vanir Construction Management of Sacramento, stated, "Construction management firms are evolving to offer more services. In California, for example, planning projects and interfacing with the state regulatory process to secure funding and approvals have become more complex with each funding cycle. Construction managers provide those services."¹

2. Capturing value beyond construction. With the traditional function of design and engineering morphing into systems design and simulation, value migration is extending beyond construction. This includes business areas such as asset man-

¹ "Builders Roundtable: The Value of Construction Managers." Correctional News. 07/06/2016.

agement, facility management, marketing and leasing, capital expenditure forecasting, building commissioning, etc. Buildings, infrastructure and other components of the built environment are already being modeled and simulated using the vast computational power of the “cloud,” which allows project stakeholders to analyze various performance issues and building characteristics.

Put simply, value no longer resides solely (or primarily) in traditional construction or construction management. Because this varies significantly by project owner type, market and segment, construction managers must understand their clients’ needs, value perceptions and likely procurement practices and preferences. In the future, no construction manager’s business strategy will be complete without this deeper system-thinking approach.

3. **Leveraging technology to integrate and streamline.** In addition to value migration as a disruptor to traditional construction management fee structures, technology will likely have a significant impact, further commoditizing the “construction only” aspect. Companies are developing software programs that integrate planning, estimating, cost management and project controls. These programs provide an integrated, one-stop solution—something project owners have desired for decades. As such, technology consulting is becoming as important a service offering as preconstruction for some project owners.

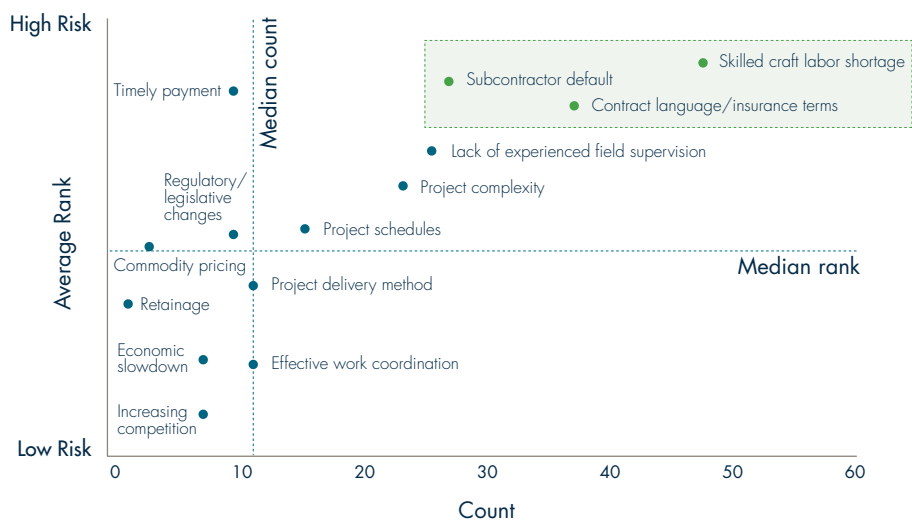
Similar advances are occurring in the realm of Building Information Modeling (BIM), where project owners have long been frustrated by the multitude of models employed and the lack of integration. The solutions now being introduced could reduce construction bidding to simple unit pricing—a big shift from traditional estimating and bidding practices. As this new ability is introduced, construction managers must either find other, higher-value services to offer or distinguish their ability to deliver projects more efficiently and cost-effectively than the competition. Otherwise, all contract award decisions will be based solely on price.

4. **Understanding risk transfer.** Fees have contracted significantly over the past several years in numerous markets and segments—a trend that’s forcing construction managers to use multiple other revenue and profit contribution strategies to compensate for this loss. To offset the lower fees, construction managers are using general conditions reimbursements, insurance and risk management (e.g., Contractor Controlled Insurance Program—CCIP, Subguard™), project buyouts and performance bonuses.

Understanding risk and how it’s transferred are key areas that construction managers can use to differentiate themselves. According to a recent industry risk study conducted by AGC and FMI, owners are putting more pressure on project costs and schedules while modifying contract terms to place greater risk on all contractor levels (CMs, GCs and specialty trade contractors) – see Exhibit 1. As a result, contractors must identify and assess risk more carefully and understand how that risk is allocated among all project stakeholders. In short, the risk environment is becoming increasingly complex, thus enhancing the importance of risk management programs for today’s construction firms. Our study findings also indicate that many contractors lack solid methods for understanding the appropriate risk transfer and processes to effectively manage risk.

EXHIBIT 1

Top risks today include skilled labor shortage, contract language/insurance terms and subcontractor default



Source: 2016 AGC/FMI Risk Survey

Strategic Move or Competitive Response?

Is the reduction in fees simply a competitive response (i.e., construction managers are influencing this trend), or does it reflect the project owner's perceived value of construction management? While the former will hold true in many situations as a competitive reality, there is evidence that suggests the latter will have increasing influence on the construction manager's ability to increase fees. Regardless of what's pushing E&C firms to rethink their fee structures, the reality is that both competition and owners' perceived value are impacting traditional industry pricing structures.

For example, consider the fact that larger construction managers are more likely to pursue non-fee or low-fee competitive strategies since they have the necessary capital to sustain this kind of pricing strategy. They may choose this approach to displace smaller construction managers or to prevent them from competing successfully. They may also pursue this type of pricing strategy because they can achieve higher profit margins on non-fee revenue and profit sources.

Also, scale does provide an advantage. Larger construction managers can leverage insurance and risk management as revenue and profit contributions as well as general conditions. For example, larger construction managers can typically get more people staffed on a project and secure higher variables on these people's rates. Moreover, these people may be double- or triple-staffed. Last, maximizing the contribution of non-fee sources may be more profitable than trying to compete on fees.

Regardless what the future holds for contractor fees, whether they remain where they currently are or return to historic norms, project owner expectations have changed. The expanding services that construction managers must often provide to differentiate themselves and achieve competitive advantage are not cheap. Moreover, the level of risk that is increasingly being transferred to contractors (across all levels) must be compensated for in some way or another. Therefore, construction managers should always explore and pursue non-fee opportunities. The question company leaders should ask is, "If fees do not increase, will the company be able to achieve its financial targets in

the long run?” If the answer is no, then taking a hard look at your non-fee opportunities should be one of your first steps.

Point of Differentiation

The concept of a fee-less construction manager is not novel. Following the Great Recession, many construction managers were not only fee-less but also had negative fees. The decision to have zero or negative fees was born out of necessity and pure survival. Those construction managers would then rely on non-fee revenue and profit sources to either break even or achieve limited margins. Construction managers may decide to go fee-less in the future, regardless of current economic and market conditions. What may differentiate these construction managers from others could also extend to the breadth of services offered and project roles assumed.

Construction management has always been, and always will be, a high-risk business, particularly today where risk is increasing exponentially along with changing industry dynamics and introductions of new technologies. The delivery of services and compensation for those services will also evolve. What will not change is the construction manager's responsibility to understand clients' needs and perceptions of value and then to maximize opportunities in a quest to find the meeting point between the two. Therefore, construction managers should contemplate where their perceived value lies in the service chain and whether they've truly maximized their own company's non-fee revenue and profit sources.



Jay Bowman is a principal with FMI. Jay assists a broad range of stakeholders in the construction industry, from program managers and general contractors to specialty trades and materials producers, with the identification and assessment of the risks influencing the strategic and tactical decisions they face. He can be reached at jbowman@fminet.com.

Your Supply Chain at Risk: The Value of a Strong Resiliency Program



By James Boileau, P.Eng. and
Angela Skow

The interconnectivity of today's global economy can pose major financial and reputational risks to general contractors. Strategies such as outsourcing, offshoring and just-in-time sourcing can create corporate efficiencies, but these approaches can also increase general contractors' vulnerabilities to supply chain disruptions and expose them to global risks, no matter where they are operating.

Supply chain resiliency is more critical to business profitability and reputation than ever before. Some key insights into supply chain resiliency you should consider include:

- Know your key suppliers and customers and where they are based; develop an understanding of the profit/revenue exposure if they fail. These are fundamental performance issues as much as they are risk management issues.
- Understand whether your supply chain can be disrupted by more than just physical events; factor this into your overall resiliency strategy.
- Determine if your insurance coverage is Named Peril or Named Supplier, as this is an important distinction that should be evaluated.

A study by the Business Continuity Institute uncovered deep-rooted sources of supply chain failure. Respondents from various industries in 62 countries revealed that nearly 75% of organizations reported at least one supply chain disruption over a 12-month period studied, and 50% of general contractors had more than one disruption (Exhibit 1). Approximately 40% of disruptions originated below the immediate tier 1 suppliers. Many of these disruptions were also nonphysical and beyond a general contractor's control, such as change in the government or regulatory environment or financial insolvency of a supplier.

EXHIBIT 1

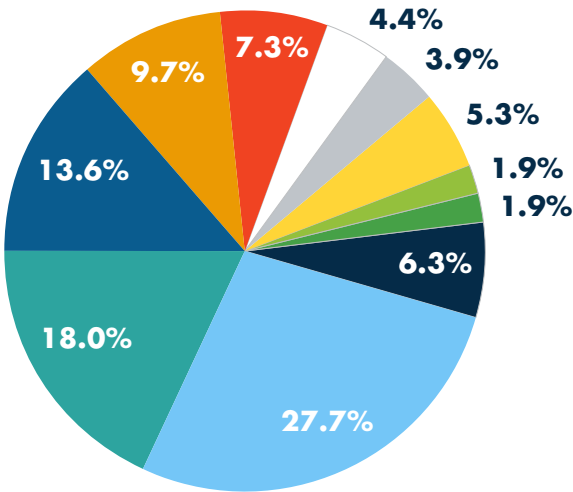
Supply Chain Statistics:
Disruptions Are More Frequent

How many supply chain incidents would you estimate your organization experienced in the past 12 months that caused disruption to your organization?

Over 50%
Had More
Than One
Disruption

Nearly 85%
Suffered a
Supply
Disruption

42% of
Disruptions
Originated
Beyond Tier 1



Number of Disruptions
0 1 2 3 4 5 6 10 20 More than 52 | All Other Responses

Source: BCI survey; over 300 companies responded.
Zurich-sponsored study with Business Continuity Institute.

EXHIBIT 2

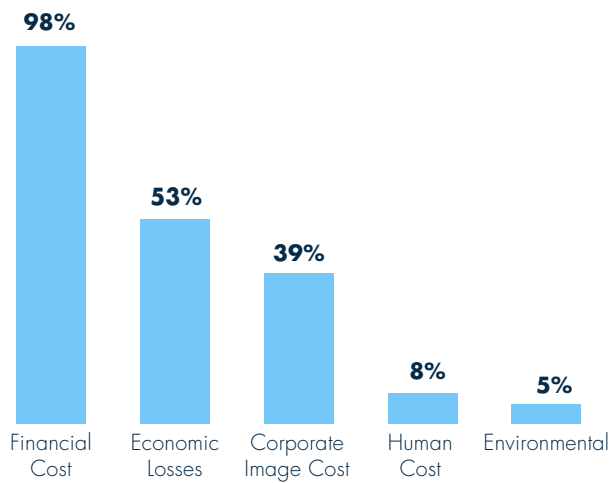
Analysis of 3,000
Supply Chain Disruptions



Source: Zurich’s supply chain loss event database, 2001-2014

EXHIBIT 3

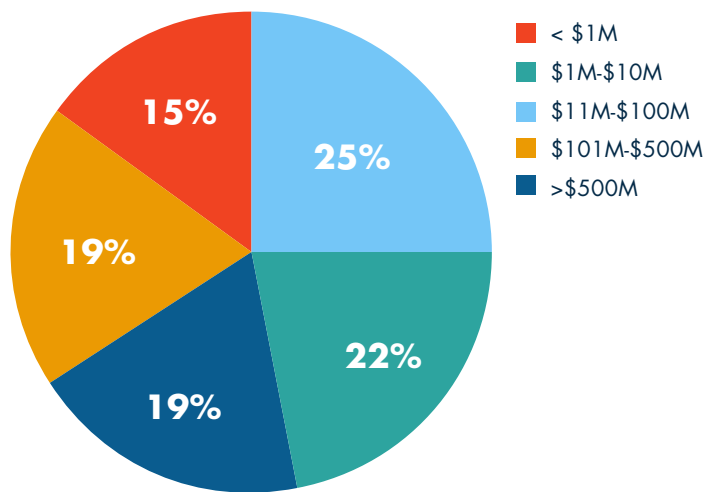
Resulting Impacts From
Supply Chain Disruptions



Source: Zurich’s supply chain loss event database, 2001-2014

EXHIBIT 4

Financial Consequences of Supply Chain Disruptions



Source: Zurich’s supply chain loss event database, 2001-2014

Supplier availability isn’t the only issue that can create problems; it could be that your customer is not able to accept your service, which can then impact your revenue. Beyond the immediate loss of revenue, these disruptions can also result in long-term effects, such as damage to reputation, shareholder concern and increased regulatory scrutiny. Both of these short- and long-term effects underscore why it should be a high priority for risk managers to help develop a program to protect the organization’s supply chain from the impact of unpredictable events and potential coverage gaps.

Deeper Analysis of Supply Chain Risks

In today’s complex global marketplace, many general contractors and their insurance brokers must address supply chain exposures and create a sustainable management solution for these risks. Generally, the onus is on general contractors to identify suppliers/customers and their locations in their chain. Overall, there is increasing pressure to determine key suppliers and limit further unnamed or unspecified business interruptions (in particular CAT perils). Today, general contractors are recognizing that supplier disruption is not caused only by physical damage, and they are seeking broader coverage for these expanded risks.

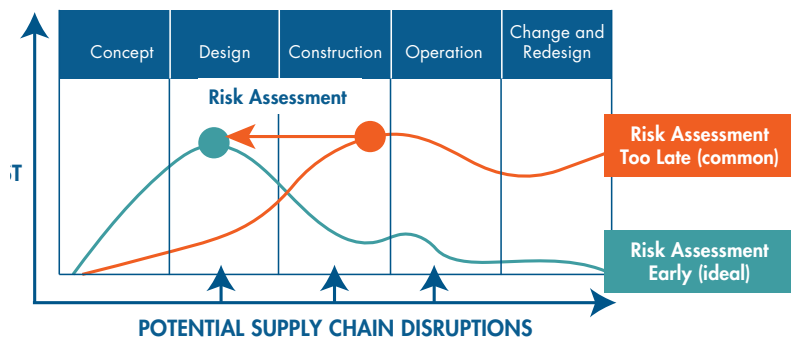
The Case for Developing a Comprehensive Risk Assessment Approach

To properly assess your supply chain risk, one of the first and foremost steps is to ensure top management’s commitment to the process by developing a total risk profile. Key considerations should be given to long lead items as well as single-sourced materials and equipment.

Utilizing a comprehensive risk assessment approach including tools for analyzing the complexities of extensive investment, you can map out critical supply chains and profit dependencies. Tools that consider industry/supplier exposure from political, economic and structural perspectives will help provide the insights needed to evaluate your exposure and facilitate informed decision-making. To minimize cost impacts, risk assessment should be done early in the design-estimating phase.

EXHIBIT 5

Construction Project Lifecycle



Source: The Zurich Services Corporation, 2015

By identifying key suppliers, you can narrow your focus to those suppliers that are most critical to protecting your profitability. The risk assessment should focus on the specific supply chains (combination of supply and supplier) you may wish to better understand (and possibly insure). Assessments should provide both an in-depth understanding of the quality of management of the supply chain risk and the financial impacts of an interruption.

Assessments can:

- Help identify key suppliers/supplies.
- Enable you to identify potential improvements to processes and performance.
- Identify areas of residual risk.
- Provide the estimated and probable maximum loss scenarios for each supply to promote a deeper understanding of the potential financial impacts associated with a disruption in the delivery of particular supplies.

Here are examples of some unforeseen exposures that were discovered through the customer risk assessment:

Detecting financial red flags. Two key suppliers at the next level to tier 1 in the supply chain were in significant financial trouble. The risk assessment helped the customer identify the problem, then follow up and decide how to deal with the situation. When conducting financial monitoring, companies tend to focus only on their tier 1 suppliers.

Exposure due to potential supplier failure, which can create costs that are higher than initially estimated, is very common among customers who underestimate the impact of these failures. In this case, the impact of this particular supplier failure was \$10 million versus the estimated \$1 million (USD).

Tracking potential geographic challenges. A company that had dual-sourced a key component discovered that a supplier and its alternative were located in an earthquake zone. This company had checked on the financial viability of its suppliers but hadn't done natural catastrophe mapping to discover that both of these suppliers' production facilities were located in an earthquake zone. Without a risk assessment, they were completely unaware of supplier overlap to natural catastrophes, putting their organization at risk for these unforeseen problems.

Balance Cost Savings with Supply Chain Risk Management

An organization must strike a balance between cost savings within its supply chain and the potential financial exposures from a disruption. One common mistake many organizations make is focusing solely on finding the lowest procurement costs, without considering risks and associated impacts on revenue and reputation.

Once an organization has its comprehensive list of supply chain risk scenarios and develops a better understanding of potential disruption and recovery costs, it can start to ascribe a total cost of ownership (TCO) to these risks. An organization that has proactively identified, prioritized and managed its risks and costs will be well on its way to a more financially sustainable future—supported by the appropriate level of Contingent Business Interruption (CBI) coverage for physical risks and Supply Chain Insurance for nonphysical exposures. Organizations that deeply understand and better manage their risks can reduce the odds of being hit in profit and cash terms as well as maintaining customer and shareholder relationships.

Supply Chain Checklist: Helpful Questions to Ask

- Do you know who your critical suppliers and customers are, and how much their failure would impact your profits?
- Have you fully mapped your critical supply chains upstream to the raw material level and downstream to the customer level?
- Have you integrated risk management processes into your supply chain management approaches?
- Do you have routine, timely systems for measuring the financial stability of critical suppliers?
- Do you understand your tier 1 production facilities and logistic hub exposures to natural catastrophes?
- Is supply chain risk management integrated into your enterprise risk management approach?
- Do you record the details of supply chain incidents and the actions you have put in place to avoid future incidents?
- Do your tier 1 suppliers have business continuity plans whose viability has been tested?
- Have you provided risk training to your supply chain management team?
- Is risk on the agenda at performance meetings with your strategic suppliers?
- Do you routinely use Total Cost of Ownership when making sourcing decisions?
- Do you accumulate the hidden costs associated with each supplier: travel costs, inventory carrying costs, warranty and rework costs, etc.?

Benefits of Contingent Business Interruption Insurance Coverage

Developing a Contingent Business Interruption program can help provide necessary protection in an environment of complex supply chains and global products sourcing.

Contingent Business Interruption is an extension to traditional property Business Interruption (BI) policies. While BI insurance can cover loss of income caused by direct damage to the insured's property, CBI can cover loss of income caused by direct physical damage at a supplier or customer location. These suppliers and customers can be named or unnamed, but this distinction could impact the limits being offered.

Any general contractor considering CBI coverage for the first time, or entering into a renewal period with their BI/CBI coverage, should start planning early with their broker and insurer to gather the more defined supplier-specific risk and customer data. This can help ensure that the appropriate risk mitigation, coverage and limits can be put in place—including both requirements related to CBI and potentially broader “all risk” supply chain insurance.

An effective CBI program that includes risk assessment tools and data analysis can be very beneficial for a company's overall profitability and shareholder value. In addition, it helps general contractors understand some of the many factors that their supply chains are exposed to beyond physical risk. It can also facilitate an understanding of profit exposure at an individual supplier level and within a particular project. By monitoring key bottlenecks in the supply chain, such as a particular port location or production site, the general contractor may be able to quantify and put into place the appropriate mitigation and recovery plans, including business continuity plans.

The first step in understanding CBI exposures is for a general contractor to work with its suppliers and major customers to identify and quantify the key exposures in the value chain. To gather the data, a CBI questionnaire worksheet can be used to help a general contractor and broker determine which suppliers or customers are most critical, what CBI limits are possible and appropriate, and whether supply chain insurance is needed to cover nonphysical risks. Such disruptions are not only caused by physical damage but also by factors such as transportation, IT outages, labor shortages and communication issues. Because of this, understanding trends in prior disruptions helps companies identify actual causes of business interruption and determine the cost and nature of disruptions for a particular project.

Many organizations find that integrating the management of supply chain risks into a captive insurance company offers greater flexibility, savings and control over their cost of risk. Some of the benefits of using a captive include access to reinsurance capacity, freeing up premium allocation, securitizing supply chain risks and funding risk assessments. Using transparent and consistent reports that form the captive infrastructure can give senior executives a better understanding about the strategic impact of supply chain disruptions.

Knowing your supply chain risks and implementing an effective CBI program is more important than ever in helping to ensure a strong financial position and long-term viability for your organization.

¹ Business Continuity Institute (BCI) Survey, November 2011

James Boileau, P.Eng. is the Construction Segment Director for The Zurich Services Corporation and Angela Skow is the Vice President of Controlled Insurance Programs for Zurich North America's Construction group.

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The Battle for Control: Whose Box Will Run Your Building?



By Porter Wiley

A look at the rapidly evolving landscape following the growing demand for intelligent, interconnected commercial and residential buildings.

The stakes are high for what PriceWaterhouseCoopers estimates to be a \$150 billion global smart home industry by 2020. And ABI Research recently released a study predicting that annual worldwide services revenue from smart building global facility services will grow from \$625 million in 2015 to more than \$8 billion in 2021.

The winners get a lucrative new revenue stream, control over the information generated by the building occupants, and, perhaps even more importantly for product manufacturers, influence over which components are installed in the building. In the race to achieve these goals, manufacturers are enabling products to communicate in the wired world and vying to become the new influencers in the customer purchase decision—or even better, the controllers of this new dynamic.

The ABI study also highlights the many different types of companies pursuing these markets—original equipment manufacturers (OEMs), system integrators, security companies, telcos and platform vendors. The two areas with the most growth potential are HVAC control systems (49% of smart building revenue by 2021) and smart lighting (32%). As the largest consumers of building electricity, this prediction is not surprising.

Companies within this new ecosystem are spending a great deal of time and money in a modern-day gold rush of sorts, with startups elbowing for space with Fortune 100 companies. However, there is still a great deal of uncertainty over where exactly that “gold” lies or even how to mine it successfully. Despite these uncertainties, everybody is sure that—as Dr. Matthew Fleming Stephenson once said—there definitely is “gold in them thar hills.”

In this article, we’ll explore emerging trends in the burgeoning markets for connected residential (smart homes) and commercial buildings (smart buildings), and how recent merger and acquisition (M&A) activity around the market hints at the different strategies companies are pursuing to stake their claim. Which strategy or company will be successful? It is still too early to declare any winners, but some companies certainly have some built-in advantages and a head start.

The Changing Landscape of Smart Buildings

A web of interconnected systems and devices with lights, smoke alarms, HVAC systems, security, water, appliances and other systems managed through a central interface, the new smart building has officially arrived. In the past, these systems—while perhaps sophisticated in their own right—existed independently and did not communicate with one another. Today, manufacturers are rushing to find ways to connect and integrate their products with all components of the building and related monitoring services, and linking the information back to the building owner.

Exactly which companies will control the interface is still an open question, but the stakes are obviously high. Buildings represent the largest energy end use in the world, consuming roughly half of global electricity. This fact has been a driving force in the early development of the smart building, which saves money by optimizing the efficiency of electrical systems, matching occupancy patterns to energy consumption and improving equipment maintenance with real-time data collection.

The economic benefits for commercial building operators are clear and have been for some time. Better building information leads to lower energy costs, but it can also lead to better building performance and healthier environments for its occupants.

Who Are the Players in the Smart Building Space?

Companies at every stage of the energy life cycle are participating in this market: the utilities that produce and transmit the energy, the manufacturers whose products consume the energy, the software and controls that network and manage the building systems, to the ESCOs that design, implement and install the Building Management System (BMS) with LED lighting, distributed energy and high-efficiency HVAC systems.

More advanced BMS programs may manage a wide range of components such as those aimed at maximizing energy efficiency by regulating fan speeds, window shades, water chillers or electrical loads during peak periods. They may also control sprinkler or fire alarm systems, monitor air quality and adjust ventilation as needed and manage building security and telecommunications.

Recent M&A activity in the sector indicates that many of the players in this market are crossing over, entering adjacent markets via acquisition to gain an edge in this rapidly evolving landscape. Some examples of this activity:

Duke Energy is one example of the many utility companies that are buying their way into the ESCO business. The company recently purchased Phoenix Energy Technologies, which provides energy management software and services to help building operators reduce energy consumption. Utilities increasingly see the future of their business being in value-added services rather than the simple provision of commodity energy. New energy and distributed generation are viewed as a long-term threat to the current business model.

GE Current is a portfolio of products and services GE has put together to serve the smart building market. It offers hardware and software solutions for energy optimization, on-site power generation, networked lighting and more. Part of this portfolio is Daintree Networks, a provider of smart building control, sensing and Enterprise Internet of Things (E-IoT) applications, featuring a networked wireless and software solution. GE Current acquired Daintree in April 2016 for \$100 million.

Acuity Brands is a leading manufacturer of commercial lighting systems. The company has made several acquisitions related to building information and

management. In January 2016, Acuity acquired GeoMetri, a provider of software for mapping, navigation and analytics for pedestrian foot traffic and building occupation. In July 2016, Acuity acquired DGlogik, which offers a hub to manage, visualize and monitor facility data from various building systems into a singular interface.

Earlier in 2013, Acuity acquired Adura Technologies, which designs and manufactures commercial building lighting control and energy management solutions. Acuity is a prime example of how traditional building product manufacturers are embracing technology as a means to improve the performance of their products as well as their market position.

Honeywell has a variety of products targeting the smart building, but it made a notable purchase in 2015 of Elster Group, a manufacturer of metering devices for gas, electricity and water for \$6.5 billion. By controlling the meter where the electricity enters the building, Honeywell ensures itself a seat at the table, as the energy must pass through its device. Elster meters can be fit with additional sensors and networked to provide valuable energy management data to the system.

Robert Bosch acquired Climatec in January 2015 to bolster its ESCO business. Climatec is a single-source integrator of critical building systems, including energy services, building automation and security system integration in the U.S. market. The company provides consulting, planning, implementation and 24/7 remote management of comprehensive comfort, security, safety and efficiency solutions.

Smart, connected products are reshaping the industry's competitive landscape while also expanding the industry's definition and purpose. As competitive boundaries widen, product capabilities expand exponentially to meet the broader needs of end users. By integrating smart, connected HVAC systems, for example, owners can enhance overall facility performance.

Several important implications for building product manufacturers include:

- Just as the smart building is a network, so must product manufacturers think of themselves as part of a network. Which companies should you align with? Which products and software must you be compatible with? These choices will be important.
- Purchase decisions become more complicated with more participants in the process. Product manufacturers must develop a strategy to touch and influence each player in the process.
- Technology will evolve rapidly and so must product capabilities.
- The mass collection and wise use of data will be required to sell product advantages.

Creating the Smart Home

The smart home market is still in its infancy, but it holds great promise for increased energy efficiency and lifestyle improvements. Eliminating complexity is the key to success in the smart home market, where consumers want products that are simple to use, easy to set up and secure. This need for simplicity and security is currently holding the market back from becoming the mass phenomenon it promises to be.

Communications protocols like Z-Wave, Insteon, ZigBee, Wi-Fi, BlueTooth, Thread and Apple HomeKit are all vying for market acceptance and supremacy right now. After all, devices can't talk to one another if they don't speak the same language. This situation increases complexity and cost as product manufacturers program their devices to speak all these languages (and many can't). It will also inevitably shake out over time to one (or several) winners since the current "free for all" is both confusing and inefficient.

A fully integrated smart home is an ecosystem in which participants at each step want to capture their share of this fast-growing market. This includes electric and telecom utilities, technology giants and the manufacturers of the many products that are wired for connectivity (lighting, HVAC, security, sensors, appliance, etc.) The interface must be managed by a central control and software. Whose control and software will it be? That is the big question, as the winner will have access to a significant service revenue stream, influence over the products installed and reams of data crying for a way to be monetized.

So which companies are competing to control this emerging market? Below are a few companies seeking to capture this market:

Google may not have fired the first shot with its \$3.2 billion purchase of Nest in 2014, but that move was surely the loudest. A smart thermostat manufacturer developed by former Apple engineers, Nest promised Google control of the building's brain (or so it was said to justify the eye-popping price). Subsequent developments (specifically the introduction of the Amazon Echo) have demoted Nest to merely another device on the network. Nest knock-offs by Honeywell, Ecobee, Schneider and others now make Google's acquisition look overpriced. Despite being beaten to market by Amazon, we would not rule Google out. Simplicity in the interface and software design will be a key determinant of success in this market—things that Google has already done with Android.

Amazon surprised the market with the introduction and success of Echo and its digital assistant Alexa. Echo made Amazon an early leader in the home hub sweepstakes.

Apple launched HomeKit, which connects various home appliances to iOS devices. With tens of millions of "controllers" already out in the market (iPhones, iPads), Apple is well-situated to assume a leading position in this market. To date, Apple is only marketing its software without Apple-branded devices yet in the market; just how and if Apple is able to monetize the HomeKit app remains to be seen. Apple has a proven history of simplifying the complex and seamless interoperability, but the bias of device manufacturers towards their own software may be a roadblock.

Samsung announced its entry into the connected home with its 2014 purchase of SmartThings for roughly \$200 million. SmartThings is a manufacturer of hubs, sensors, outlets and other smart devices for the home. The hub and app interface are the keys to the system and are compatible with all Z-Wave gadgets. It will be interesting to see how Samsung and Google compete in this market. Though Samsung has millions of cell phone handsets in the market capable of managing the smart home interface, Samsung phones run on Google Android software. Another natural transition will be the integration of Samsung TVs and appliances.

Verizon, AT&T and Comcast already have tens of millions of computerized boxes in homes and an existing monthly relationship with its customers. It would not take much to add additional smart home functionality to cable or satellite

receivers. Comcast is already doing this, but with its renowned customer service and support, it will be astonishing if it is successful. Comcast has also acquired security software provider iControl and now offers a monthly security service. AT&T hasn't made any significant moves into the space as of yet, but could enter or buy its way in as the market matures.

The Smart Building of the Future

With the smart buildings market poised for continued growth and transformation, building product manufacturers are particularly well-positioned to seize the opportunity by developing smart, connected and user friendly products. By establishing agile development platforms, for example, manufacturers can gain flexibility to innovate and disrupt traditional building products and ultimately lead the way in this space. And while the challenges of winning in this new business environment will be many, the rewards will be great for those companies that find ways to own and influence buildings owners...and their dollars.



Porter Wiley is a managing director with FMI Capital Advisors, Inc., FMI Corporation's Investment Banking subsidiary. He leads FMI's Building Products Team, which focuses on manufacturers and distributors of products and materials used in commercial and residential construction – from the carpet on the floor to the shingles on the roof, and everything in between. He can be reached at pwiley@fminet.com.

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Denver

210 University Boulevard
Suite 800
Denver, CO 80206
303.377.4740

Houston

9303 New Trails Drive
Suite 350
The Woodlands, TX 77381
713.936.5400

Phoenix

7639 East Pinnacle Peak Road
Suite 100
Scottsdale, AZ 85255
602.381.8108

Raleigh (headquarters)

5171 Glenwood Avenue
Suite 200
Raleigh, NC 27612
919.787.8400

Tampa

308 South Boulevard
Tampa, FL 33606
813.636.1364

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