



Accelerating the Benefits of Construction IT

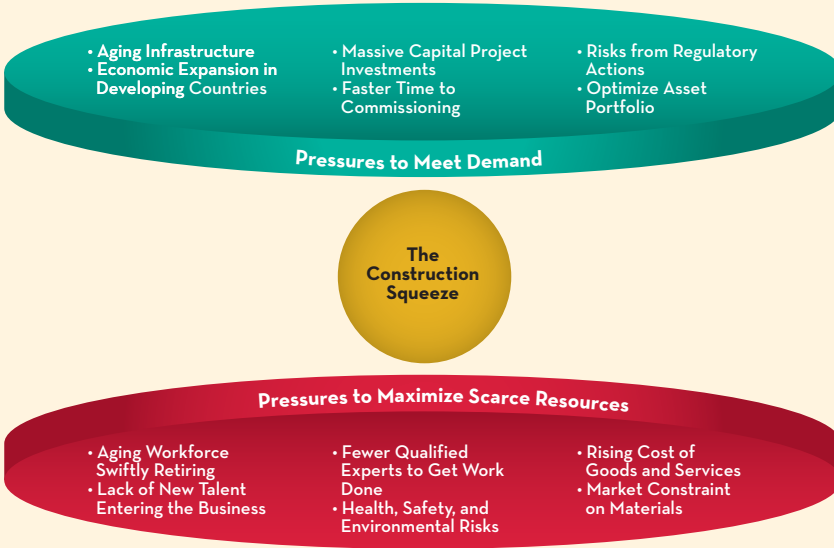
Understanding the broader landscape beyond the realm of construction increases peoples' willingness to reconsider their assumptions and adopt innovative approaches to IT integration.

By Marisé Mikulis and Kathryn Robinson

It has been more than 50 years since the construction industry experienced the overall infrastructure demand at work today. Growth in demand is hyperactive, driven by aging infrastructure, immigration patterns, migration patterns, demographic trends, and general economic growth, all of which necessitates new and upgraded highway, bridge, rail, transportation, education, healthcare, power generation, transmission grid, and water/sewer systems infrastructure.

U.S. demand is compounded by expansion underway in the developing world, including China, India, and Russia. On the supply side, however, the industry is strapped, trying to apply the right skills in the right place at the right time. The baby boomer generation makes up the majority of the construction workforce, both contractors and owners. This bubble is quickly approaching retirement age — a constraint worsened by the small pipeline of new industry entrants. The same pinch is happening with the availability of building materials globally. It's no wonder that construction costs have inflated and parallel the rise of material and construction commodities over the previous five years. Exhibit 1 illustrates the result of these forces — the “construction squeeze.”

Exhibit 1

The Construction Squeeze**LOOSENING THE GRIP**

The best practices of yesterday such as innovative sourcing structures are the minimum requirements of today. As the bar continues to rise, simply tweaking a business model, imitating an industry leader, or adapting to economic change will no longer be sufficient to maintain a competitive advantage in the marketplace. Innovations will need to be adopted ... and quickly. Is it possible to build the plane during takeoff? One answer lies in integrated information technologies.

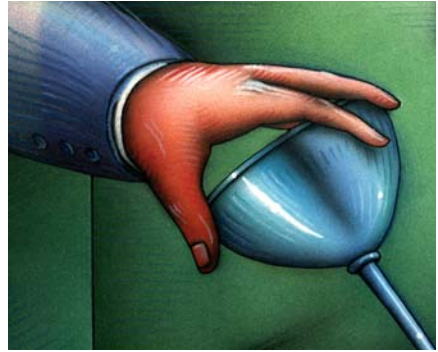
Yet, the application of information technology (IT) has received mixed reviews as a tool to help the construction industry wriggle free from the grip of the forces outlined above, and thus, meet its challenges and thrive. The question remains: Why are so many of our IT-related efforts classified as disappointments even as they are launched into service? Whether it's an upgrade to a project management system or an innovative Building Information Modeling (BIM) program, our industry is full of well-intentioned and well-planned undertakings whose outcomes range from mildly annoying to "train wrecks." It's no wonder that this business meets new IT undertakings with dread. Illustrating this are common responses heard to IT-based recommendations, which include:

- "That's way beyond what our people at the job site can handle."
- "The contractor will use that system because we are going to tell them to. Period."
- "All that general IT collaboration stuff is world peace. We need to focus on BIM and expand from there."
- "We use a spreadsheet for that, and it works just fine."

Fundamentally, IT's capacity to benefit a business depends on its adoption by target users. This might seem obvious and fundamental; yet, bridging the adoption chasm is neither easy nor quick work. The most experienced construction IT

managers and “gurus” (both internal and external) have learned to go back to basics — persuading users of the new technology’s soundness and personal benefit. Business value is the watchword; sizzle is secondary. In “tech speak,” the acronym, WIFM — What’s In It For Me? — is the users’ question of the day.

Progressing from the historical IT practice of requiring the organization to accommodate rigid software systems to requiring the software to serve the business dynamic is how soundness and personal benefit are achieved. Otherwise, the business and IT tools are disconnected.



THE IT DISCONNECT: “IF WE BUILD IT, THEY WILL COME.”

Common Sense IT Rule No. 1: Technology is only successful when it enables those individuals running the business to achieve their business objectives.

The good news is that these individuals — whether in design, planning, construction, or operation — are generally eager to receive help. People at all industry levels are laser-focused on the job-at-hand due to ever-increasing performance pressures. As a result, any efficiencies offered by technology are welcomed.

More good news is that widespread advances in IT, largely driven by the thriving video-gaming industry and the public, are ripe to give the construction industry the very efficiencies that have been so elusive for the past two to three decades: collaboration, visualization, security, search, mobility, and timely information for making sound decisions.

Common Sense IT Rule No. 2: The soft stuff is the hard stuff.

Construction solutions made possible through IT applications may be complex and expensive to produce. Still, the hardest part will actually be the “soft stuff” — the investment in training time and dollars needed to ensure adoption by the user-community. Too often business and operations managers are counseled by their IT managers and gurus that the most critical success factor in applying IT improvements

is the careful identification of needs in order to steer system selection and/or development. Thus, companies invest considerable time and planning into specifying functionality requirements and schedules that systems must meet. Indeed, most system enhancements and new systems suffer from functionality overkill. The thinking is: If you can do something one way, why not provide five or 10 ways to achieve the same end-result? So programming bloat and training difficulties ensue. Rather than a first-thought, the time and money

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needed to train and give system-users the confidence to adopt work-process changes introduced by the new system, it is instead treated as a post-script. Training is paramount to reaping the new technology's intended benefits.

Common Sense IT Rule No. 3: If it sounds too good to be true, it probably is.

Experience is a good teacher. The maxim above is frequently applied, either consciously or unconsciously, as people assess risks related to business decisions, including IT undertakings. Yet, an important dependency is just as frequently overlooked: The soundness of this maxim depends entirely on having accurate assumptions. If our assumptions are wrong, then we may judge an option as too-good-to-be-true and miss an extraordinary opportunity for innovation and even first-mover advantage.

Construction-industry users in the office and in the field will be inclined or disinclined to adopt IT solutions based on assumptions, and these assumptions are commonly incorrect.

The situation is innocent. Users are often making a decision based on some prior disappointing experience. In the interim, they have fallen out of touch with the technology advances widely in use since they haven't been inclined to track them.

In some ways, today's IT managers and gurus are victims of their own success. Among the reasons IT groups exist is to offload from the people on the front lines the need to track and understand the complex and swiftly changing aspects of IT. It's not a priority for the users to keep up with IT trends and developments. The challenge arises when these under-informed users' assumptions drive their adoption decisions. Unfortunately, having once offloaded this role, the front-line decision makers then position themselves as knowledgeable arbiters of the final decision while holding in (slight) contempt, their diligent IT staff.

EARNING ANOTHER CHANCE

Adoption and diffusion of IT solutions can be accelerated only by persuading users of their viability and value. The critical factor involves making a compelling case about our technologically connected world to a skeptical

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audience. Building trust that users' assumptions are worth relaxing is the real task.

Thomas Friedman's *The World is Flat* is a popular example of just such an assumption-busting foray. He identifies 10 "flatteners" or transformations that have fundamentally changed the world's overall business landscape, regardless of market sector or geography. He defends his thesis that IT has played a central role in these 10 transformations. The conclusions give the nonprofessional greater trust that IT advances are far more mainstream than someone on the sidelines might assume. These 10 flatteners show how widely and deeply such technology advances are already ingrained in business; those who would classify them as "cutting edge" — even within the construction industry — would be sorely mistaken.

TEN FLATTENERS THAT CHANGED THE WORLD ... OF CONSTRUCTION-RELATED IT

1. Nov. 9, 1989

Nov. 9, 1989, is the day the Berlin Wall fell. With this step, a seismic shift in the interdependency of worldwide market economics occurred. The opportunity and the complexity of global supply chains grew exponentially. This milestone is attributed largely to the former Soviet Union-population's growing awareness of the rest of the world, which was stimulated by the introduction of the Intel-based PC in 1981, coupled with the introduction of Microsoft Windows in 1985 and Windows 3.0 in 1990.

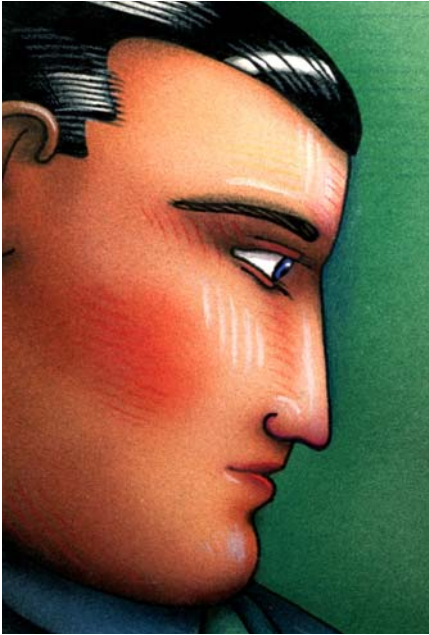
2. Aug. 9, 1995

On Aug. 9, 1995, Netscape went public. This move set in motion the Internet boom as we now know it. The computing style for the masses was transformed from a stand-alone experience to one with instant access to vast knowledge. This new world arrived with the wide adoption of open protocols, such as Hypertext Transfer Protocol (HTTP), and investments in fiber-optic cable. Business to business (B2B) and e-commerce were born. In construction, these technologies enjoy some presence, but the use of systems such as electronic invoicing and payment remains spotty at best. Still, this type of automated vehicle dramatically decreases submittal errors, benefiting the owner and speeding the payment process, benefiting the contractor.

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3. Workflow Software

Some outside of IT have heard of workflow software, but experience with it is still limited. Defining a business process for people to follow is one challenge; it is quite another to ensure it is followed. Friedman explains that progress during the early 1990s advanced transport protocols that became standards of practice (e.g., Extensible Metadata Platform¹ (XMP) and Service Oriented Architecture Protocol² (SOAP)). This accomplishment helped interaction move to the level of software program to software program, well beyond person to person.



So what? So automating the routing and management of design and construction documents is not merely an aspiration, but can easily become accepted practice at little cost. So BIM is not a pipe-dream, but rather, a realistic approach to deliver gains in efficiency and effectiveness by harnessing information-sharing practices widely accepted outside the construction industry. A contractor can reasonably expect to know in real-time how a job proposal will align with a materials-sourcing strategy and vice versa.

4. Open Sourcing

Open sourcing is the fourth flattener Friedman cites. In plain English, this concept highlights that

knowledge is power and emphasizes that sharing knowledge increases the power of both the provider and the receiver. Rooted in academia, open sourcing enables self-organizing collaborative communities. In construction, open-sourcing ideas reinforce collaborative and sharing needs on all levels. For owners, this plays out with electronic designs that evolve into as-builts used in operations and maintenance. For contractors, this plays out as “co-opetition,” with information-sharing via secure sites opened to selected clients and partners during specific engagements.

5. Outsourcing

Next on Friedman’s list is outsourcing. Here outsourcing means taking some specific, but limited, function a company was performing in-house, such as research, call centers, or accounts receivable, and having another company perform that exact same function. Then, the company reintegrates their work back into the overall operation.

Outsourcing-related IT experienced a zenith as preparations swelled for Y2K. It blossomed in India largely due to the bandwidth of the fiber-optic networking established with flattener No. 2. Closer to home in construction is the growing popularity of systems located and managed offsite from our offices, which is a direct manifestation of this IT concept. These “hosted systems” provide IT software and data management services specifically oriented to our industry, from names such as e-Builders and Textura. Such providers complement the more general IT hosting provided by Accenture,

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EDS, HP, and Microsoft. The attraction of these hosted systems stems from the flexibility and reliability of the service provided.

6. Offshoring

When China joined the World Trade Organization, offshoring really crystallized. Offshoring, contrasted with outsourcing, is when a company takes one of its factories that is operating in Canton, Ohio, and moves the whole factory to Canton, China. The factory produces the same product, the same way, only with cheaper labor, lower taxes, subsidized energy, and lower healthcare costs. Such a venture only became reasonable when supported by the robust connectivity and collaboration now afforded by IT systems.

For us, off-shoring movements certainly contribute to the hyperactive demand for materials by developing countries. In addition, when large fabrication projects can be disaggregated, such as a multi-million dollar deepwater drilling and production platform, a considerable amount of module construction activities have been shifted to other countries, from Norway to South Korea. BIM approaches are essential to executing such complex arrangements.

7. Supply Chaining

The unchallenged champion at supply chaining is Wal-Mart. This flattener recognizes information as a competitive advantage, grounded in openness with suppliers regarding sales and inventory database. Analysts call this “full-asset awareness.” It’s about amazing new levels of visibility with which to make decisions. The outcome produces business growth for both parties.

Are the multiple contractors executing a new sports arena able to gain full view and context on the project? Can they anticipate impact of accelerations and decelerations? For example, the power of an enterprise project management (EPM) system lies in someone’s ability to make more-informed decisions. Achieving more-informed decisions depends on having the right data at the right time. The implications of this are vastly different between a highly customized limited-access system and an EPM that is accessible and usable by multiple project participants and widely intuitive. Is your EPM actively used by all your contractors? Are your field workers, direct and contract, connected with your EPM via their mobility devices?

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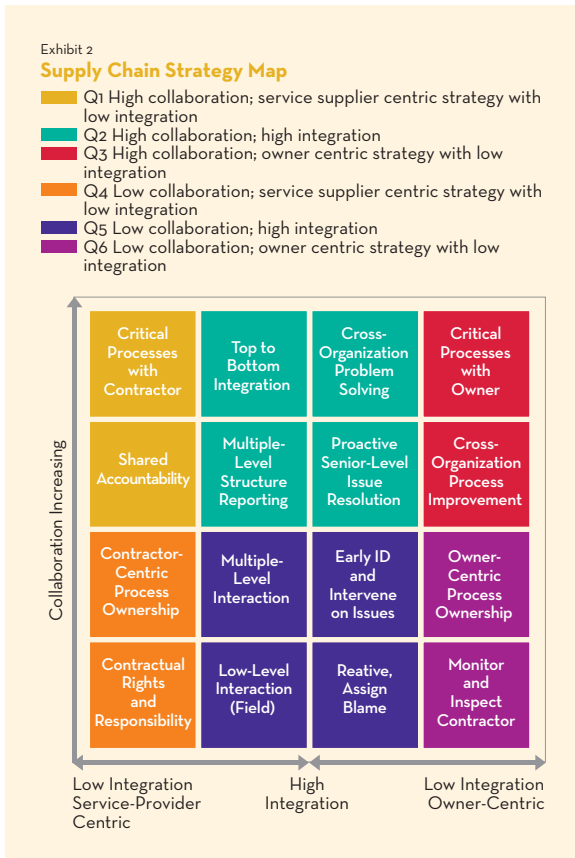
8. In-sourcing

As a flattener, in-sourcing is an especially innovative development. So its impact has been far-reaching. Here’s an example: Did you know that when you arrange for your Toshiba PC to be repaired and UPS comes to pick it up, the PC never actually goes to Toshiba? Perhaps you guessed that for operational efficiency Toshiba would hire some outfit to perform the repair, like outsourcing. But did you know that the extraordinary PC repair outfit that Toshiba uses is UPS?

Today UPS doesn’t just deliver packages; it provides logistics services, synchronizing global supply chains for customers large and small. The service is called in-sourcing

because UPS engineers come right inside your company; analyze its manufacturing, packaging, and delivery processes; and then design, redesign, and manage your whole global supply chain. And if necessary, they’ll even help finance parts of it, such as receivables and COD payments. UPS, a blue-collar delivery firm, has harnessed IT to completely reinvent itself.

Outsourcing, off-shoring, and in-sourcing all manifest in our business. Judging the best approach or blend of multiples for an operation can be a challenge. Having the options, however, is definitely welcome, particularly in light of demographic challenges we



are wrestling with. And activating these options depends on enlightened relationship dynamics, strategic partnerships, and extended enterprises.

For construction owners today, this speaks to fundamentals of sourcing and construction delivery overall. Ultimately, there are four questions to address:

1. What degree of collaboration and integration is optimal for my sourcing strategy?
2. How will I contract construction delivery?
3. How will I build?
4. How will I manage construction?

Exhibit 2 illustrates the dimensions of collaboration, highlighting the pros and cons of various courses.



9. In-forming

In-forming is the flattener related to search — Google, Yahoo, Live Search. Through the transformative power of searching, we can become informed, according to our unique question, unique logic, and our unique timeframe. Today, few of us would choose to be without this, and we each have our favorite search engine that we rely upon.

How many people in construction use search technologies to find things on their own computers, though? In construction, time is money, and huge amounts of time are lost looking for and checking the accuracy of the information we need. We can search our Outlook e-mail; we can search our local PCs across the documents we produce. The breakthrough is that now search technology spans many different types of data at the same time: Word and Excel documents, Primavera schedules in Oracle, and e-mail. Now, novice construction users can realistically expect to get the complete answer to questions, and quickly.

The question is whether the construction industry is willing to try it. Just because we assumed we couldn't do this doesn't mean we were right.

10. Steriods

The steriods (digital, mobile, personal, virtual) amplify and further empower all other forms of collaboration. Foremost is the availability and widespread acceptance of digital content that can be shared. A mutually reinforcing scheme of computation, storage, and I/O technology enabled this. Next is availability and widespread acceptance of highly robust mobile devices; wireless is the most natural form of communication. Ultimately, these have produced what Friedman calls the “Mobile Me,” personal and always connected online.

These technologies in particular hold extraordinary promise for construction because they are perfectly matched to our work styles: Orchestrating field work and material delivery in concert with sophisticated project scheduling, accounting, and design. Yet when proposed, our management and leaders rush to observe that IT-based solutions are beyond what construction field workers can handle. This assumption is no longer true, and we are missing important opportunities for gains. How do we expect to attract new entrants who have cut their teeth on video games and cell phones, whether American or immigrant? The case for video-based training modules is quite similar. How can we ignore this

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extraordinary vehicle that can help accelerate solutions to the critical skills shortage and Health, Safety, Environmental (HSE) risks we face?

THE TRIPLE CONVERGENCE

Skeptics frequently cite the long time it can take to see the effects and realize the value of IT projects. With Friedman's flatteners at work for over a decade, why have the transformational effects outlined only recently experienced increased momentum? Friedman addresses this with "Triple Convergence:"

- Complementary reinforcement of technologies
- New ways of doing business
- New population of workers

First, the flatteners needed time to converge and start working together in a complementary, mutually enhancing fashion. This occurred around 2000, with a new playing field for multiple forms of convergence. The net result was the creation of a global, web-enabled playing field that allows for multiple forms of collaboration — the sharing of knowledge and work — in real-time, without regard to geography, distance, or, in the near future, even language.

Second, it took time for new technology to combine with new ways of doing business. The changes were unfolding not just in IT, but also in new business processes and their associated new skill types. Stated another way, the people doing work needed time to adopt the new practices and this time needed to be recognized and budgeted in IT project deployment schedules.



Third, there was an arrival of a huge new population of workers from Mexico and Latin America, as well as China, India, Russia, and Eastern Europe. This demographic shift was due to the collapse of Communism in the Soviet Empire, India's turn from autarky, China's shift to capitalism, and population growth all over.

It is this triple convergence — of new players, on a new playing field, developing new processes and habits for horizontal collaboration — that

Friedman believes is the most important force shaping global economics and politics in the early 21st century. This wide access to tools of collaboration and to information through search engines and the web ensures that the next generation of innovations will come from all quarters.

This translates to construction in the unprecedented business challenges our industry is wrestling with. We're not going to "save" our way out of this one. Competitive advantage depends on quick innovation. In an industry that contributes almost 10% of the U.S. GDP, yet is challenged to capitalize on proven technology

Competitive advantage depends on quick innovation.

developments, how is it possible to pick up the pace, catch up, and keep up with the other runners in the race? Information technologies may hold the answer.

THE ASSUMPTIONS HAVE CHANGED

The World is Flat is helpful

ammunition to illustrate to the layperson how innovative IT approaches are being actively adopted far beyond our own

construction arena. There is a certain solace and enhanced confidence in knowing that the rest of the world is pursuing such advances with success. It's important to recognize that these overtures to harness IT for business improvement aren't only happening in construction. Much skepticism about IT's value contribution exists throughout our industry on all levels, but understanding the broader landscape beyond the realm of construction increases peoples' willingness to reconsider their assumptions and adopt innovative approaches. ■

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¹ The Extensible Metadata Platform or XMP is a specific type of extensible markup language used in PDF, photography, and photo editing applications. It was first introduced by Adobe Systems in April 2001 as part of version 5.0 of the Adobe Acrobat software product.

² SOAP originally stood for Simple Object Access Protocol, and lately also Service Oriented Architecture Protocol, but is now simply SOAP. It is a protocol for exchanging XML-based messages over computer networks, normally using HTTP/HTTPS. SOAP forms the foundation layer of the Web services stack, providing a basic messaging framework that more abstract layers can build on. There are several different types of messaging patterns in SOAP, but by far the most common is the Remote Procedure Call (RPC) pattern, in which one network node (the *client*) sends a request message to another node (the *server*), and the server immediately sends a response message to the client. SOAP is the successor of XML-RPC, though it borrows its transport and interaction neutrality and the envelope/header/body from elsewhere, probably from Web Distributed Data eXchange (WDDX).