Technology disruption: Digitizing E&C

2018 Engineering and Construction Conference
June 20–22, 2018
Agenda

Growing the business using technology

Latest in technology

  Internet of Things (IoT)
  Geospatial Technologies
  Mobile Technologies
  5D Building Information Modeling (BIM)
  Sustainable Construction
  Smart Cities
  Robotics Process Automation (RPA)
  Artificial Intelligence (AI)

Q&A
Growing the business

The case for industry investment in technology
Argument for growing your technology spend

Investment in technology is likely to have positive effects on profit margins by reducing cost and increasing efficiencies. Technology allows companies to deliver larger revenue projects with the same or reduced support team. Use of technology and integration may result in higher initial costs but bigger margins in the long run.

Digital Transformation Industry Trends

- The shifting role of ERP to Cloud and Digital
- The “field tech”, the end of the back-office investment
- BIM/VR
- Smart Buildings
- RPA, Cognitive and AI
- Tech savvy and millennial focused workforce
- Labor shortage
- IoT coming on line everywhere

![Profit Margin Affected by the Use of Technology and Integration](image)
Specific enablers of future growth

Industry investment in technology
IoT, geospatial, and mobile technologies can help E&C companies improve operational efficiency in a competitive environment

Internet of Things (IoT)*

**Trend overview**
- Use of IoT technology is evolving across industries, including E&C

**Impact**
- Track construction quality and equipment condition
- Improve safety and automate tasks, like reporting and communication
- Post-construction, capture usage data to aptly design future building structures

**Action item**
- Assess the types of IoT applications that would be most efficient
- Focus on better integration and interoperability with existing technology systems
- Adopt appropriate cybersecurity measures

Geospatial technologies

**Trend overview**
- Several forms of geospatial technologies such as drones, geofencing, and geotagging are being developed and gradually coming into mainstream construction

**Impact**
- Monitor site work and safety in real-time through drones
- Keep construction equipment and tools within a specified geographic area through geofencing
- Enable information to be tagged by a unique geographic location through geotagging

**Action item**
- Evaluate the required type of geospatial technologies
- Develop a more customized strategy across the enterprise

Mobile technologies**

**Trend overview**
- Gradual shift toward more advanced features of mobile technologies, such as video call, social media, and GPS tracking

**Impact**
- Enhance productivity, timeliness, and employee satisfaction by moving beyond communication
- Foster collaboration through mobile, including integration with client systems, and social interaction on joint venture projects

**Action item**
- Develop an enabling technology infrastructure
- Improve integration with legacy systems
- Invest in mobile device management to address security and privacy risks

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**Saurabh Mahajan and Surabhi Sheth, “Engineering and construction companies: Cracking the collaboration code with mobility,” Deloitte Center for Financial Services, October 2015.
Efficiency investments are typically not core to clients, with the exception of some industrial sectors. These factors can make it difficult to convince client financial decision-makers to approve capex spending.

To solve the issue of upfront capital investment, an opex-based business model can be used to cover capex requirements for energy efficiency improvements.

This is referred to as energy savings contracting. It is a technique that vendors of smart building technology can also use to accelerate growth.
IoT, Geospatial and Mobile Technologies

“Start small, think big & scale to the max.” Running pilots with the latest smart devices makes sense without jumping head first. Vendors include Terminus, Enerbrain, Philips, Encycle, & Tenna.

IoT

• McCarthy has deployed wireless environmental sensors from Pillar Technologies at Mercy Hospital in St. Louis to measure ambient qualities temp., humidity & dust-particulate levels, as well as noise & vibration.

• Mortenson Construction ran a connected jobsite pilot on a project at the Penn State campus, State College, Pa., in which it ran trials on a comprehensive wireless mesh network with IoT capabilities.

• Mitsubishi Electric US is giving owners and builders a savings calculator tool to evaluate life-cycle savings of bundled IoT systems.

• JE Dunn construction is using Trimble Connect for HoloLens to perform quality checks in the field. DAQRI is also a leading provider of augmented reality devices.

Geospatial

• Triax Technologies is getting its belt-mounted sensor out in the field. It is seeing how data gathered while tracking workers can improve safety. Based on a local mesh network, the device, whose batteries last a year, logs worker movements only while they’re on site.

• PR Construction has run its own pilot projects for sensors, but it also is developing the back end that will help to make sense of the information.

Mobile

• DEWALT’s Wi-Fi system is being used at Penn State where Bluetooth-enabled DEWALT tools, tagged materials and workers with badges will be passively tracked. The project manager said, “There are so many opportunities to track data and collect it in the field for locational awareness.”
5D BIM and sustainable construction can help E&C companies save costs, increase productivity and quality, and enhance sales.

**5D Building Information Modeling (BIM)**

**Trend overview**
- Digital modeling technique for visual representation of physical and functional characteristics of a construction project form decision making.
- 3D modelling with additional layers of schedule planning (4D) and cost estimation (5D)

**Impact**
- Increase in predictability
- Visualization of the end product
- Real time assessment
- Enable cost and time sensitivity analysis

**Action item**
- Communicate the benefits and get stakeholders onboard
- Focus on integration with existing technology systems
- Prepare an action plan for the implementation with periodic check points to assess progress

**Sustainable construction**

**Trend overview**
- Awareness and expectation of healthier buildings continues to rise
- Owners and occupiers increasingly looking for health and wellness features to attract and retain employees and clients
- Continuous research and innovation on sustainable construction designs, materials, and processes

**Impact**
- Improve saleability
- Lower carbon emissions
- Increase client satisfaction and brand value

**Action item**
- Start with design features that focus on health and wellness
- Invest in research and innovation initiatives around sustainable construction processes
- Collaborate with clients and stakeholders to understand and customize the health and wellness features

**Smart cities**

**Trend overview**
- Increase in demand for technology-fueled and sustainable development of cities that enhance livability
- Growing focus by governments and large technology companies
- Rapidly rising spending on smart cities

**Impact**
- Increased demand for faster, cheaper, better construction material and methods
- Changes in zoning could lead to new development opportunities

**Action item**
- Be proactive in using a wide variety of technologies—the IoT, geospatial, mobile, 3D printing, and sustainable construction material
- Focus on project prioritization
- Collaborate with local governments to drive smart city initiatives
The most immediate business benefits of BIM are reduction in the cost and time to design and construct facilities and structures.

**Survey results from 35 construction projects conducted in different countries showed the following benefits attributed to BIM:**

60% of the projects had a cost-savings benefit. Some survey participants reported 9.8% cost savings for large projects. 35% of respondents reported a time savings in planning the construction projects. Some reported that construction planning, which historically took *months*, was reduced to *weeks* with BIM. Benefits such as these can justify investment in BIM today, with expected value increasing over time as BIM technology advances and experience with BIM grows.
5D BIM and Sustainable Construction

5D definition includes 2D—Print drawings, 3D—Modeling, 4D—Adding elements of time, 5D—Adding elements of cost, and 6D—Adding elements of lifecycle management

5D BIM

• BuildIT Construction software solution, with 3D laser scanning, is the first consolidated software and hardware solution that enables users to perform immediate, real-time build and verify analysis through the entire project and facilitates a new level of cost management and operational efficiency.

• Mortenson Construction is using BIM 360 Glue for the VDC (virtual design & construction) and BIM, and they were able to have constant access to the model. “For the project management side, we were able to use Procore anywhere on the site to get the latest project information.”

• CPL is beta testing both Enscape plug-in and 3D Studio Max Interactive, a tie-in to Autodesk Revit. CPL is implementing the tools and VR headsets in a design and planning mash-up to let contractors and owners take virtual walk-throughs before construction begins.

• Sage is teaming with Autodesk’s Navisworks Integrator to facilitate true 5D BIM. Viewpoint (now part of Trimble) introduced Spectrum Business Intelligence that organizes data from multiple sources.

• The Weitz Co. completed Park West at Texas A&M aided by Bluebeam Revu for 1,500 people, 58 subcontractors over 15 buildings and 70 acres.

Sustainable Construction

• Black & Veatch and CDM Smith are building tunnels that are being used to keep storm water and wastewater from polluting natural bodies of water. “There are more water tunnels out their than auto tunnels.”
RPA and AI can optimize time and cost along with improving quality of construction and operational activities

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<tr>
<th>Robotic Process Automation (RPA)*</th>
<th>Artificial Intelligence</th>
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<td><strong>Trend overview</strong></td>
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<td>• RPA essentially uses software to automate many manual, repetitive and often rules-based processes and tasks.</td>
<td>• Software to manage drones to capture data for analytics</td>
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<td>• RPA can be implemented at the desktop or in the virtual environment.</td>
<td>• Image recognition software teaches systems to recognize people from jobsite images and flag safety concerns</td>
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<td><strong>Impact</strong></td>
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<td>• Optimize cost and quality</td>
<td>• Automate the survey and monitoring process</td>
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<td>• Enhance scalability and efficiency</td>
<td>• Save time and cost</td>
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<td>• Insource and control processes</td>
<td>• Increase data availability for analytics</td>
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<td>• Improve governance and compliance</td>
<td>• Highlight safety lapses to improve safety</td>
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<td>• Enable informed decision making</td>
<td>• Ease monitoring at tough job locations</td>
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<td><strong>Action item</strong></td>
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<td>• Identify the tasks eligible for RPA</td>
<td>• Identify tasks eligible for AI implementation</td>
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<td>• Estimate the return on investment and available budget</td>
<td>• Train employees to capture and analyze the data</td>
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<td>• Evaluate and implement data protection and privacy measures</td>
<td>• Forecast future trends based on the data</td>
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AI value growth will slow from 2018 through 2025, dropping from a peak of 70% to 7% by 2025.

**Enterprises between 2017 and 2022 will use niche solutions. In 2006 BIM resulted in the potential savings in Construction costs ranging from 15-40% (Holness, 2006).**

AI agents have a first-mover advantage that will last only until 2019, when decision support/augmentation will overtake and remain the largest type of AI by business value-add. Customer experience is the majority of business value through 2020, when new revenue takes over to gain prominence. Cost reduction, while important, will not be a point of differentiation from most products and users. By leveraging the increasing amount of data available through IoT, this sector leads in derived business value from AI.
Robotics Process Automation (RPA) and Artificial Intelligence (AI)

“Construction is not exactly viewed as a leader when it comes to technology, but that is rapidly changing,” says Mike Sicilia, SVP Oracle’s E&C business unit. “There’s a lot of pressure on the labor supply chain right now, but there are trends that will help citing augmented reality and robotics.”

**RPA**

- SAM is the Semi-Automated Mason. While the average human mason can lay 500 bricks per day, SAM can lay 3000. Autonomous construction vehicles are already available.

- Clayco is re-examining the roles of its project managers, with the idea of following the manufacturing model more closely, talking more about process managers instead of project managers.

- Using robotics, cognitive and AI, the construction industry can make progress in eliminating factors that create unsafe work environments and remove humans from repetitive tasks that are prone to error.

- **The Midwest Economic Policy Institute, US Bureau of Labor Statistics and Univ. Illinois say automation could displace or replace $2.7M US craftworkers by 2057 and cut labor income by $127.5B. A study by McKinsey & Co. say that 49% of construction tasks can be done by RPA.**

**AI**

- Suffolk uses Smartvid.io on many of its projects that requires gloves. Suffolk says VINNIE has helped improve personal protective equipment (PPE) compliance rates among subcontractors.

- Graycor Construction says “technology will continue to advance construction, making it safer, helping projects run smoother and opening it up to a whole new workforce. However don’t forget about the heart of our projects, the heart of our buildings, the heart of our industry: the hardhats, the skilled craft workers, the people with the work boots and weathered hands.”
Questions?