Top 5 Emerging Technologies
for 2016 in Engineering & Construction

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TOP 5 EMERGING TECHNOLOGIES FOR 2016 IN ENGINEERING & CONSTRUCTION

In today's business world, new technologies are regularly introduced to help companies improve efficiency, productivity, strategy and communication, among other benefits.

Technology has been identified as a primary driver of profitability and market differentiation in every industry;[1] and the Architectural, Engineering, and Construction (AEC) industry is no exception, as recorded benefits of technology-enabled mobility, analytics and business intelligence are frequently highlighted.[2] Specifically, growths in productivity and profitability and reductions in risk exposure have all been cited from the adoption and application of new technologies in this sector.[3]

So, what are some of these emerging technologies influencing industry trends and practices? From 3D printing to big data analytics, here's a detailed look at the top 5 emerging technologies slated to shape the future of the engineering and construction fields:

1. VIRTUAL DESIGN & CONSTRUCTION (VDC)

Virtual Design & Construction (VDC) has been recognized as an effective tool to visualize, organize and plan construction activities. By enabling the development of a virtual prototype to increase certainty during the design and building process,[4] this technology minimizes cost and labor while maximizing quality, value and sustainability.[5]

Using Building Information Modeling (BIM) as the virtual prototype to formulate the design, VDC is the process that actualizes the idea.[5] Taken together, the objective of BIM and VDC is to improve communication through the visual medium;[5] and for project stakeholders, resultant benefits include, earlier and better informed decision-making—which leads to time-savings, decreased costs, improved quality of products or services and increased site safety.[5] More explicitly, the following benefits have been achieved using this technology:[3]

- 50% time-savings in the design document phase
- 80% reduction in time to complete cost-estimate
- 60% fewer Requests-for-Information (RFIs)
- 7% schedule savings
- 600 total days direct schedule reductions[6]
- Productivity increases of 25% or more[6]
- 2.95% average direct cost reductions[6]

In order to effectively implement VDC technology and fully enjoy the wealth of benefits afforded through this method, an in-depth understanding of how these tools can be applied to meet organizational needs is essential. This can be best achieved through a commitment to specialized training and ongoing consultation.[7]

2. DRONES

Drones or Unmanned aerial vehicles (UAVs) are finding increased popularity within the construction and engineering fields. In engineering, large firms are putting them to use in risky and unconventional settings;[9] likewise, in the construction industry, this technology has been well-received due to the

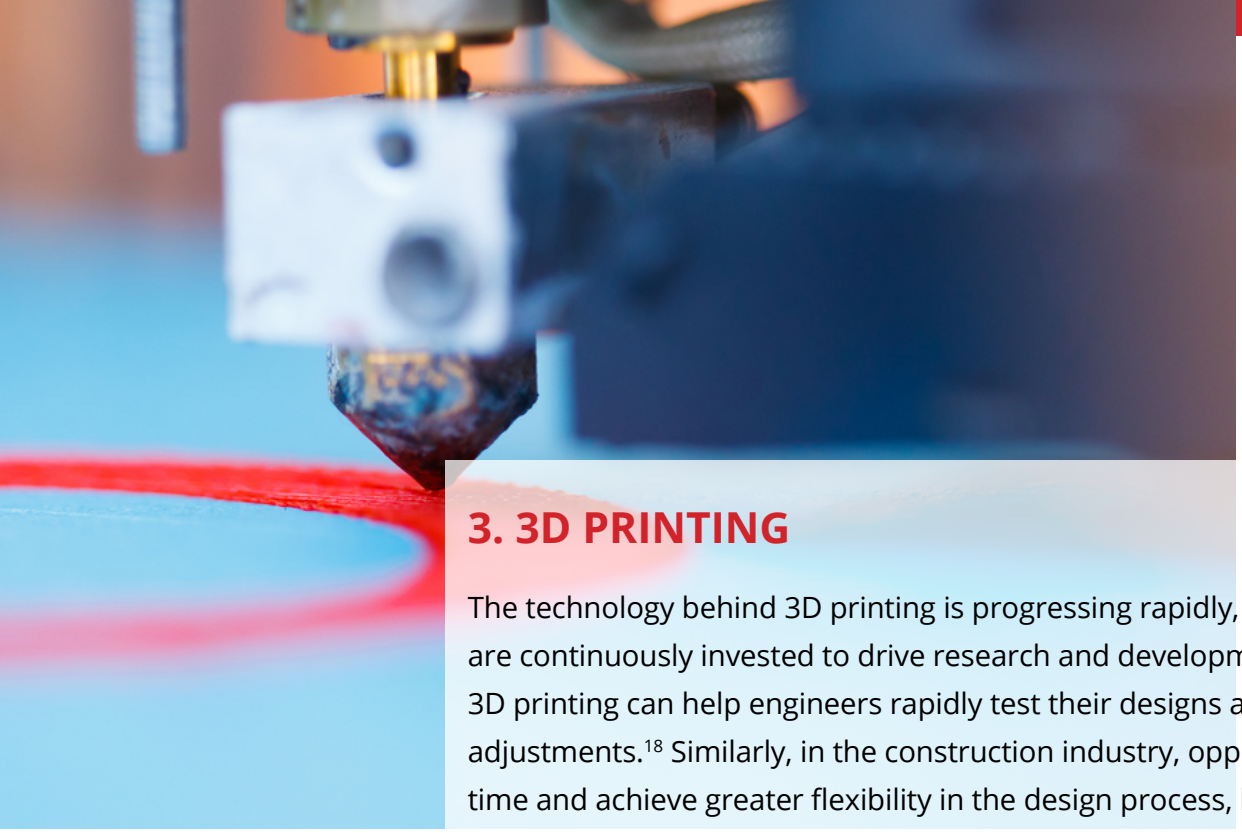
unprecedented level of data mobility, visualization, access and efficiency it lends to projects.[7] Furthermore, drone technology has been shown to reduce costs associated with poor communications from the field, reduce material theft from the jobsite and increase worker safety.[7] The latter is significant, given the fact that construction continues to be one of the most dangerous industries in the U.S. economy:[8] In 2014, approximately 20% of worker fatalities were attributed to construction-related jobs.[9]

Overall, the benefits of using drones in the AEC industry include:[10]

- Time-savings
- Improved safety
- Access to richer information
- Improved decision-making

From the public to the private sector, this technology is being used with promising results. As specific examples, The Minnesota Department of Transportation's (MnDOT) use of drones on bridge inspections has yielded savings in time and cost;[11] similarly, British Petroleum's (BP) use of drones for pipeline inspections in Alaska has made this process quicker, more frequent and safer in the arctic climate.[12]

As the use of drones for commercial and other activities grows in popularity, a simultaneous increase in regulations governing their use has been seen.[13] Consequently, along with safety and other concerns, training in these technologies is imperative for leading companies engaged in their use.



3. 3D PRINTING

The technology behind 3D printing is progressing rapidly, as billions of dollars are continuously invested to drive research and development.[14] In engineering, 3D printing can help engineers rapidly test their designs and make adjustments.[18] Similarly, in the construction industry, opportunities to save time and achieve greater flexibility in the design process, has fueled interest in printing large structural parts or even entire buildings using this technology.[19]

Specific advantages of using 3D printing in the construction industry include:[20]

- Faster and accurate construction
- Reduced labor cost
- Reduced waste generation
- Improved health and safety[15]
- Estimated savings of 30% and 60% in construction waste
- Estimated reduction in production times by 50% to 70% and labor costs by 50% to 80%[16]

Companies stand to benefit from investing in ways to integrate 3D printing to operations; however, the ability to harness the power of this technology relies heavily on the training and experience of personnel responsible for creating these models.[17]

4. BIG DATA

Big data analytics is being adopted at a rapid rate across every industry[18] because it facilitates the efficient analysis and management of vast amounts of data to obtain valuable insights and improve decision-making.[19]

In the construction industry, the combination of faster mobile computing and an increase in the amount of software being used onsite is paving the way for increased big data opportunities.[19] Because construction companies tend to juggle multiple projects concurrently, large amounts of data is produced, collected, organized and analyzed.[20] Left untouched, this mass of unstructured data can place heavy burdens on database systems.[19] Using big data analytics, these companies can perform a wide range of tasks, from data management to pre-construction analysis;[19] in turn, they gain valuable insights that enable them to improve cost certainty, identify and avoid potential problems and find opportunities for efficiency improvements.[19] Ultimately, companies that implement big data solutions place themselves at a competitive advantage.

Armed with this knowledge, and owing to the enormity and complexity of such data, numerous organizations are depending on new tools and technologies requiring a niche expertise to successfully manage and process this information[21]—to achieve this, a trained workforce with the ability to handle big data analytics is critical. Overall, undergoing big data training can help the employees learn about related management systems,[22] meet process demands, ensure faster decision making and generate a better understanding of their customers.[23]

5. MOBILE/PAPERLESS TECH

Mobile devices are playing a critical role in enabling workplace efficiency and productivity.[23] For engineering and construction companies, mobile devices offer benefits of increased efficiency, accuracy, as well as process and information management on the job site.[24]

Specifically, mobility equips industry professionals with:[25]

- Better communication
- Improved workflow with real-time data
- The seamless ability to save and transfer information
- Increased productivity

Likewise, paperless technology offers numerous benefits to AEC professionals, including increased productivity and cost-savings. Consider the following: It is reported that organizations spend an estimated 15% of their revenues creating, managing and distributing documents;[26] further, of all documents, approximately 8% get lost and 3% of the remainder get misfiled.[27] Through the use mobile/paperless systems, these and other operational pitfalls can be avoided.

However, despite advantages seen with these technologies, many employees may not be tech-savvy or receptive to system or procedural changes. To combat this issue, training is increasingly important to ensure all employees are up to speed and comfortable with the adoption of these technologies.

LOOKING AHEAD

Emerging technologies in the AEC industry aim to increase productivity, efficiency and cost-savings, among a host of other benefits. In order to fully realize the potential of these tools in meeting set goals, companies must invest considerable time and resources in employee training—this guarantees that they are on track with evolving industry trends and boosts the organization's bottom line.

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