Construction Technology Report, 2017

Each year, JB Knowledge, a Texas-based construction technology consultancy issues its *Construction Technology Report*, a scan of the top technology trends in our industry. The 2017 edition is the company's sixth, and it surveyed the habits and opinions of 2,690 builders from across the United States, Canada and the world.

This year, the survey asked builders about their technology workflows, solutions and budgets. One of the principal findings of this year's report is that technology continues to be a difficult sell for many builders. Construction continues to budget the least of any industry towards IT. Managers are hesitant to adopt—and are largely unaware of—the right technology solutions.

"The Construction Technology Report provides our members with a snapshot of where the industry is, what tools are being used and where they should allocate more resources towards improvement," said Sean McGuire, Director of Construction Technology for the Mechanical Contractors Association of America.

So, where is the industry at? According to this survey, it's showing gradual improvement. In 2017, IT budgets slightly increased. Employees reported greater comfort with BIM technology. More companies expanded their research and development budgets, and, for the first time in this survey's history, builders decreased manual-data entry.

The upcoming digital construction landscape promises existing and immersive technical solutions to construction challenges. Hopefully, this year's positive technical trends will continue, and our industry can take full advantage of the technological sophistication available to it.
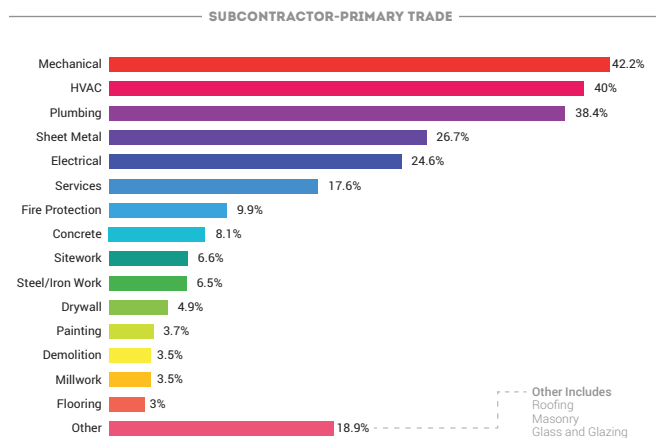
The participants

Respondents came from many industries. This year's survey saw increased numbers of subcontractors, and decreased numbers of contractors. While these fluctuating numbers may suggest changing demographics, general contractors are not underrepresented. Respondents were permitted to identify with more than one role; many selected both general contractor and subcontractor.

Most general contractors—nearly 80 percent—build commercially. Most subcontractors work in mechanical trades.
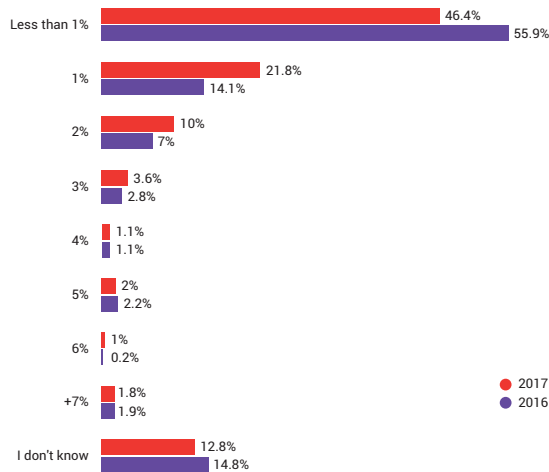
Over 30 percent of the construction professionals surveyed work for companies with 100 to 500 employees. More than 44 percent of those firms earn sold more than $50 million annually.

SUBCONTRACTOR-PRIMARY TRADE

Trade	Percent
Mechanical	42.2%
HVAC	40%
Plumbing	38.4%
Sheet Metal	26.7%
Electrical	24.6%
Services	17.6%
Fire Protection	9.9%
Concrete	8.1%
Sitework	6.6%
Steel/Iron Work	6.5%
Drywall	4.9%
Painting	3.7%
Demolition	3.5%
Millwork	3.5%
Flooring	3%
Other	18.9%

Other Includes
Roofing
Masonry
Glass and Glazing

IT budgets

Construction continues to budget the least of any industry for information technology. More than 46 percent of surveyed companies spend less than one percent of annual sales on IT. While this number is concerning, there was also a noticeable uptick in builders allocating more than one percent of annual sales. This promising trend suggests that builders value dedicated IT funds and are planning for technology upgrades.

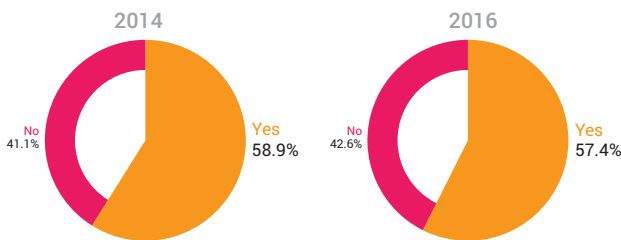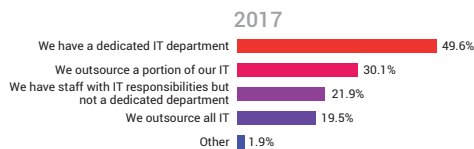|	2017	2016
Less than 1%	46.4%	55.9%
1%	21.8%	14.1%
2%	10%	7%
3%	3.6%	2.8%
4%	1.1%	1.1%
5%	2%	2.2%
6%	1%	0.2%
+7%	1.8%	1.9%
I don't know	12.8%	14.8%

● 2017
● 2016

Despite this change in budget, there are still many barriers to companies integrating sophisticated technology. Most construction companies—almost 60 percent—don't reimburse IT expenses. This approach affects industry-wide technology-attitudes. If IT expenses aren't legitimized and recaptured, the industry won't have the incentive it needs to invest in, and prepare for, construction technology.

IT staff

Less than half of construction companies have dedicated IT departments, a figure that dropped seven percent in the last year alone. The other half of companies either outsource a portion of IT (30.1 percent), outsource all of IT (19.5 percent) or designate staff with IT responsibilities without a designated department (21.9 percent).

These high levels of outsourcing present opportunities and challenges. Companies can scale resources, but they must manage new processes and vendors. A solution to this delicate balance would be the creation and implementation of industry-wide construction technology roles. These positions could centralize and manage technical processes and investments.

DEDICATED IT DEPARTMENT

2017

We have a dedicated IT department	49.6%
We outsource a portion of our IT	30.1%
We have staff with IT responsibilities but not a dedicated department	21.9%
We outsource all IT	19.5%
Other	1.9%

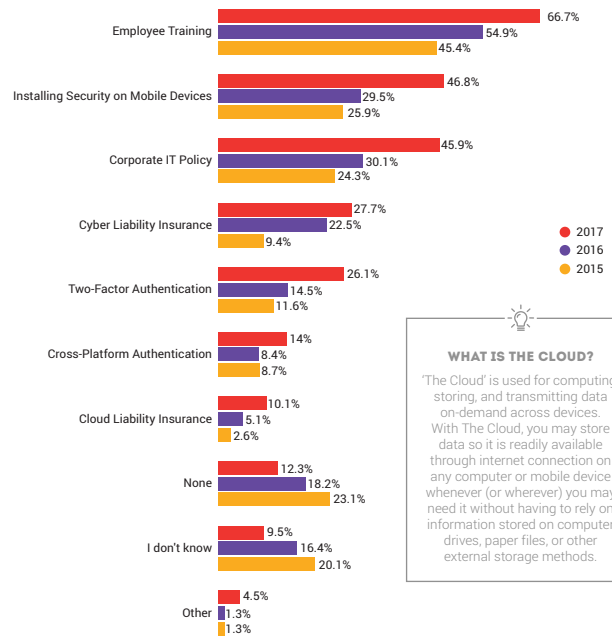**2014**
No 41.1%
Yes 58.9%

2016
No 42.6%
Yes 57.4%

While designated IT departments decreased, the size of IT staff increased almost 5 percent. This positive shift is likely correlated with increased IT spending.

Data security

Builders are taking promising actions to ensure data security and management. Their cyber security initiatives have increased 15 to 20 percent over the past year through expanded and more robust employee training, mobile device installations and corporate IT policies.

METHODS OF SECURING CLOUD DATA

	2017	2016	2015
Employee Training	66.7%	54.9%	45.4%
Installing Security on Mobile Devices	46.8%	29.5%	25.9%
Corporate IT Policy	45.9%	30.1%	24.3%
Cyber Liability Insurance	27.7%	22.5%	9.4%
Two-Factor Authentication	26.1%	14.5%	11.6%
Cross-Platform Authentication	14%	8.4%	8.7%
Cloud Liability Insurance	10.1%	5.1%	2.6%
None	12.3%	18.2%	23.1%
I don't know	9.5%	16.4%	20.1%
Other	4.5%	1.3%	1.3%

● 2017
● 2016
● 2015

WHAT IS THE CLOUD?

'The Cloud' is used for computing, storing, and transmitting data on-demand across devices. With The Cloud, you may store data so it is readily available through internet connection on any computer or mobile device whenever (or wherever) you may need it without having to rely on information stored on computer drives, paper files, or other external storage methods.

Many companies have made progress to secure cloud data. Sixty-seven percent of surveyed companies train employees to secure data. Yet, nearly 80 percent of them admit that only half of their employees really understand and apply the policies. This discrepancy implies that IT training is either not as prevalent as reported or not fully implemented and monitored. Construction companies are still vulnerable and should adopt more strategies to educate employees effectively.
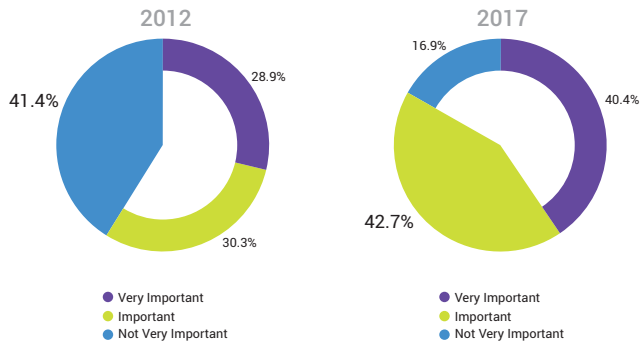
Mobile strategy

Mobile devices serve an increasingly helpful role for construction projects. This year, over 83 percent of surveyed companies found mobile capabilities to be "important" to "very important". These high approval rates indicate nearly 24-percent increases since 2016.

The top three mobile apps construction companies use are Procore, Bluebeam and Plangrid, apps that integrate workflow processes between the field and office. This finding suggests significant mobile appetite in the industry to enhance collaboration and communications.

The industry has not implemented social media as widely as it has mobile apps. Social media can bolster business credibility. Yet 25.5 percent of surveyed companies don't use it. Among respondents who do use social media, Facebook and LinkedIn are the most popular.

HOW IMPORTANT ARE MOBILE CAPABILITIES

2012

- 28.9% Very Important
- 30.3% Important
- 41.4% Not Very Important

Legend:
- Very Important
- Important
- Not Very Important

2017

- 40.4% Very Important
- 42.7% Important
- 16.9% Not Very Important

Legend:
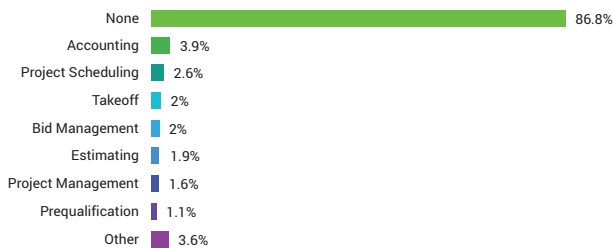- Very Important
- Important
- Not Very Important

Workflow strategy

Technology-poor construction strategies slow construction projects. Many builders reported workflows that are inefficient for four reasons.

Firstly, many companies duplicate workflows. The workflows most dependent on spreadsheets—estimating, accounting and project management—are also those most dependent on software. It is difficult to say why so many construction workflows require both spreadsheets and software. Are companies transferring data? Does existing technology fall short? No matter the reason, doubled workflows always increase risk and lower efficiency.

Secondly, respondents don't outsource workflows. Instead, they meet workflow needs in-house and absorb training, professional development and quality control responsibilities.

OUTSOURCED WORKFLOW

None	86.8%
Accounting	3.9%
Project Scheduling	2.6%
Takeoff	2%
Bid Management	2%
Estimating	1.9%
Project Management	1.6%
Prequalification	1.1%
Other	3.6%

Thirdly, builders are unaware of the technology solutions within the industry. In 2017, builders requested BIM, safety, and scheduling workflow technology. There are many technology solutions for these demands.

Fourthly, builders underestimate the importance of data integration when choosing a software solution. Respondents

reported that technology decisions are adopted at the departmental level, often without input from IT staff. Executives select technology solutions that don't consider how data enters and leaves the department.
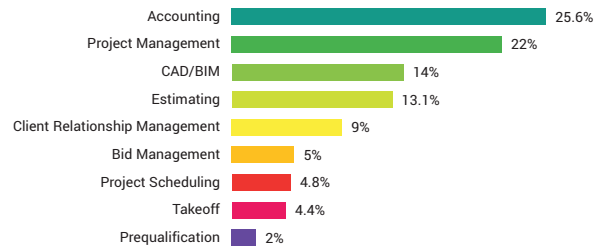
Tellingly, over 30 percent of companies use software applications that don't integrate, and nearly 50 percent of companies resort to manual data transfers when applications don't integrate. Manual data entry is tedious and risky. Happily—for the first time in the survey's history—the levels of manual data entry have decreased. Hopefully, this downward trend will continue.

Software in use

This year's survey asked builders which software they had recently implemented to improve workflows. Accounting and project management software were the most common. For accounting, builders tend to use Sage, Viewpoint or Quickbooks. For project management, they use Procore, Viewpoint and Sage, and for project scheduling they use Microsoft, Primavera and Asta Powerproject.

Switching to new accounting software is a major initiative. A deeper dive revealed that companies were partially influenced by smaller companies maturing into ERP systems. The fewest respondents implemented preconstruction software, a workflow which still relies heavily on spreadsheets.

WORKFLOW SOFTWARE IMPLEMENTED MOST RECENTLY

Accounting	25.6%
Project Management	22%
CAD/BIM	14%
Estimating	13.1%
Client Relationship Management	9%
Bid Management	5%
Project Scheduling	4.8%
Takeoff	4.4%
Prequalification	2%

Prequalification appears to be a low priority for most contractors. Companies perform prequalification internally with custom-built solutions or use another preconstruction software to augment prequel processes. This choice is confusing, as growing labour shortages make project search increasingly difficult.
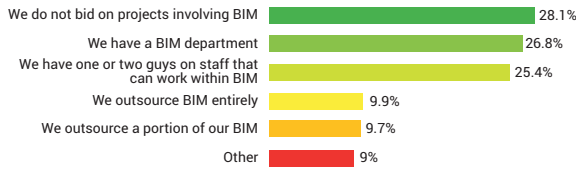
BIM

Last year, builders shifted away from BIM staff towards virtual design and construction (VDC) teams with leaner processes. The ConTech Survey evaluated the success of this transition. The results were troubling.

Most companies—over 73 percent—do not have dedicated BIM or VDC departments. And 28 percent of respondents don't bid on projects involving BIM. It seems that once companies hit more than $20 million in sales volume, they are likely to have dedicated VDC departments. Before this target, companies don't prioritize BIM or VDC. Companies find the lack of capable VDC labour, low buy-in options, and difficult time restrains on coordination challenging.

BIM speeds up projects and decreases safety risks. Furthermore, due to low levels of BIM expertise, those companies that take advantage of these opportunities will be in high demand. There are numerous resources for BIM education, training and implementation.

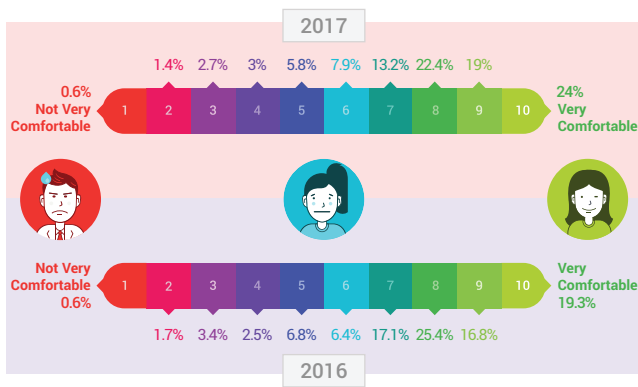|	
We do not bid on projects involving BIM	28.1%
We have a BIM department	26.8%
We have one or two guys on staff that can work within BIM	25.4%
We outsource BIM entirely	9.9%
We outsource a portion of our BIM	9.7%
Other	9%

Despite the shortage of experienced BIM staff, companies reported more comfort in their abilities to maximize VDC in 2017. Companies that do take on BIM projects are gaining confidence in maximizing workflow output.

Research and development

Builders are open to new technologies. The majority of respondents reported feeling "comfortable" to "very comfortable" trying new technology. Even respondents born between 1940 and 1959 reported an average comfort level of eight out of ten. These findings suggest that employees do not consider themselves barriers to implementing new tools.

HOW COMFORTABLE ARE BUILDERS WITH NEW TECH?

2017

| 0.6% Not Very Comfortable | 1 | 1.4% 2 | 2.7% 3 | 3% 4 | 5.8% 5 | 7.9% 6 | 13.2% 7 | 22.4% 8 | 19% 9 | 10 | 24% Very Comfortable |

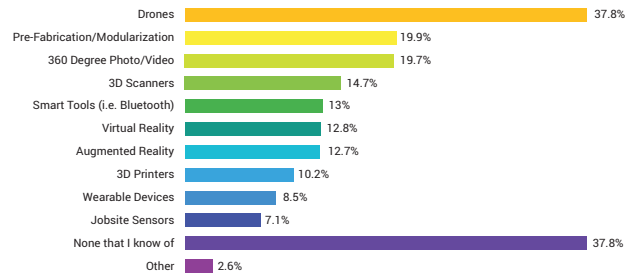| Not Very Comfortable 0.6% | 1 | 1.7% 2 | 3.4% 3 | 2.5% 4 | 6.8% 5 | 6.4% 6 | 17.1% 7 | 25.4% 8 | 16.8% 9 | 10 | Very Comfortable 19.3% |

2016

The largest obstacle builders face to adopting new technology seems to be management reluctance, which has been steadily increasing since 2014. Lack of IT staff and employee reluctance remain issues, while the influences of budget and maturity of technology have declined.

As technology matures, builders believe construction workflows will be automated using 360 cameras, drones, prefabrication and BIM. They hope the next generation will have field experience, BIM and comfort with technology R&D efforts. To prepare for this next generation, many builders have expanded their R&D budgets. Though this trend seems to be reserved for companies earning above $6 million.

Emerging technology

Companies are experimenting with new technologies at a higher rate than 2016. Most businesses are implementing drones, pre-fabrication or modularization, and 360-degree photos and videos. Only 38 percent of companies are not considering new tools. While this number may seem high, it is a promising 20 percent decrease since 2016.

WHAT EMERGING TECH ARE COMPANIES TRYING?

Drones	37.8%
Pre-Fabrication/Modularization	19.9%
360 Degree Photo/Video	19.7%
3D Scanners	14.7%
Smart Tools (i.e. Bluetooth)	13%
Virtual Reality	12.8%
Augmented Reality	12.7%
3D Printers	10.2%
Wearable Devices	8.5%
Jobsite Sensors	7.1%
None that I know of	37.8%
Other	2.6%

360-degree video and photo tools, BIM technologies, augmented reality and virtual reality promise exciting industry change. New and old construction players will offer low-end mobile-first features, digital training, fully-immersive digital landscapes, collaborative features and cross-system integrations.

These new drones, smart tools and sensors will help companies monitor—and ensure the safety of—employees. While most builders are, or are considering, using employee tracking technology, some don't see the benefit. This group perceived low benefits and high costs to tracking.

Pre-fabrication, modularization and 3D printing are particularly exciting. Simple solutions are being developed and used within our industry. Some companies are turning to pre-fabrication to deliver products within the supply chain constraints of modern construction. These businesses meet local demands and get materials quicker within a delivery-based model.

Modularization gained renewed industry, following the success of the 97-room Marriot hotel that was completed two months ahead of schedule. Industry leaders have tapped this as a possible solution to the United States' housing crisis.

Finally, strides in 3D printing are gaining ground, but this sector is still in its infancy. The cost and adoption barriers of 3D printing continue to drop and commercial use the latest materials and printing techniques may soon be widely available.