



THE 3RD ANNUAL CONSTRUCTION TECHNOLOGY REPORT

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Makers of



In Partnership With



CONSTRUCTION SCIENCE
TEXAS A & M UNIVERSITY

2014 CONSTRUCTION TECHNOLOGY REPORT

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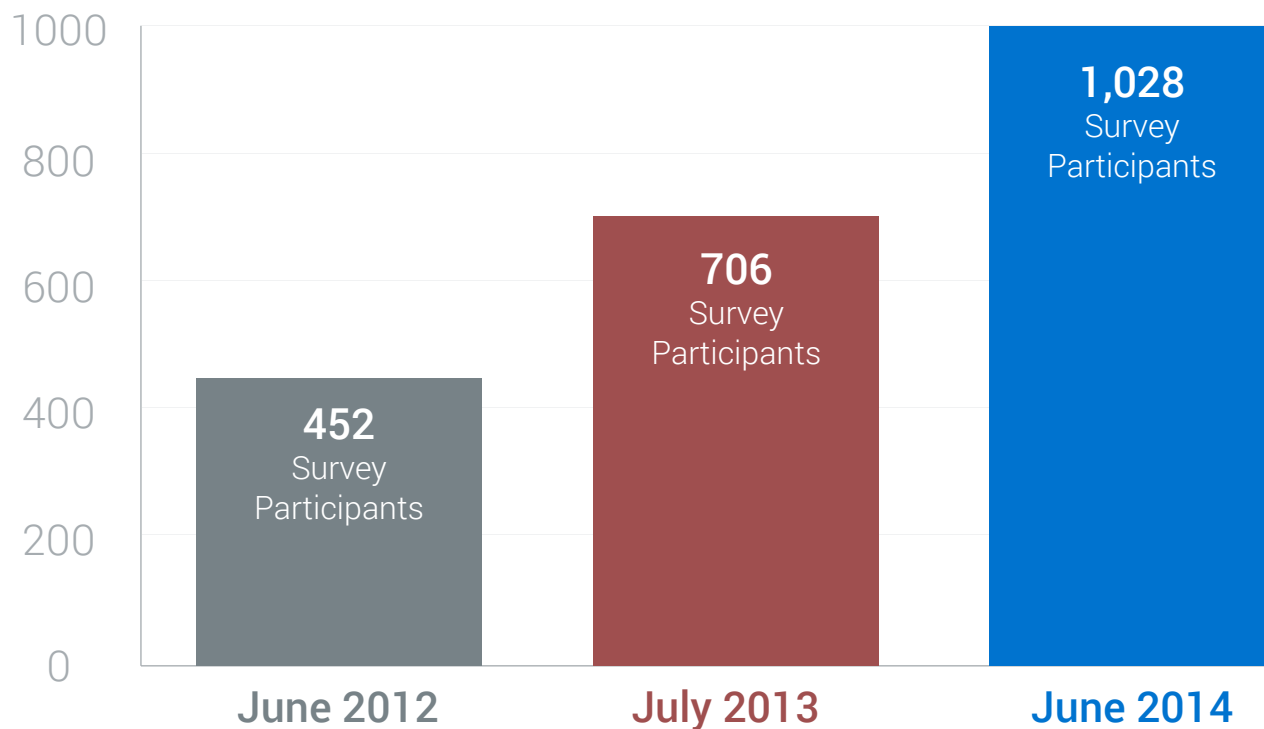
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JBKnowledge, Inc. conducted the first annual Construction Technology (CT) Survey in 2012. In providing technology consulting and solutions to firms across the U.S., JBKnowledge found that there was a distinct need to learn more about technology adoption and usage within the construction industry.

In June 2012, the first 20-question, web-based survey elicited more than 450 responses. In July 2013, the second annual survey drew responses from over 700 builders. This year, the third annual Construction Technology Survey was issued by JBKnowledge™ in conjunction with the Construction Financial Management Association (CFMA®) and the Texas A&M University Department of Construction Science and received over 1,000 responses. The results were again revealed by JBKnowledge™ President, James Benham, at the Associated General Contractors (AGC) of America Annual IT Forum in Chicago. Year after year, survey participants are contributing to valuable statistics on cloud adoption, mobile policies, security, and the role of IT professionals in construction companies.

This report reveals the comprehensive results from the 40-question 2014 survey with commentary and analysis from the perspective of a construction information technology provider. As we develop the 2015 survey, we encourage readers to send us feedback and recommendations at jbknowledge.com/contact.

The 2014 CT Survey aims to address the information technology strategies of small, medium and large construction companies alike, the solutions they employ, and how devices and software technologies integrate to support construction project collaboration. The following questions were posed during numerous discussions between the survey facilitator and its construction industry audience, further confirming the need for this survey.



What technology solutions and devices are industry professionals relying on in each stage of the construction process?

How are companies allocating IT staff and budgets to meet evolving technology needs?



Are builders taking advantage of developments in data integration and mobility?

Are data security policies and employee training keeping up with the new technology being implemented?



With what new technologies (i.e. wearables and augmented reality) are builders experimenting?

From 450 to 700 to now over 1,000 participants, we are extremely grateful for the growth in participation the annual Construction Technology Survey has seen since 2012. Now with partner organizations like the Construction Financial Management Association (CFMA®) and Texas A&M's world-renowned Construction Science Department, we are able to produce and distribute the most relevant survey possible to extract the most relevant statistics possible from our industry. First let me say thank you to our partners in contributing their industry expertise to the content and distribution of the CT survey and report. Second, thank you to every participant who took a few minutes to complete this survey. We trust that the contents of this report will be well worth your time.

Every year, the survey evolves through many rounds of research, analysis, and discussions. Every year, our industry's technology does the same. I often meet builders struggling to keep up with the pace of technology in construction and this report is an effort to mitigate that speed. This report should provide a benchmark and comprehensive review for where your firm stands and should stand among your peers in information technology strategy, adoption and usage.

Every year the results return a 'mixed bag' of insightful, surprising and concerning trends among builders large and small. Anyone who's heard me speak knows about my mission to eradicate our industry of spreadsheets and paper as a primary workflow tool, but alas, this year's survey proves I still have much work to do.

I'll repeat my favorite quote from a client: "I got into construction decades ago because you didn't have to be a rocket scientist, only to find out that now, you have to be a rocket scientist to be in construction." Many of you started in this industry because it was two guys and a hammer and you were ready to get dirty - skepticism towards emerging technology is common among this generation. Now, an increasing number of our industry is young and tech savvy, with more social media profiles in their tool box than actual tools. I'm here to say we need both of these demographics equally, and this report reveals why.

This year we've added questions about my favorite new developments in construction technology: augmented reality, virtual reality and wearable devices. I was happy to see the industry moving forward in research and development and the number of builders beginning to 'nerd out' on us. This report shows that some construction companies are determined not to fall behind other industries in the next generation of technology, and some companies are still not convinced.

This report also digs into how companies are allocating IT resources, from staffing to budget as a percentage of revenue. Unfortunately, the statistics confirm that our industry is still grossly under spending on information technology. One can only hope the rebound the industry is seeing this year will bump budgets in 2015 so we don't continue to fall behind other industries in IT investments.

I'll let the report tell you the rest of the story and leave you with one last thought to mull over as you read. One of our primary motives in launching the Construction Technology Report & Survey in 2012 was to confirm a theory: construction professionals use increasing amounts of technology - but are they fully harnessing the value of that technology through data integration, security and mobility? In one question - how well are we, as an industry, using the technology available to us and can we be using it more efficiently? This will never be a 'yes, no, or maybe' multiple choice question, but each year's CT Survey gets closer to providing a thorough answer. And each year, efforts like the Construction Open Software Alliance (COSA™), now joining forces with agcXML, gain purposeful momentum from that answer.

At the end of the day, I hope this report empowers you, your company and our industry to make more informed technology decisions.

Sincerely,



JAMES M. BENHAM
President, JBKnowledge, Inc.

The Construction Financial Management Association (CFMA®) serves thousands of CFOs, controllers, and financial managers in the construction industry, as well as construction CPAs; banking, financial service, and insurance professionals; surety underwriters; attorneys; and other construction industry specialists. Technology is an increasingly important topic when it comes to staffing and budgeting, and therefore a major aspect of any financial manager's role. Understanding industry trends and concerns relating to technology is a key component of allocating resources to employ that technology. We publish our own construction financial survey every year, but in partnering with JBKnowledge on the Construction Technology Report, we're able to get our members involved in a wider body of research on technology usage that contributes to industry strategy and benchmarking. **Our members joined CFMA® to learn more about their profession and their industry, and research like the CT Report is an invaluable resource in that endeavor.**

We are proud that many in our network of nearly 7,000 members were able to contribute data to this report. We hope it empowers all of our members to make more informed financial decisions for their company's technology strategy going into 2015.

Sincerely,

STUART BINSTOCK

President & CEO

Construction Financial Management Association ®

The Construction Science Department at Texas A&M University is dedicated to education, discovery, development, and application of knowledge in the field of construction and the 2014 Construction Technology Report is an effective and powerful tool in reaching that end. In an increasingly digital world, technology has become an inseparable part of construction, and as such an inseparable part of construction education. Whether it is in learning which applications have the highest level of adoption so students can be exposed to them, exploring the technologies that are just beginning to take hold, or learning the direction technology is heading, the results of this survey provide the insight needed in construction education to ensure technology is an appropriate part of construction higher education.

We are proud to be a part of the 2014 Construction Technology Report, as it is an invaluable tool in the Texas A&M Department of Construction Sciences' mission to prepare students to assume roles of leadership, responsibility, and service to society.

Sincerely,

BEN F. BIGELOW, PH.D.

Assistant Professor

Department of Construction Science, College of Architecture

Texas A&M University

Before reading the following report it is important to understand the process by which the survey and analysis were conducted. The 2014 CT Survey consisted of 40 total questions. The survey began by categorizing participants by industry, company size and role within the company. From there, survey respondents were filtered through a series of questions about their IT resources and staffing depending on whether or not their companies have an IT department or they themselves are designated as IT staff members. Next, all participants answered questions on the mobile integrations, devices and applications they use. The survey then asked about the web-based and desktop software participant companies use daily in each stage of the construction process and the integrations available for those solutions. Finally, respondents identified the emerging technologies they are familiar with and whether their firm is actively researching their use.

The survey was distributed via email, social media and online publications to over 30,000 construction industry professionals. It is important to note that a statistically relevant number of respondents are users of JBKnowledge's products, therefore statistics involving mobile apps and invitation to bid software may be skewed. JBKnowledge has made significant efforts to distribute this survey to as broad an audience as possible to mitigate statistical bias.

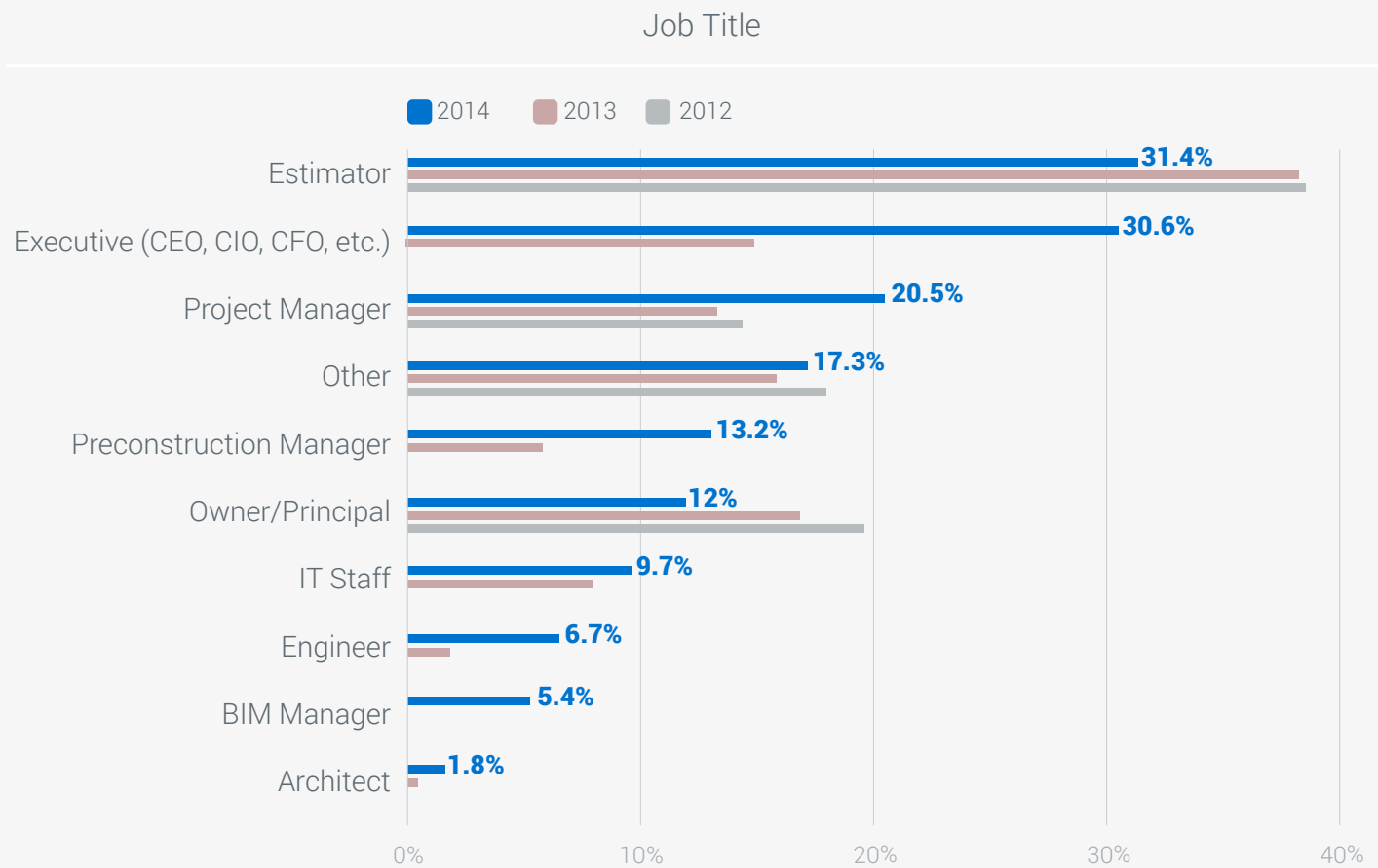
Many of the same questions that were presented in the 2012 survey were also in the 2013 survey and again in the 2014 survey. To compare the results, relevant graphs and statistics from previous year's surveys are provided alongside 2014 survey data. In some cases, new answer choices were added to the 2013 and 2014 survey questions and, in many cases, entirely new questions were added to 2013 and 2014 surveys. Therefore, there will not always be data available from previous years for comparison. Thanks to feedback from previous years' surveys, the number of respondents selecting "Other" for any given question has been significantly reduced as a result of including more varieties of answer choices each year.

On all questions with answer choices that were not simply "Yes/No" or a ranking system, survey respondents could select multiple answers. Many companies use a combination of solutions that varies across offices and locations. **For this reason, only percentages displayed in a pie graph will add up to 100%.**

Lastly, it is important to note that over 1,300 total responses were logged for this survey. To ensure statistical relevance, however, nearly 250 of those responses were removed for one of the following reasons: 1) The participant was a CPA, consultant, educator or technology provider who could not provide feedback on how the solutions and strategies mentioned are used in construction operations. 2) The participant did not provide enough answers to hold statistical significance.

Learn the individual and corporate demographics behind the 2014 Construction Technology Report survey results.

JOB TITLE AND INDUSTRY



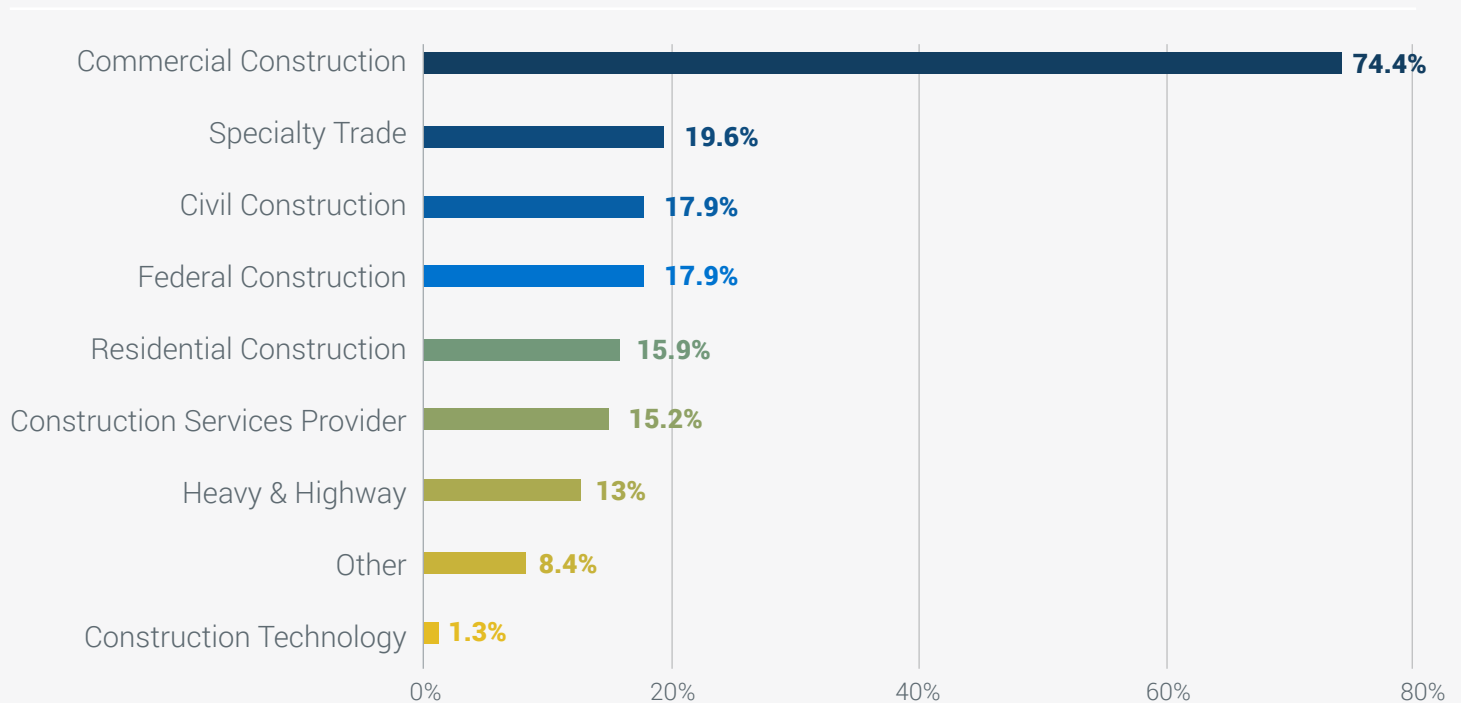
OTHER INCLUDED • Controller • Accountant • Administrative Assistant • Estimating Coordinator

The largest number of survey respondents to the 2014 Construction Technology Survey identified their role as Estimator, and over 30% of those estimators are a Project Manager or Preconstruction Manager. Closely behind, executives formed the next largest group. **Over half of the survey respondents perform a leadership role as a C-Suite executive or manager.**

“ We are a small start up construction firm so I am also pulling duty as an estimator/project manager/business developer. ”

ONE SURVEY PARTICIPANT COMMENTED 

Industry



OTHER INCLUDED • Industrial • Healthcare • Water/Wastewater Construction
• Multi-Family Residential Construction

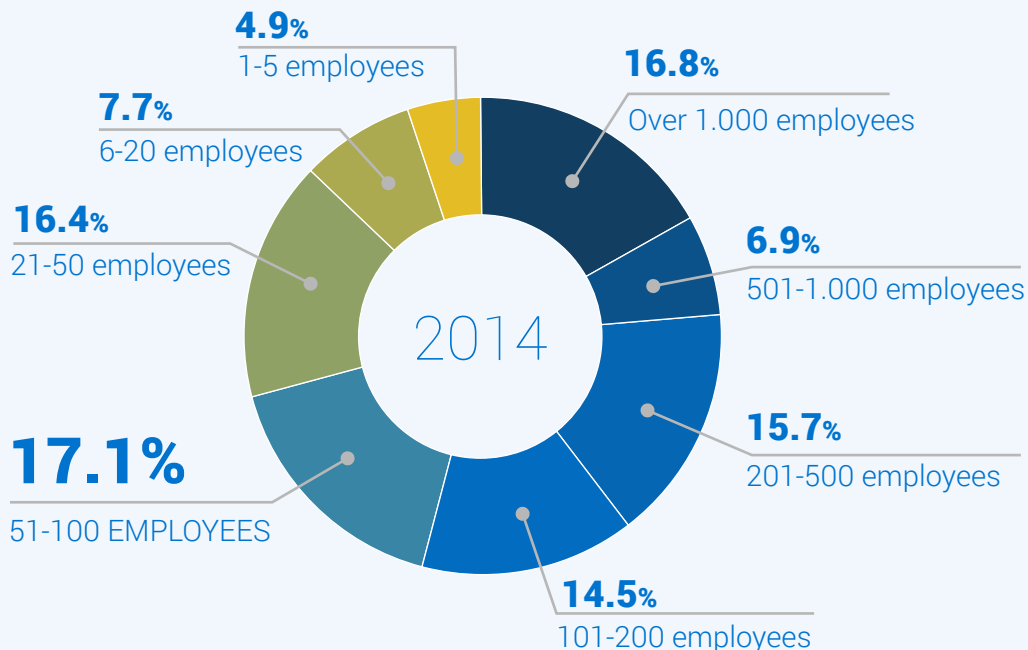
The majority, over 74%, of survey respondents build in the Commercial Construction sector in addition to at least one other sector, most often Federal Construction. Only one combination of sectors, Residential and Construction Technology Provider*, did not exist among survey respondents in any instance.

While the results of this survey are highly indicative of commercial construction technology trends, the data is still relevant to a wide range of industries due to the number of cross-sector companies and the likelihood of non-commercial firms integrating data with a commercial contractor somewhere along the project process.

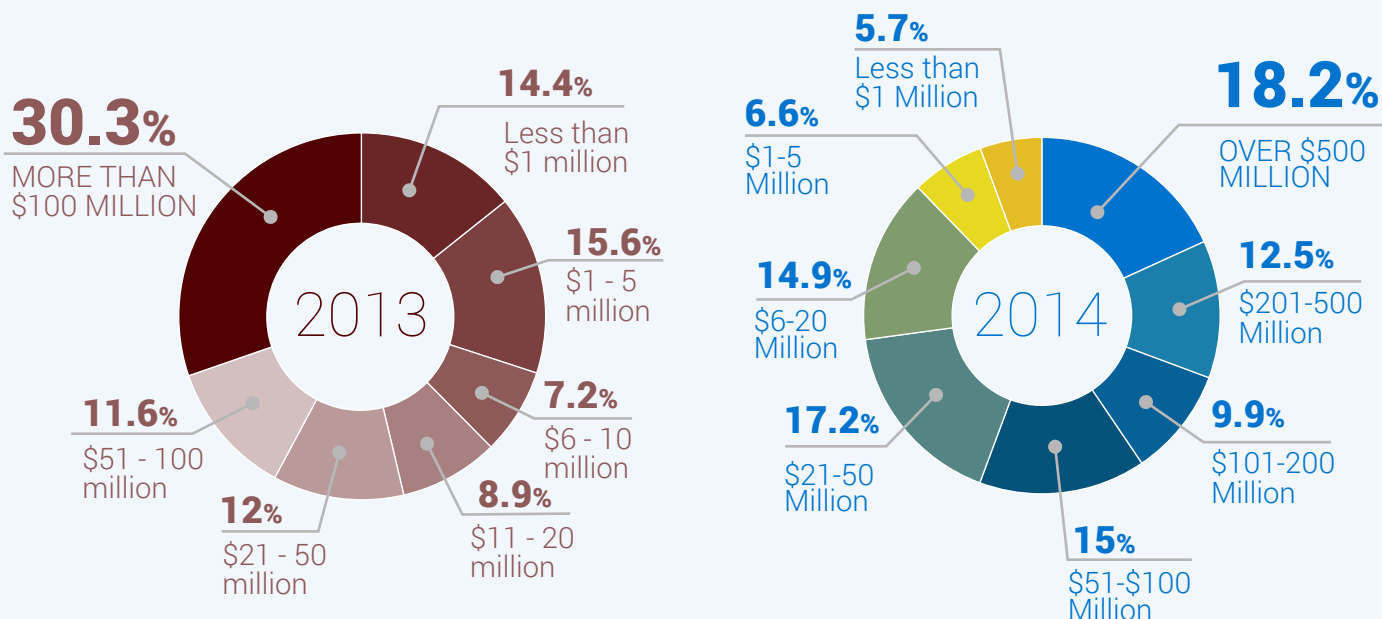
*As noted in the "Important Notes" section of this report, all construction technology providers' data were removed to improve statistical relevance, unless the company also performs construction operations and management, which accounts for the 1.3% shown above.

COMPANY SIZE AND SALES VOLUME

Number of Employees



Annual Sales Volume

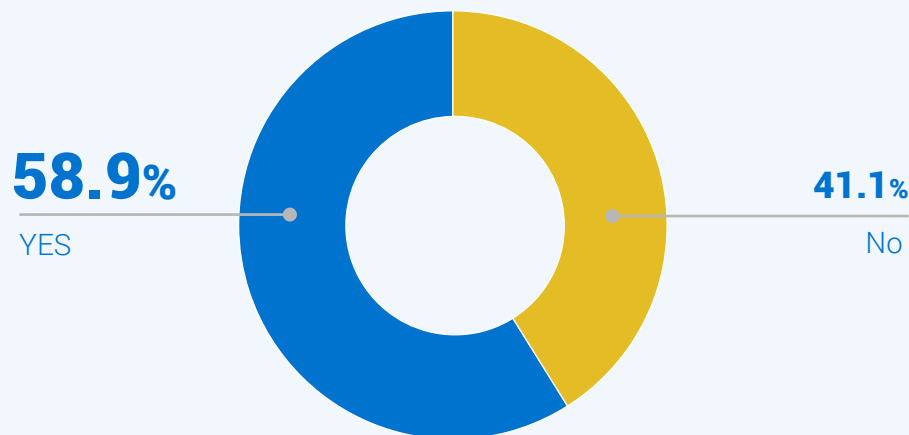


Survey respondents work for a wide range of company sizes and, as expected, the number of employees and annual sales volume are highly correlated. Over half of those surveyed work for companies with over 100 employees. Over 40% of those surveyed work for companies averaging over \$100 million in sales volume annually. Companies with the largest staff and annual sales volumes build in the Commercial, Civil and Federal sectors.

Being the third year in which the CT Report survey has been conducted, wider recognition of the survey led to the largest distribution reach yet. Therefore, the scope of participants is inevitably wider than in previous years. The breadth and depth of survey respondents' roles shows the pervasive nature of technology. IT best practices, solutions and strategies are no longer only of interest to the IT department. End users from all sectors, all company sizes, and all roles completed the survey to learn more about the technology that structures their daily operations and the daily operations of their peers. The 'Other Job Title' write-ins proved the entire construction process is represented in this report, from Project Management Intern to BIM Coordinator to CEO.

See how construction companies are staffing, budgeting and structuring information technology resources.

Does your company have a dedicated IT department?



Nearly 60% of companies surveyed have a dedicated IT department; most often these companies have staff sizes of 201-500 employees or over 1,000 employees and build more than \$200 million in projects annually. The likelihood of having an IT department dropped by 50% below 200 employees and \$200 million in sales volume. Interestingly enough, the likelihood of having an IT department also fell by 50% if a company has 501-1,000 employees. It is hard to say what makes 501-1,000 employee companies an outlier, but the reason may be due to the increasing number of companies employing third party IT staff. This may be a prime employee range for outsourcing IT.

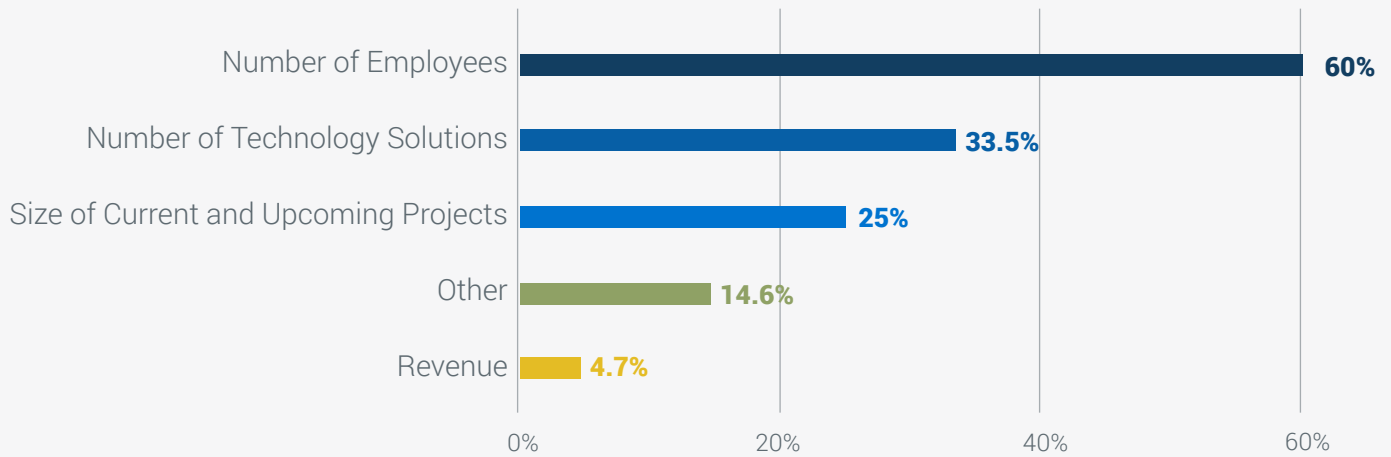
It's important to note that in their comments, many survey respondents were unsure how to differentiate between a team of IT staff, a very dedicated one-man 'department', and third party IT services staff. "IT department" is a relative term into today's construction environment.

ONE SURVEY
PARTICIPANT
COMMENTED



“ We outsource IT to a firm, and they have one person on staff every day; others available on call, and developers working off site. ”

Size of IT Department Depends On



When asked how their companies determine the number of IT department staff needed, over 50% said it is a function of the number of total employees on staff. Thirty-four percent said IT staffing depends on the number of technology solutions needing support and 25% said IT staff depends on the size and scope of upcoming projects. Only 4.7% said IT staff is dependent on budget allowances. This ranking of factors was consistent no matter the size of the company.

While it's hard to know how many survey respondents actually know or decide the factors behind IT staff size, the fact that many confidently ranked those factors similarly is compelling. Only 2% said they didn't know how their companies determine IT staff size.

ONE SURVEY
PARTICIPANT
COMMENTED



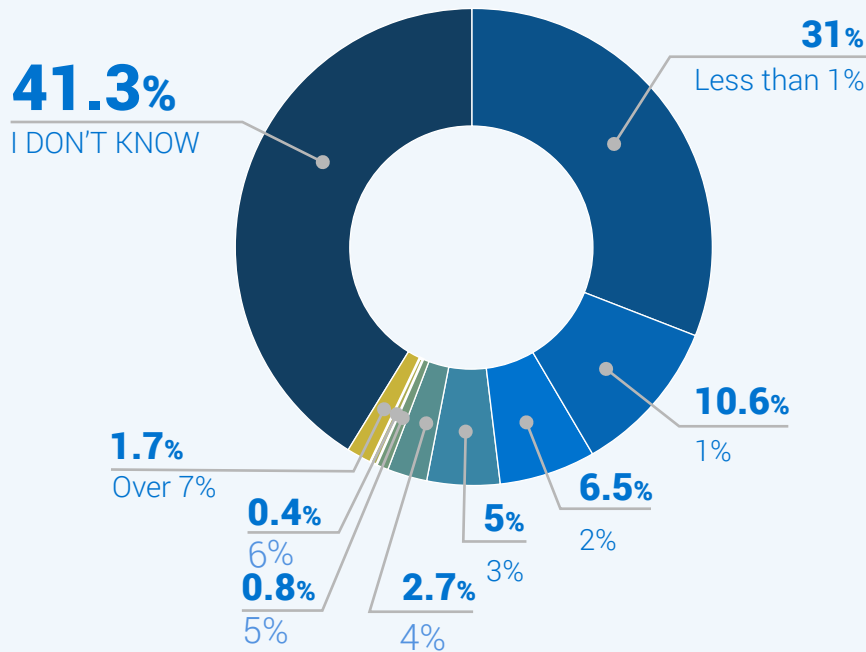
“

I think it's more like, "that's what we've always had."

”

IT BUDGET

IT Budget As a Percentage of Corporate Revenue



Over 30% of companies surveyed said that their 2014 IT budget as a percentage of 2013 corporate revenue (not building volume) is less than 1%. The larger the company's, the more likely the survey respondent was to select 'I Don't Know' when asked about their companies' IT budget. **Also, the size of the company did not impact the IT budget allocation; the majority of companies with the largest sales volumes still only allot less than 1% of revenue to IT.** These results coincide with [Gartner's 2014 IT Key Metrics Data](#) which highlights construction as the industry spending the least on IT as a percentage of revenue out of 19 industries. The Cross-Industry Average, according to Gartner, is 3.3% while construction sits at 1%. This means that the construction industry spends less than one third of its peers in other industries, leaving the industry poorly equipped to adapt to new on-site and back office technologies.

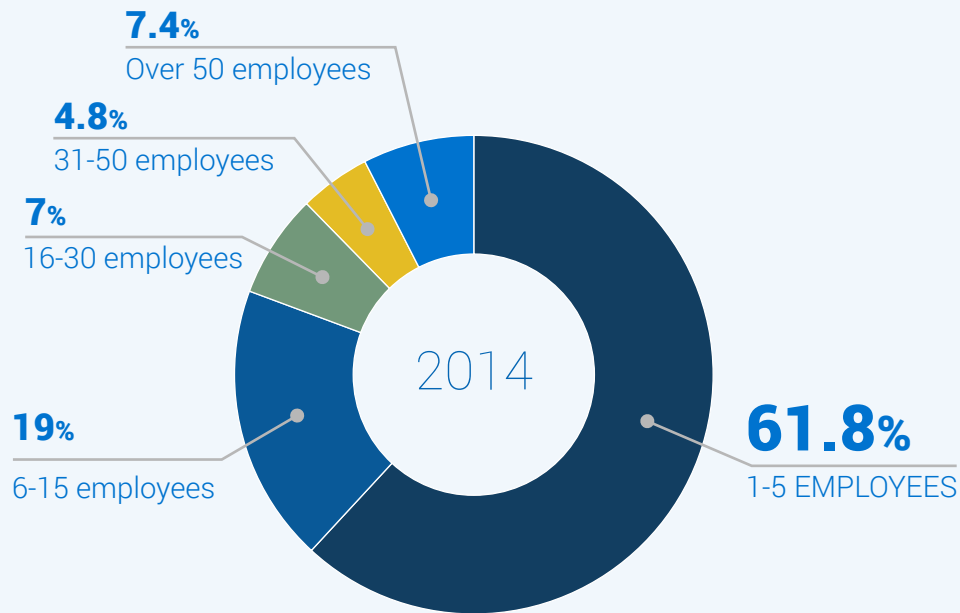
ONE SURVEY PARTICIPANT COMMENTED



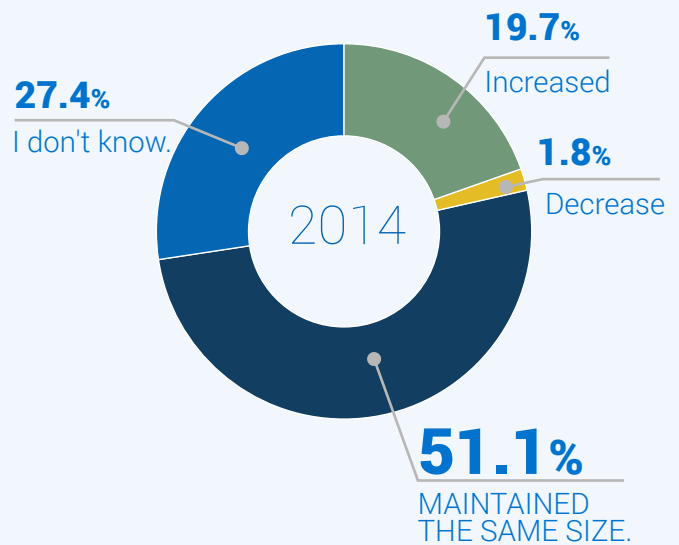
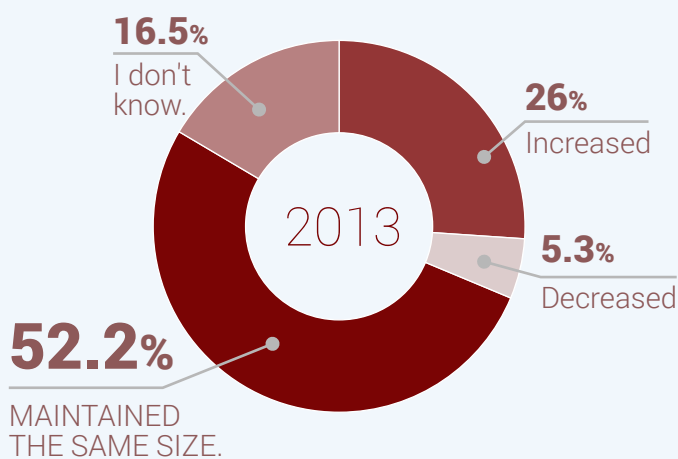
“ I don't have access to these numbers, but I would say that we didn't invest in too many "new" technologies in 2013 - just kept up with changing/adding staff. ”

IT STAFF

Number of Employees Dedicated to IT



Size of IT Staff



Survey respondents who answered 'Yes' to "Does your company have a dedicated IT department?" went on to answer questions about the structure of that department.

To put the above graph in perspective, the size of IT staff was compared to total employees, annual sales volume and allocated IT budget. The results showed that for companies ranging from 1 to 1,000 total employees, no matter the sales volume nor IT budget, the average IT staff size is 1-5 employees. The number of employees dedicated to IT grow only in companies with more than 1,000 employees. Over half of the companies maintained the same IT staff size in 2013 and plan to maintain the same size in 2014. Very few companies plan on decreasing IT staff in 2014.

With its very small chunk of corporate revenue, IT is forced to operate with a very small staff. The survey results reveal that whether a company has 1 employee or 999, no matter the number of projects, devices and software solutions that accompany that number of employees, most often they have no more than 5 employees dedicated to IT. The only consolation for frustrated end-users and overworked IT staff is that companies do not plan on decreasing IT staff in 2014.

ONE SURVEY
PARTICIPANT
COMMENTED

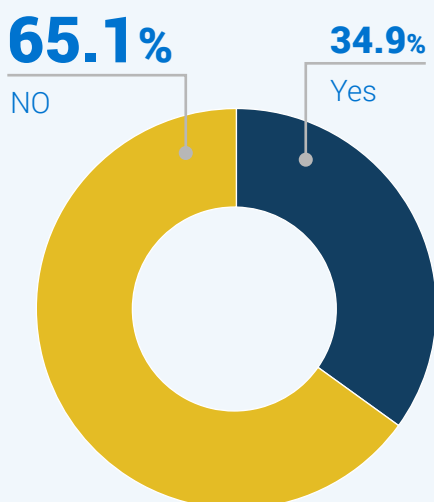


“

We have about 225 end users and two dedicated IT employees.

”

Do you perform an IT role at your company?



President
Owner
IT Manager
No 'Official' Title
Chief Estimator
Director of IT
Chief Financial Officer
Project Manager
Controller
Chief Information Officer
Director of Finance
IT Committee Member
Senior Systems Administrator

Over 60% of survey respondents fulfill an IT role for their companies, both in official and unofficial capacities. **Only 9.7% of survey respondents selected “IT Staff” when asked their job title in the survey, but when asked if they perform an IT Role, over 60% said yes.** Respondents were asked to write-in the title of their IT role and responses ranged from “My job title? ‘Help, it doesn’t work!’” to Chief Information Officer. Chief Estimator and No 'Official' Title were frequent write-ins.

It is inevitable that with IT staff not proportional to the number of employees, power users and proponents of their department’s technologies become the impromptu support staff. Estimators frequently use a large variety of solutions due to the computational requirements of their job and, therefore, it’s not surprising that many of the Chief Estimators, lacking sufficient IT support, admit to taking on the IT role themselves. This also creates a difficult environment for those dedicated IT staff who do exist but who don’t have the time or the resources to support their end-users. How often do employees dread having to ‘ask IT for help’? How often do IT staff dread their least favorite user improperly using a system yet again?

With very small IT budgets to work with, companies are relying too heavily on self-help among their employees and on software providers to make solutions easier to implement and operate. The other functions of an IT staff – procurement, systems analysis, data security and integration – are clearly being forgotten - this is even more apparent later in the report.

ONE SURVEY PARTICIPANT COMMENTED



“

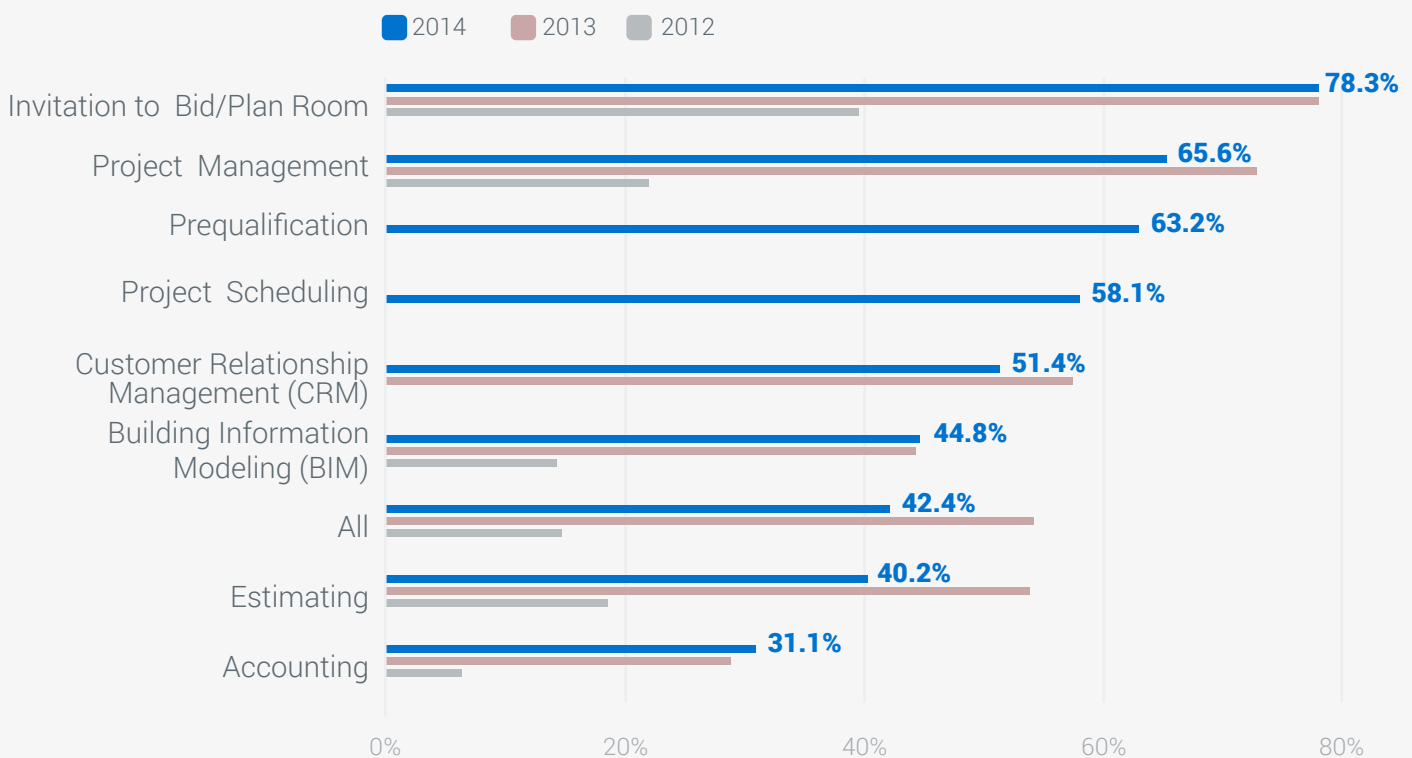
Although it has nothing to do with my position, nor do I get paid for my efforts, I tend to bridge the gap between our IT person and the staff in the office. I am much more approachable and can provide more insight to the end-user to help them work with the technology they are trying to use.

”

Review the current state of construction industry cloud security practices and policies and how data could be at risk.

SOFTWARE ALLOWED IN THE CLOUD

Data Permitted in the Cloud



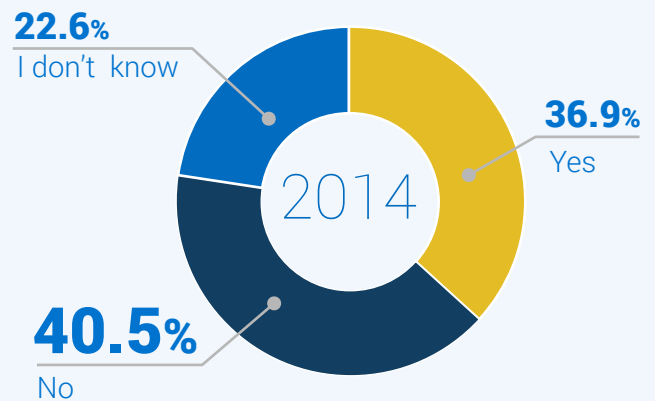
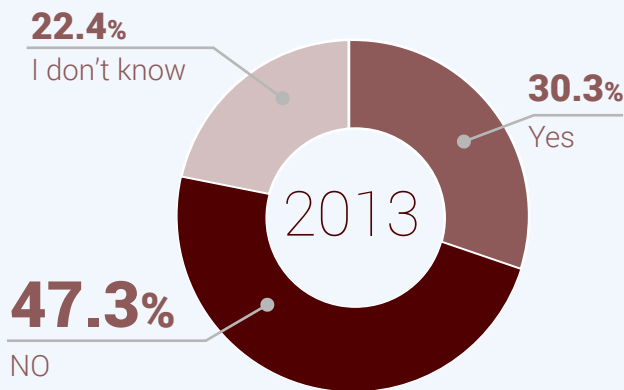
“Cloud computing” for the purposes of this survey is best **defined by The National Institute of Standards and Technology (NIST)**:

“Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction.”

Since the Construction Technology Report survey was first conducted in 2012, the allowance of cloud-based software to be used for construction processes has doubled. (Note: Allowance, not necessarily the adoption.) **Despite the proliferation of cloud solutions, for the third year in a row, accounting is still the least likely process to be in the cloud.** This is largely due to the perception that data on premise is safer than data in the cloud. The reality is that all data stored electronically is vulnerable to a broad variety of attacks and, by refusing to adopt cloud-based technologies, companies are missing out on the benefits of cloud computing for accounting. There are many ways to address this problem, including the hybrid approach taken by Sage in partnership with Microsoft Azure to deliver cloud-based reporting without exposing the entire general ledger and transaction log. Others, like CMiC and Jonas, have developed separate brands (Hikuu and Jonas Premier) to deliver entirely cloud-based accounting solutions.

CLOUD SECURITY POLICIES & PROCEDURES

Does your company have cloud security policies?

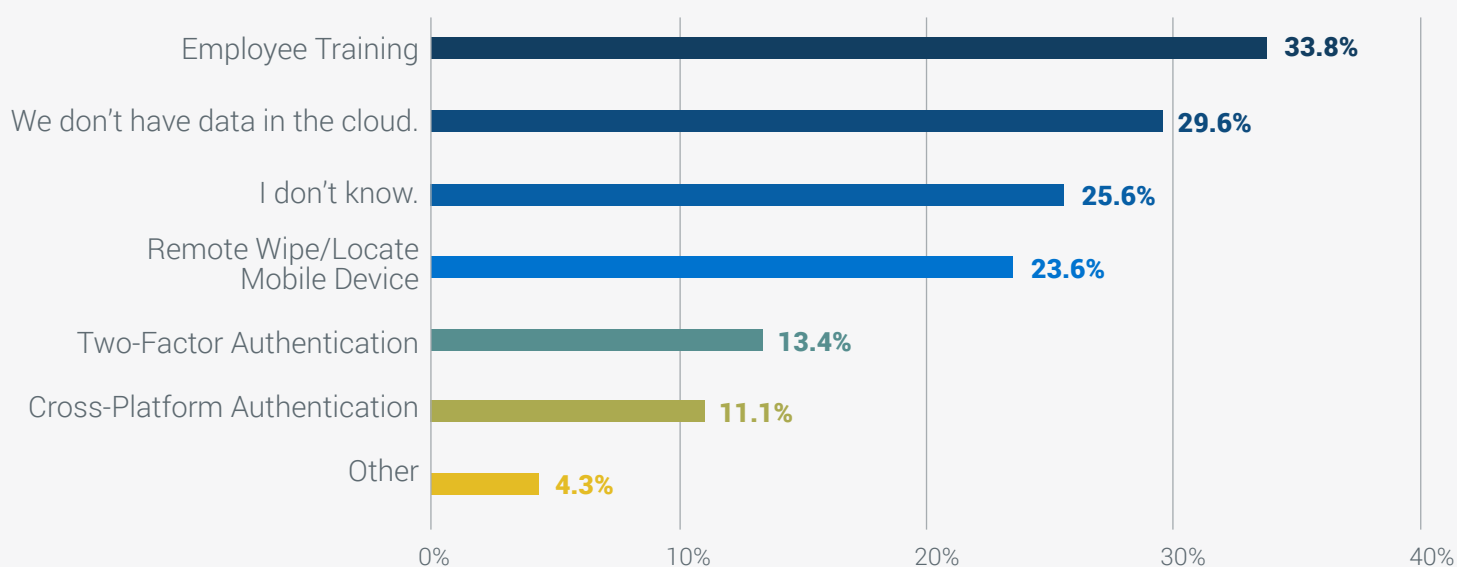


Sixty-three percent of the construction professionals surveyed admitted that their company has no cloud security policies in place, or that they knew of no cloud security policies in place.

Seventy-five percent of those who said “I don’t know” answered previously that their companies have a dedicated IT department. Sixteen percent of those who said “I don’t know” also said they perform an IT role at their company. When compared to company size, companies with more than 200 employees were more likely to answer “Yes” to cloud security policies being in place, while mid-range contractors, with 21-200 employees, were the most likely to answer “No” to security policies being in place. Two hundred employees is much too high of a threshold for companies to reach before reigning in and monitoring cloud data usage.

Despite companies allowing an increasing amount of data in the cloud, the policies and procedures that should accompany cloud usage are not increasing at the same rate. Builders are using more cloud solutions than ever before, opting for mobile, remotely accessible data in place of desktop applications needing installation or CD-ROMs. Construction professionals are accessing their data via private and public cloud infrastructures and collaborating across departments and continents. While this appears to be an optimistic trend for anyone who believes in the legacy of technology, one look at the lack of data security policies in place turns this trend on its head. Companies are adopting more and more cloud solutions without implementing the security policies to accompany them. Data is requested, transmitted and manipulated by an increasing amount of devices, people and companies through the cloud, and, according to these survey results, companies know less and less about the quality and security of the data.

Methods of Securing Cloud Data



When asked how they are securing data in the cloud, 29.6% of construction professionals surveyed answered that they don't have data in the cloud. Later in the survey, over a quarter of that group said that they use a personal mobile device, connected to the cloud, for work purposes.

Employee training is the most common method of securing cloud data according to survey participants. Twenty-six percent of those surveyed don't know how their cloud data is being secured. Seventy-three percent of those "I don't knows" have no dedicated IT department at their companies.

Companies are out of touch with cloud maintenance and threats, and employees follow suit. Those who answered that they “Don’t store any data in the cloud,” later admitted to using smartphones, tablets and personal solutions, like Dropbox, for work purposes. This means that people are using the cloud through their mobile solutions and don’t even recognize that they have data in the cloud.

Employee training is the most frequent data security method used most likely because it is the least expensive, and, in theory, easiest to get approved and implemented. Beyond that, it seems most of the companies surveyed are leaving themselves exposed to cloud security threats and relying on an unofficial honor system among employees or their solutions providers to ensure data security. Even if the IT department handles cloud data security, employees must be aware of the policies they need to follow to maintain that security.

ONE SURVEY
PARTICIPANT
COMMENTED



“

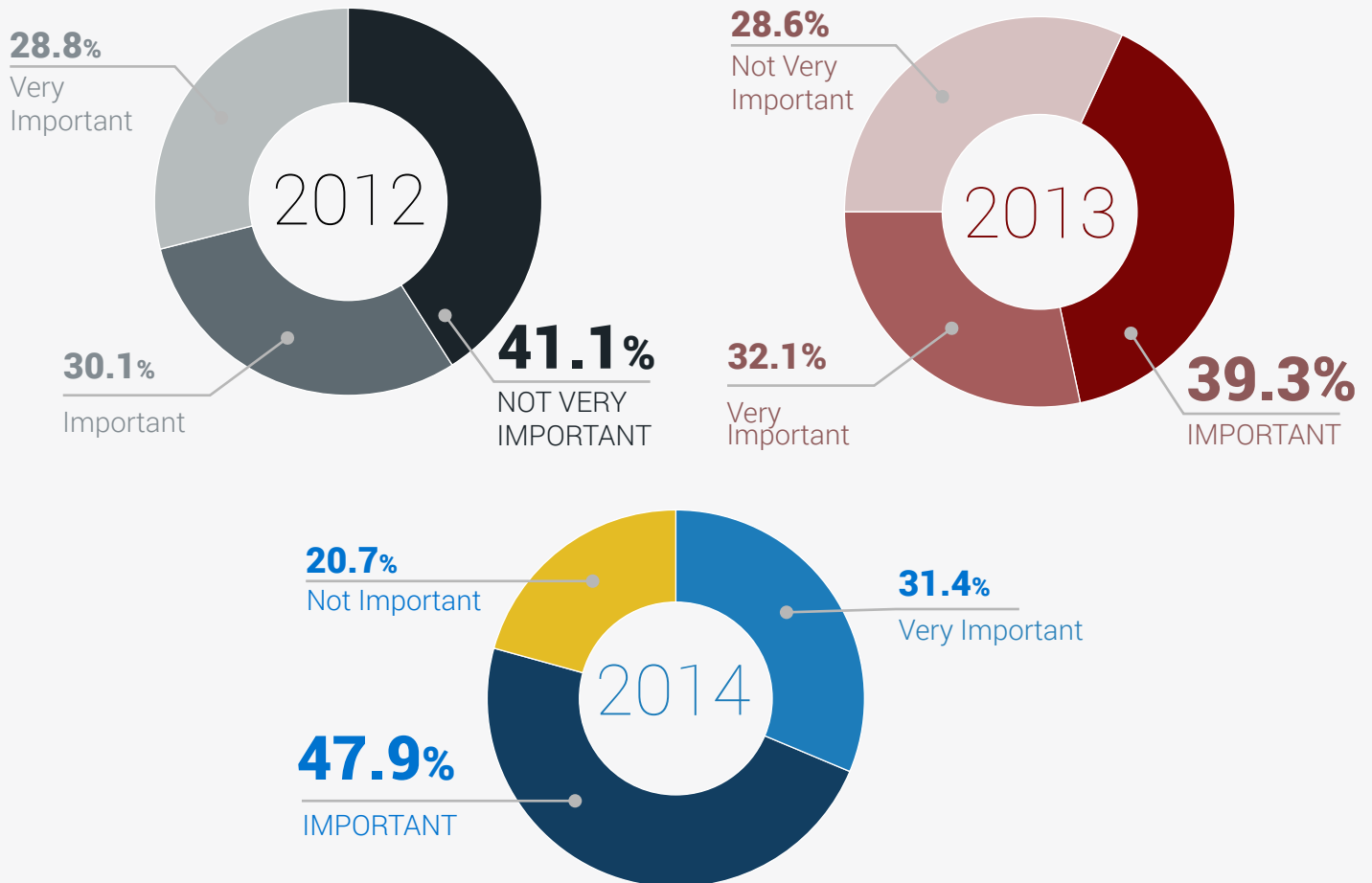
Data storage service provider secures the information... or so we hope.

”

Discover the mobile strategy, applications, hardware and policies that drive project data accessibility on-the-go.

IS MOBILE A PRIORITY?

How important are mobile capabilities when selecting solutions?



While the number of construction professionals who say mobile technology is “Very Important” has remained fairly consistent since 2012, **the number of professionals who say mobile is “Not Important” has decreased since 2012.** While companies weigh the costs and benefits of the latest mobile technology, fewer and fewer construction professionals can deny the importance of a mobile strategy.

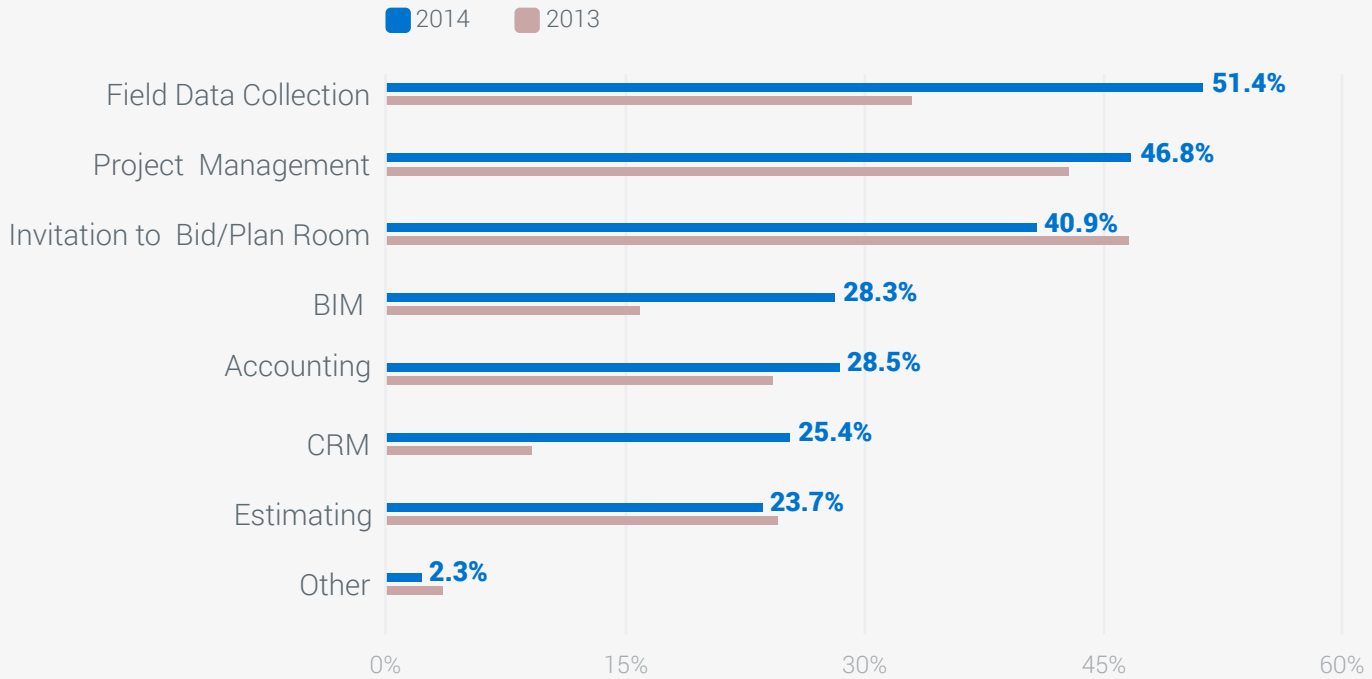
ONE SURVEY PARTICIPANT COMMENTED



“ Company standpoint - Not Very. Personal standpoint - Very. ”

TOP MOBILE APPS

Which of your software providers offer a mobile app?



OTHER INCLUDED • Daily Payroll & Reports • Field Service Management • Safety • Document Management

Since 2013, the categories of software in which construction professionals have seen the most growth in mobile development are solutions for Field Data Collection, Building Information Modeling (BIM) and Customer Relationship Management (CRM).

Invitation to Bid/Plan Room software led mobile development in 2013, but was surpassed by Field Data Collection and Project Management offerings in 2014. The proliferation of mobile devices connecting the office to the job site is being met by increased capabilities from field data collection solutions providers. Project management solutions touch every phase of a construction project so it's fitting that mobile technology connects that data through the phases. Accounting lags behind in mobile offerings. As you'll see later in this report, construction professionals still don't fully trust accounting in the cloud and therefore trust accounting even less on mobile devices. Accountants also do not require the same mobile capabilities as, for example, a job site superintendent communicating between the office and the field.

CRM and BIM mobile applications also lag behind, but not because of cloud security fears, but rather because adoption rates of these software applications are lower than the other categories, most likely due to the cost and maturity of solutions.





















While BIM software in general falls behind in mobile development, 25% of the top 20 mobile apps in use by those surveyed are BIM mobile apps; so the mobile solutions that are available are being put to use frequently. Finally, Estimating in last place reflects the functionality of the software - it is difficult to perform complex measurements and takeoff from a small, mobile touch-screen. Computing capacity limitations of web browsers and mobile devices also limits the ability to manage the gigantic data grids that most estimates entail.

ONE SURVEY PARTICIPANT COMMENTED



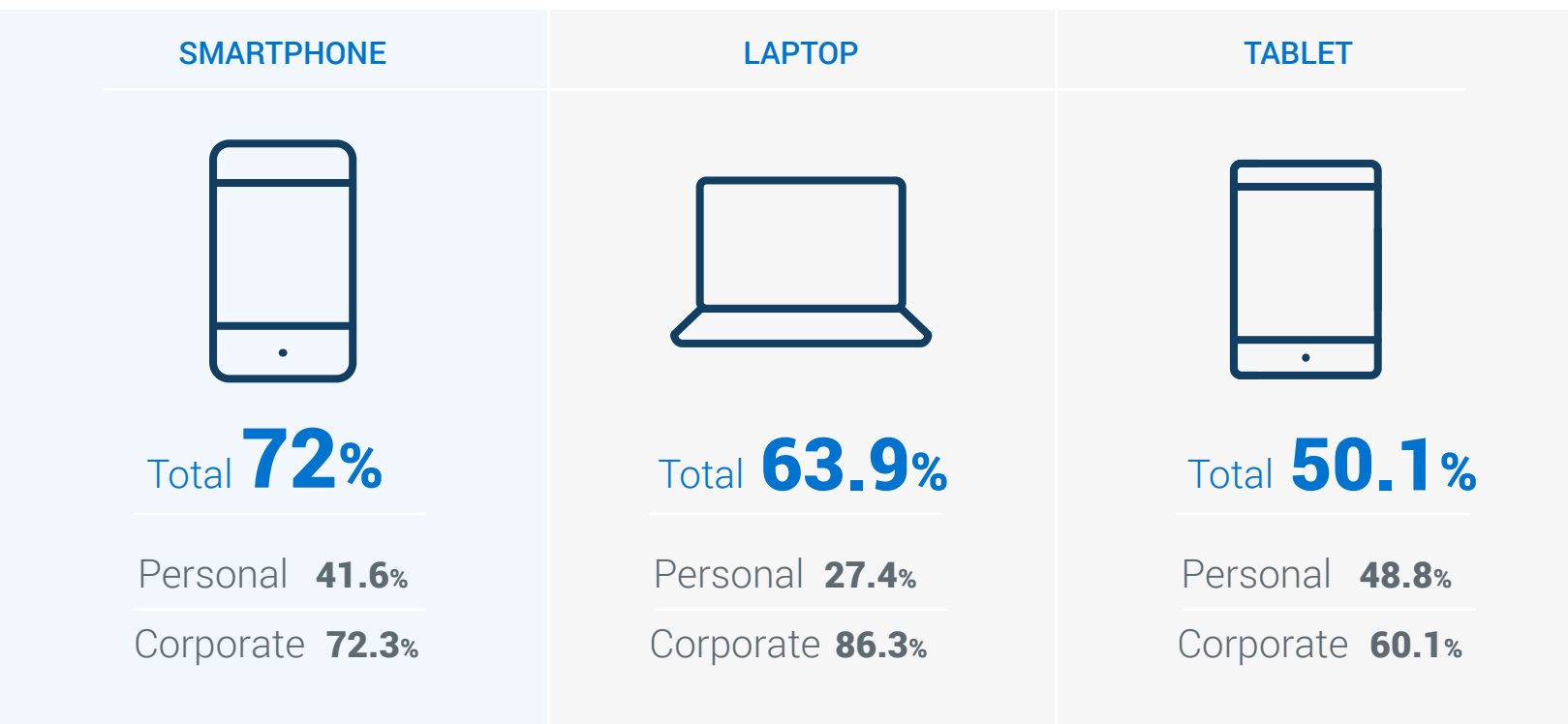
“ We connect to a lot of these programs through Citrix to a central server on our mobile devices. Based on this I don't know if my yes's are correct. ”

TOP 20 MOBILE APPS

				
AutoCAD 360®	Bentley Navigator®	BIM 360 Field™	BIM 360 Glue®	BIMx™
				
BlueBeam®	Construction Master 5	DeWALT Mobile Pro™	HCSS	iAuditor
				
MagicPlan	Onsite Planroom™	PlanGrid	Procore™	Prolog Mobile
				
Sage Timberline	SmartBidNet®	SmartReality®	TurboViewer	Vela Systems Mobile®

It's important to point out that some survey respondents may not distinguish a native mobile application from accessing their web-based software through a mobile browser. While all apps listed in the top 20 by survey respondents are native mobile applications (and not a website accessed through a mobile browser), very few of the top 20 are standalone mobile applications. Most of them are mobile extensions of web-based software, giving users mobile access to their cloud data but not necessarily full functionality to edit that database. The construction industry is starting to see mobile-first solutions that later add limited web functionality. This is a byproduct of a more sophisticated development community, more tech savvy user base and, of course, much more powerful mobile devices.

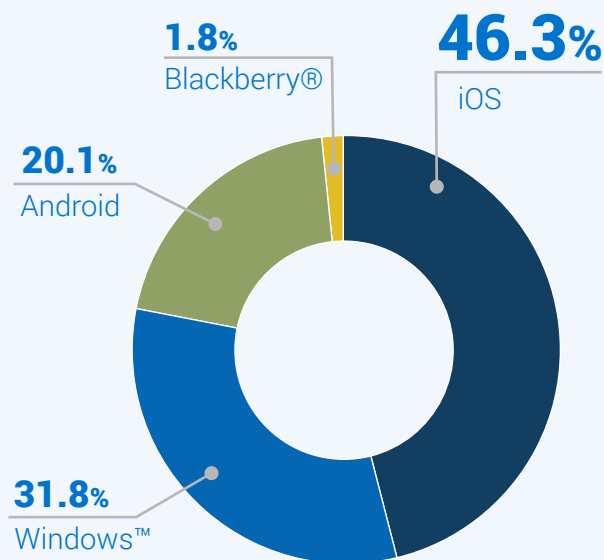
MOBILE DEVICES & OPERATING SYSTEMS



The total number of devices used by construction professionals for work purposes in 2014 versus 2013 did not increase dramatically. However, when distinguishing between personal and corporate devices being used, the numbers suggest that more companies are providing hardware for work purposes, as personal devices used at work have declined in number. Corporate-provided devices used at work increased in number but not quite at the same rate that personal devices declined.

This suggests that despite the increase in corporate-sponsored devices, it may be a blurry line when distinguishing if a device is personal or corporate, especially with Bring Your Own Device (BYOD) policies in place. BYOD means construction professionals can select and use their preferred device, but corporate policies apply to that device and corporate applications are provided and supported by corporate IT staff. In some cases, BYOD policies even provide a subsidy and guidance for hardware purchase, further complicating the distinction between 'Personal' and 'Corporate.' **Outside of desktop computers, smartphones are the most frequently used computing devices by construction professionals in 2014 and the majority of those smartphones are corporate-provided.**

Mobile Operating System in Use

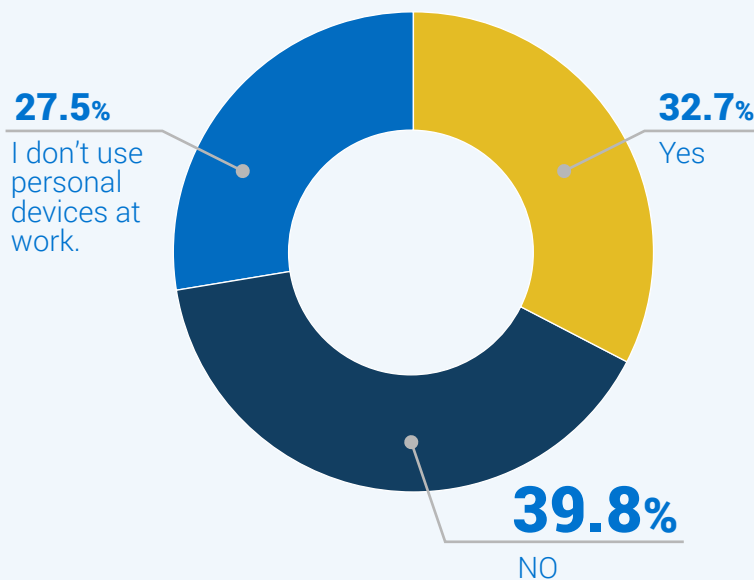


The largest percentage of builders are employing mobile devices running Apple® iOS operating system. iOS' popularity as a mobile operating system no doubt reflects Apple® position as first movers in the consumer smartphone and tablet markets; however most business desktops run Windows™ and, therefore, the Windows™ mobile operating system should continue to follow close behind in popularity. Blackberry® is used by only 1.8% of construction professionals surveyed. The survey question asked the primary operating system builders use daily, but many commented that they use more than one and it would be hard to say which of their mobile operating systems was used most throughout the day. Less savvy respondents also admitted to selecting Windows™ operating system because it ran on their desktops, and not because they use the actual Windows™ mobile operating system.

As hinted by several survey respondents in their comments, the next phase in mobile capabilities will depend not on hardware and software providers, but on network providers. Companies are finding that connectivity, devices and operating systems are improving but the cost of data plans and installation of networks, especially on remote job sites, far outweighs the benefits of employing the mobile technology. The industry should be excited about the development of gigabit wireless prototype networks currently being pioneered in South Korea, which would give users the ability to download, for example, entirely coordinated Revit models, in a matter of seconds, to their mobile devices.

BYOD (BRING YOUR OWN DEVICE) POLICIES

Does your company secure personal devices used at work?



Forty-nine percent of survey respondents said they use a personal laptop, smartphone or tablet for work purposes, but only 32.7% of those professionals' companies insist on securing those personal devices before they can be used at work. Over a third of those surveyed admitted that their companies do not require approval or securing of the personal devices they use daily that contain corporate data. Companies are increasingly negligent in not knowing and securing the employees and devices that touch their corporate data at all times.

ONE SURVEY PARTICIPANT COMMENTED

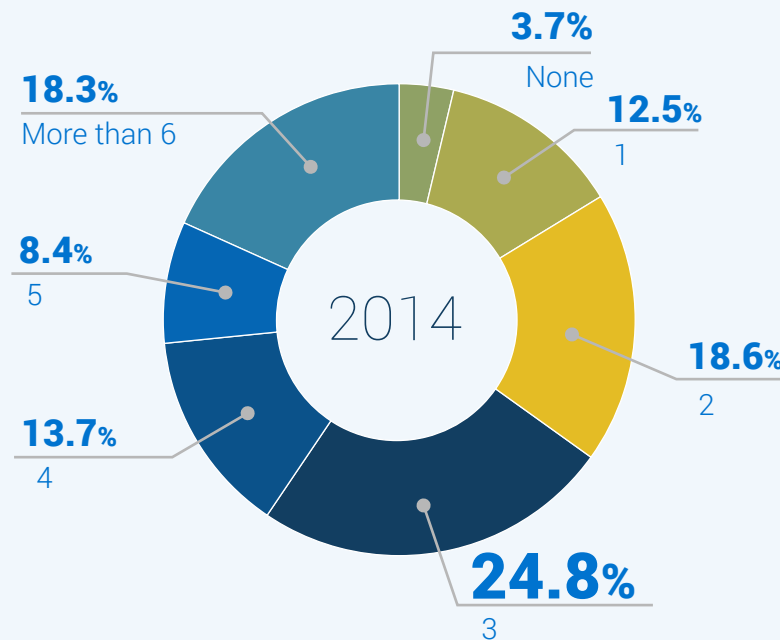
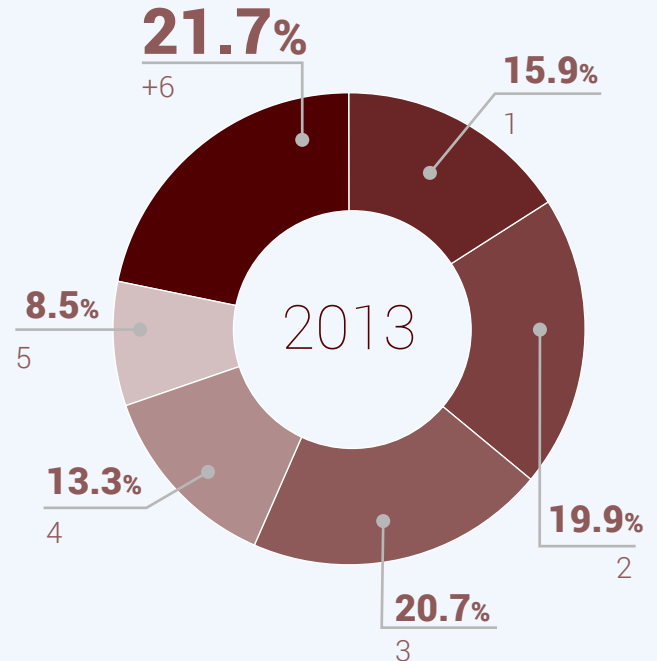
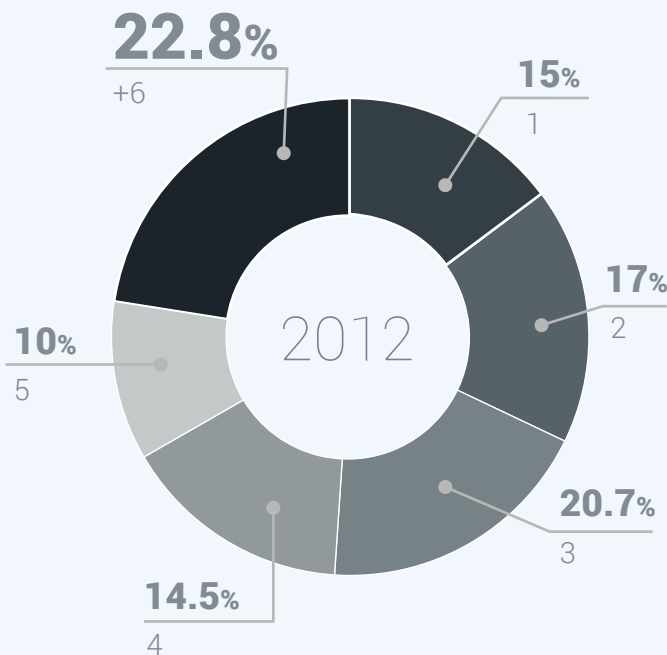


"Yes and no. Yes for getting to shared files, VPN log in is required. No for email on smartphones."

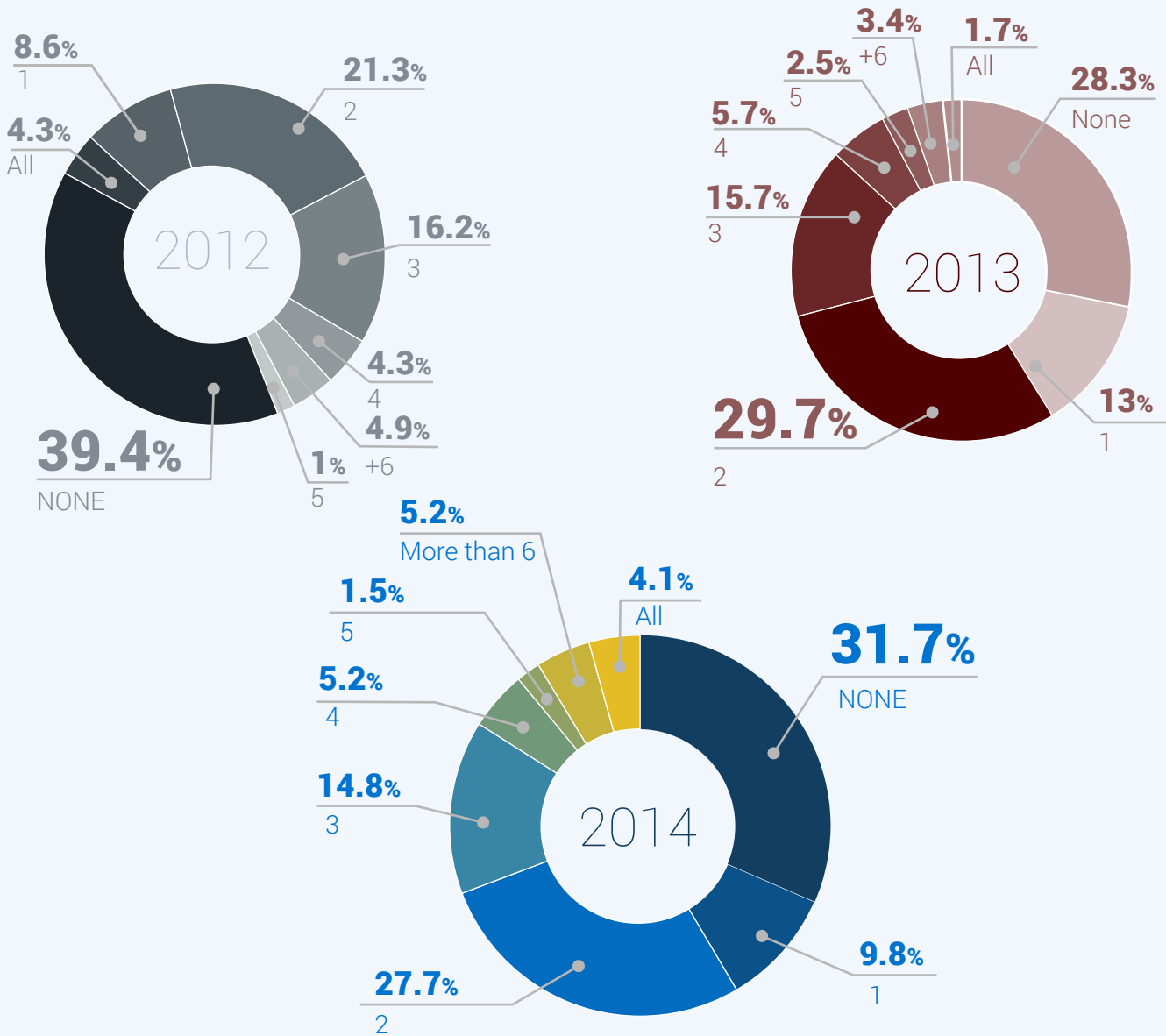
Explore the software categories, brands and integrations used in the daily operations of construction professionals.

SOFTWARE INTEGRATIONS

Number of Software Applications Used Daily



Number of Integrated Software Applications



The average construction professional uses 3.3 software applications daily and, on average, 1.7 of those applications integrate. Eighteen percent use more than six. **On average, professionals are using fewer software applications than they did in both 2012 and 2013.** This could mean the consolidation of processes from independent software to enterprise suites or that companies are taking more processes in-house from third party solutions.

For the purposes of this report, 'integration' is defined as the automatic or user-prompted one or two-way transfer of data between independent, cloud-based or server-based solutions without a significant amount of manual effort required by the end-user. A subcontractor prequalification software that allows users to push qualified subs' data into a separate bid invitation software through a secure web API would be considered 'integrated' with the bid invitation software.

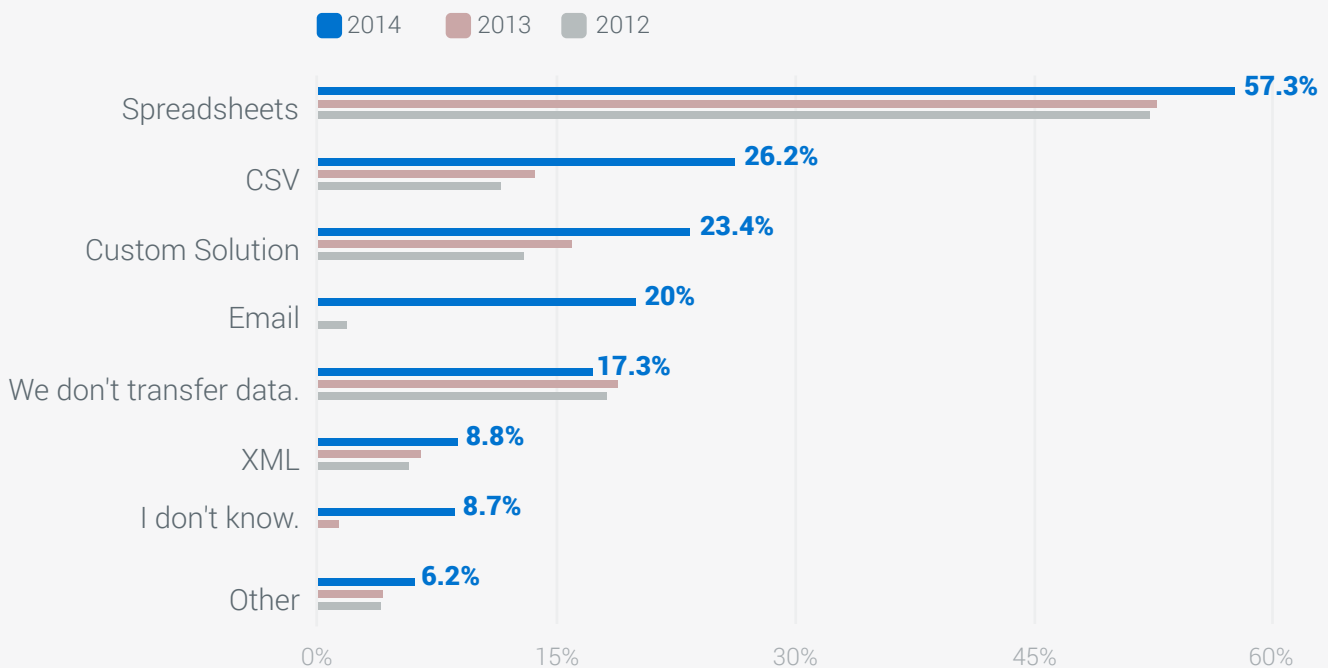
Of all the construction professionals surveyed, only 4.1% have full integration across their software platforms and over 30% said that they have no software integration whatsoever. To put this in perspective, 11.9% of construction professionals that use six software applications daily have zero automatic data transmission between those six applications.

ONE SURVEY PARTICIPANT COMMENTED



“ I don't count exports that then have to be massaged for import into another application. ”

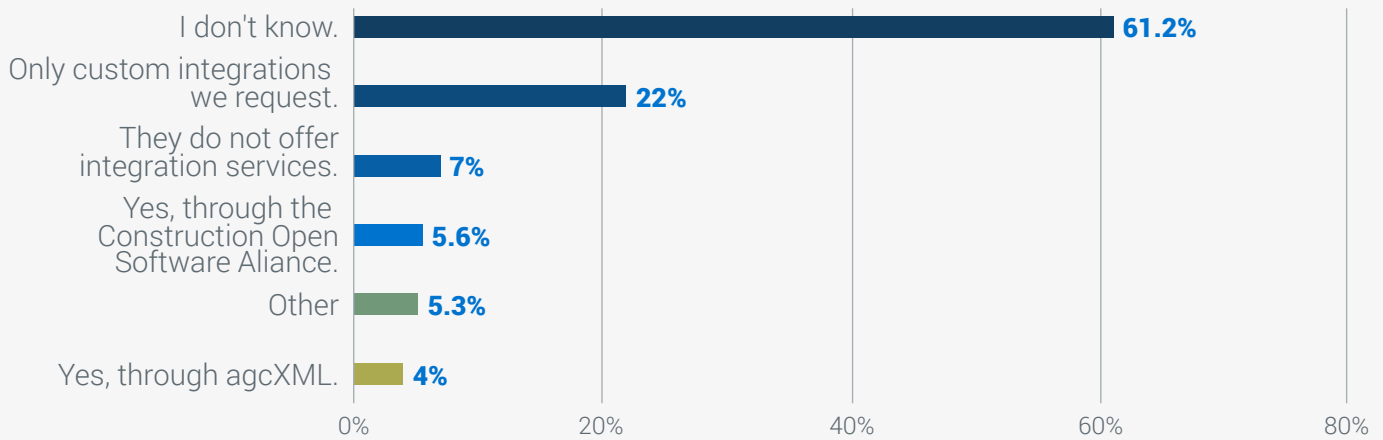
Data Transfer Method Used When No Integration Exists



Since 2012, the number of builders relying on spreadsheets for data transfer continues to rise, along with the use of CSV files and email. For the third year in a row, nearly 20% of those surveyed said they simply don't transfer data. A growing number of companies are building custom solutions for data integration.

Since the cost of such custom developments increase with the efficiencies created, it is understandable that the majority of companies building custom solutions are those also bringing in over \$500 million in annual sales. Nine percent (Estimators, whose data is transferred throughout the entire life cycle of a project and Project Managers, who often manage several processes and deliverables throughout several phases of data) admitted they do not know how data is transferred between processes.

Do your software providers offer integration services?



Are software providers working to remedy lacking integrations among their solutions and between their solutions and other providers' solutions? Sixty-one percent of survey respondents said they don't know and have seen no definitive action from their solutions providers to integrate data. Twenty-two percent of software providers will build custom integrations for users if the price is right, and only 9.6% of software providers are aligned with open integration initiatives such as the Construction Open Software Alliance (COSA™), which has now joined forces with agcXML.

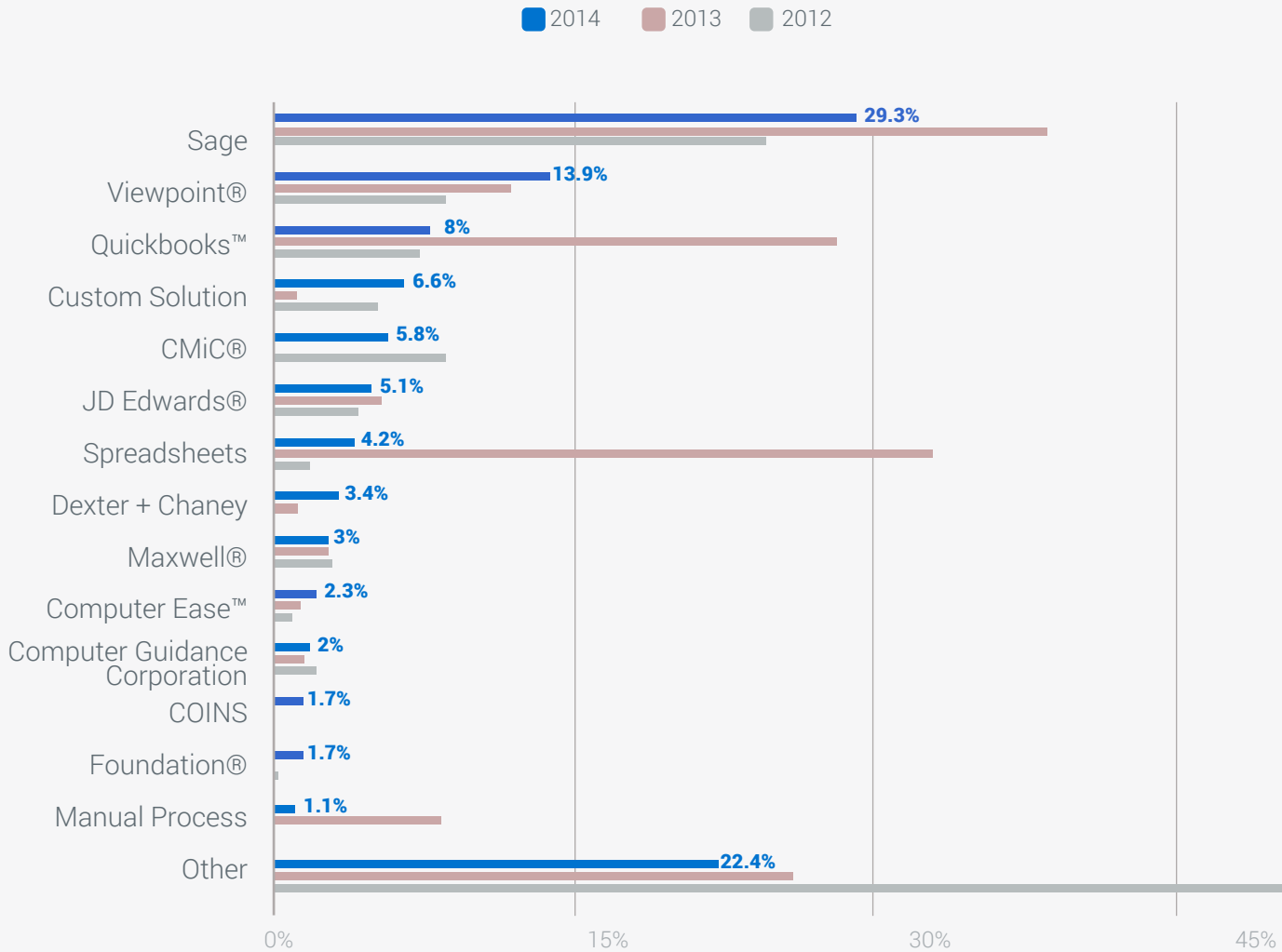
It is clear that builders have yet to grasp the full value that interoperability provides - most likely because their software providers aren't preaching it to them. The hope is that construction professionals learn more about organizations like COSA™, see the integrations they are developing, and recognize that their software providers should be involved. **Mandating that subcontractors and project collaborators use the same software is not and never has been a sustainable remedy to data fragmentation - the need for integration across best-of-breed software providers is critical.**

ONE SURVEY
PARTICIPANT
COMMENTED



“ Software companies could provide integrations but they don't want to help out the competition. ”

ACCOUNTING



OTHER INCLUDED • I don't know • Deltek Vision™ • SAP® • CSSI® • Oracle® • Starbuilder

Significantly fewer survey respondents in 2014 are using Quickbooks™, spreadsheets and/or manual processes for accounting than in 2012 and 2013. It's hard to say whether all of those respondents have instead adopted a construction-specific accounting software, since the number of respondents using any particular software brand didn't jump significantly.

However, the number of respondents using a custom solution more than quadrupled since 2013, so companies may be abandoning spreadsheets for internally-developed software, most likely due to security concerns of critical financial data in the cloud. For the third year in a row, Sage's accounting solution is the most widely used among construction professionals participating in the survey.

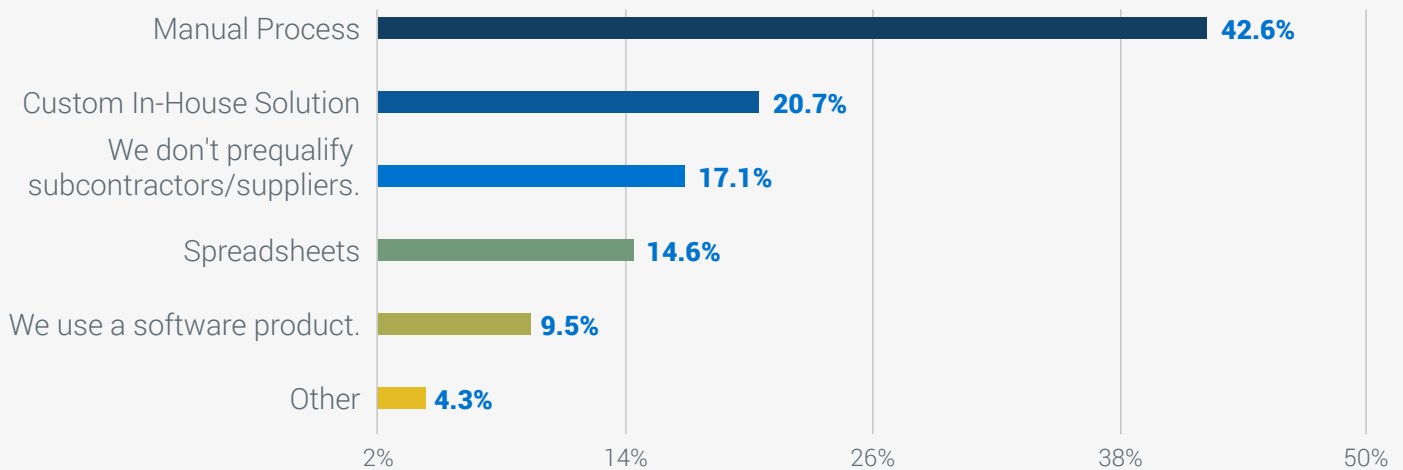
ONE SURVEY
PARTICIPANT
COMMENTED



“ IT and accounting are often not on the same page anymore -- Operations is adding more IT solutions and spending budgeted dollars, while accounting is still using the older solutions that seemingly are becoming more and more outdated. ”

”

PREQUALIFICATION



WE USE THIS SOFTWARE PRODUCT • SmartBidNet® • CMIC® • iSqFt® • Textura® • Viewpoint®

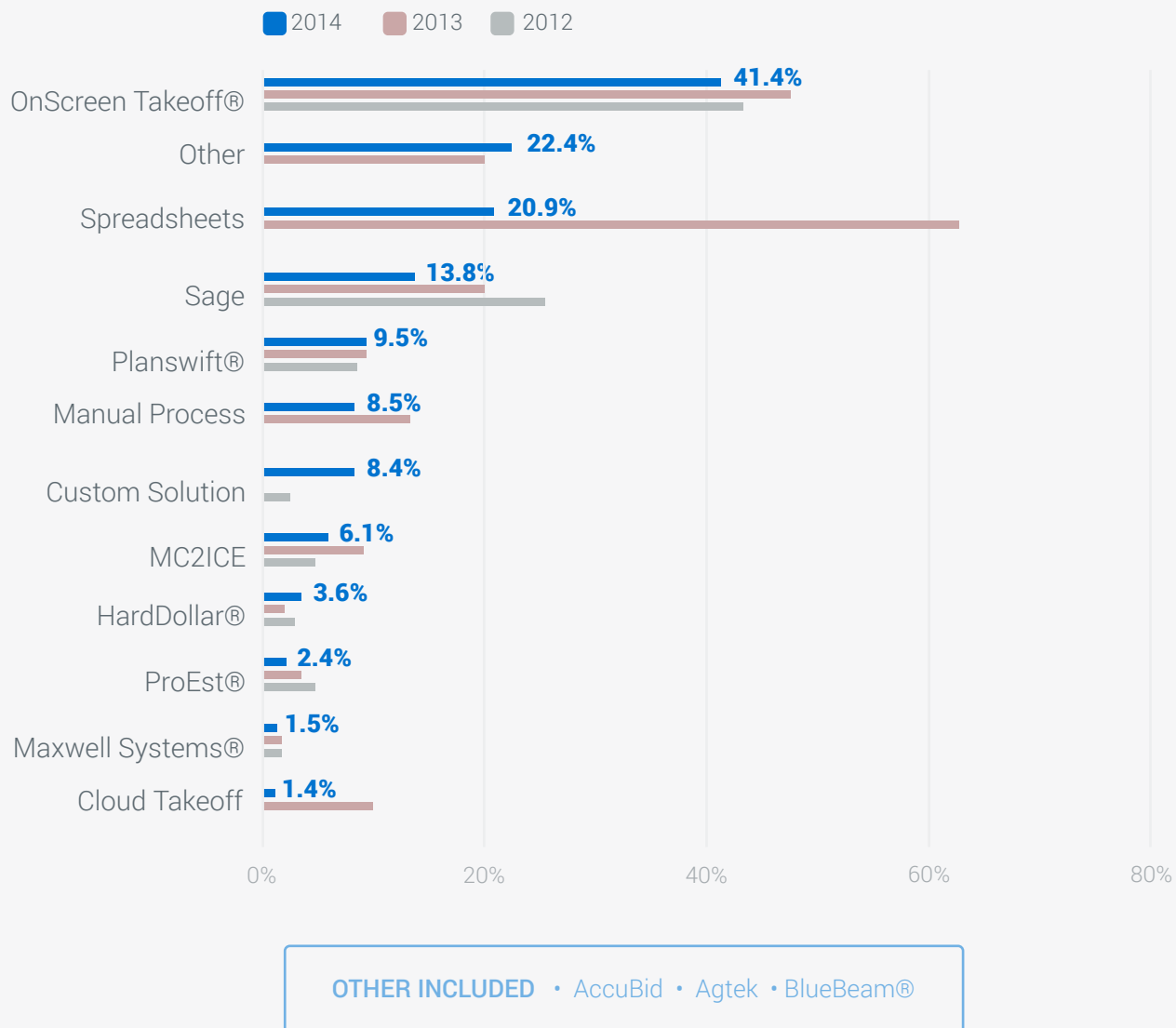
Seventeen percent of survey respondents do not prequalify subcontractors for build projects. A concerning trend for any builders who remember the period after 2008, when lack of due diligence in hiring contractors proved fateful for so many projects. Fewer than 10% of companies surveyed prequalify using a dedicated software solution. **The largest percentage of survey respondents prequalify subcontractors manually, through a process of paper, PDFs and email communications.** The five software solutions used most often for prequal double as either invitation to bid, accounting or project management solutions. No standalone prequalification solutions were identified, though over 20% of contractors have developed their own in-house. What was particularly interesting is that companies who are very progressive in emerging technology (featured later in the report) are still performing critical functions, like prequalification, on paper.

ONE SURVEY PARTICIPANT COMMENTED



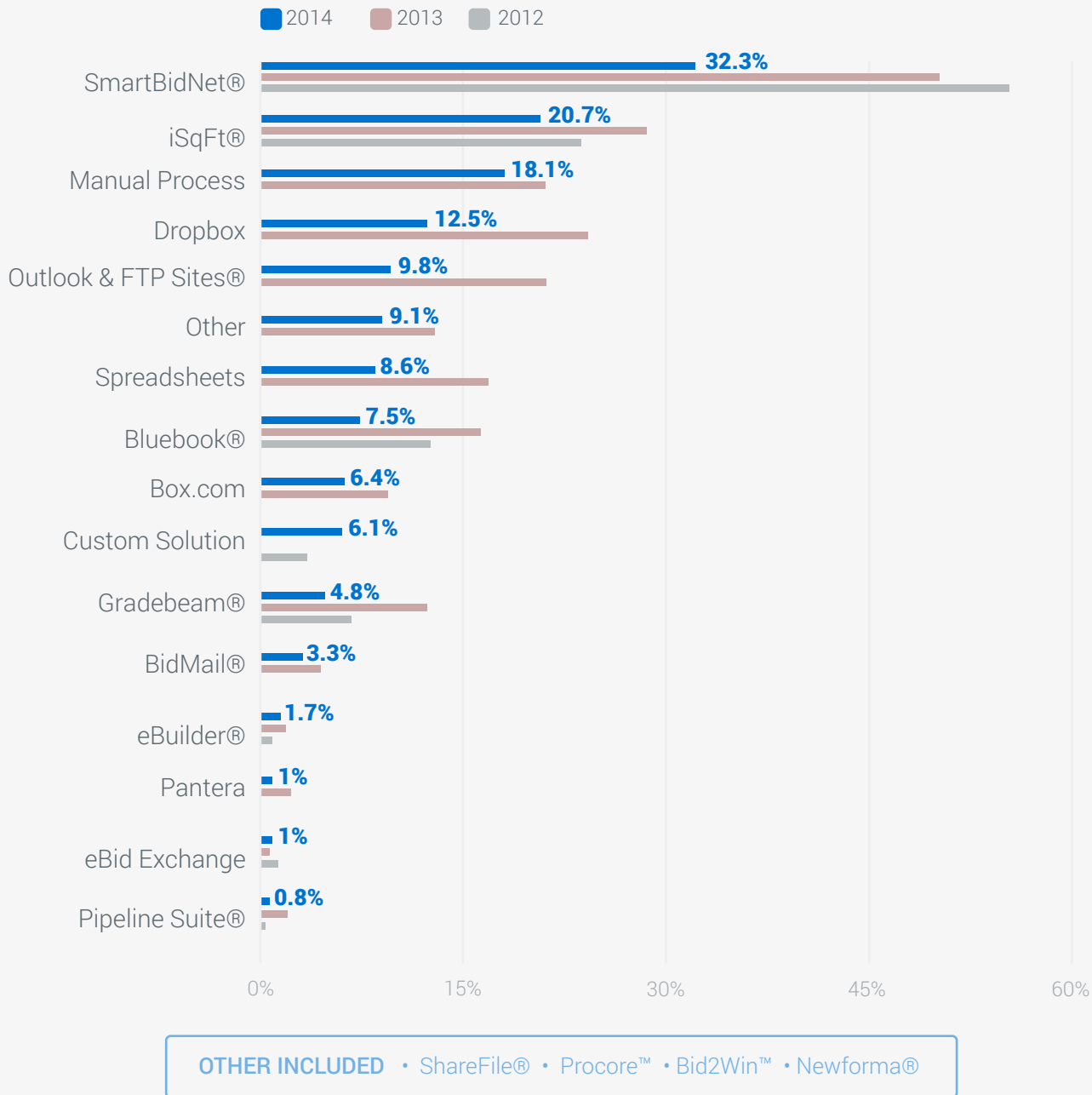
“ We used to prequalify our subs - haven't been doing it for awhile. ”

ESTIMATING TAKEOFF



The percentage of contractors relying on spreadsheets for estimating processes fell by two thirds in 2014, compared to 2013. Since there was not significant growth in the number of users of any particular software brand, those abandoning spreadsheets may have spread out evenly to various software solutions. The other possibility is that their software solutions now provide more integration and capabilities and using a combination of spreadsheets and software is no longer necessary. Remember for all “Software in Use” questions of the survey, respondents could select more than one answer choice, since many use a combination of solutions, spreadsheets and manual processes when one solution does not meet all their needs.

INVITATION TO BID (ITB)/PLAN ROOM

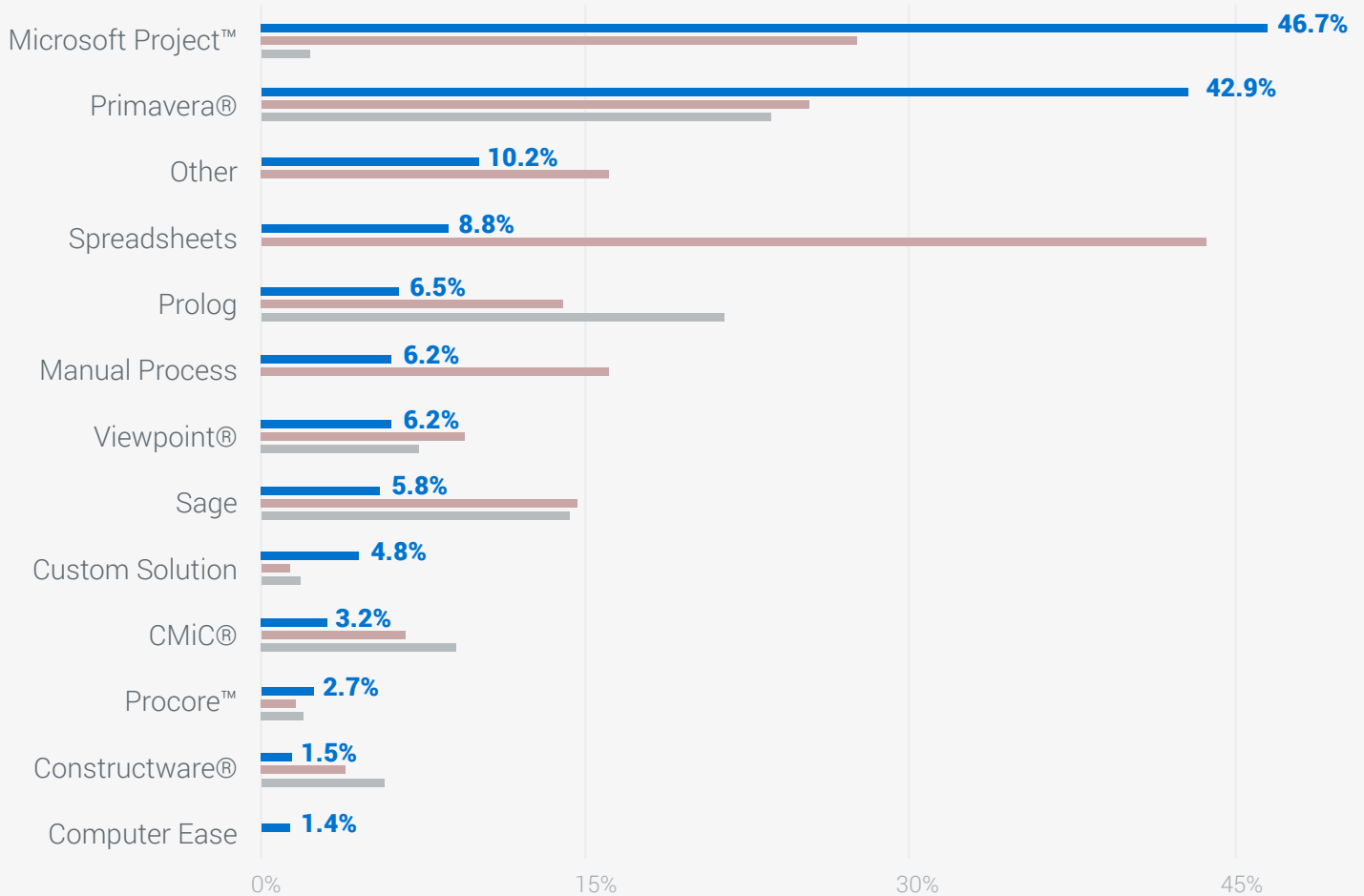


As in previous years, the largest percentage of construction professionals typically use one of two bid software solutions, SmartBidNet® or iSqFt®, or build an ad-hoc plan room involving manual processing of spreadsheets, email and file sharing sites. No particular software solution saw a large increase in percentage of adoption in 2014, though all solutions reported gains in user base.

ONE SURVEY PARTICIPANT COMMENTED 

“ Found plan rooms don't keep up with changes as well as the actual owner. ”

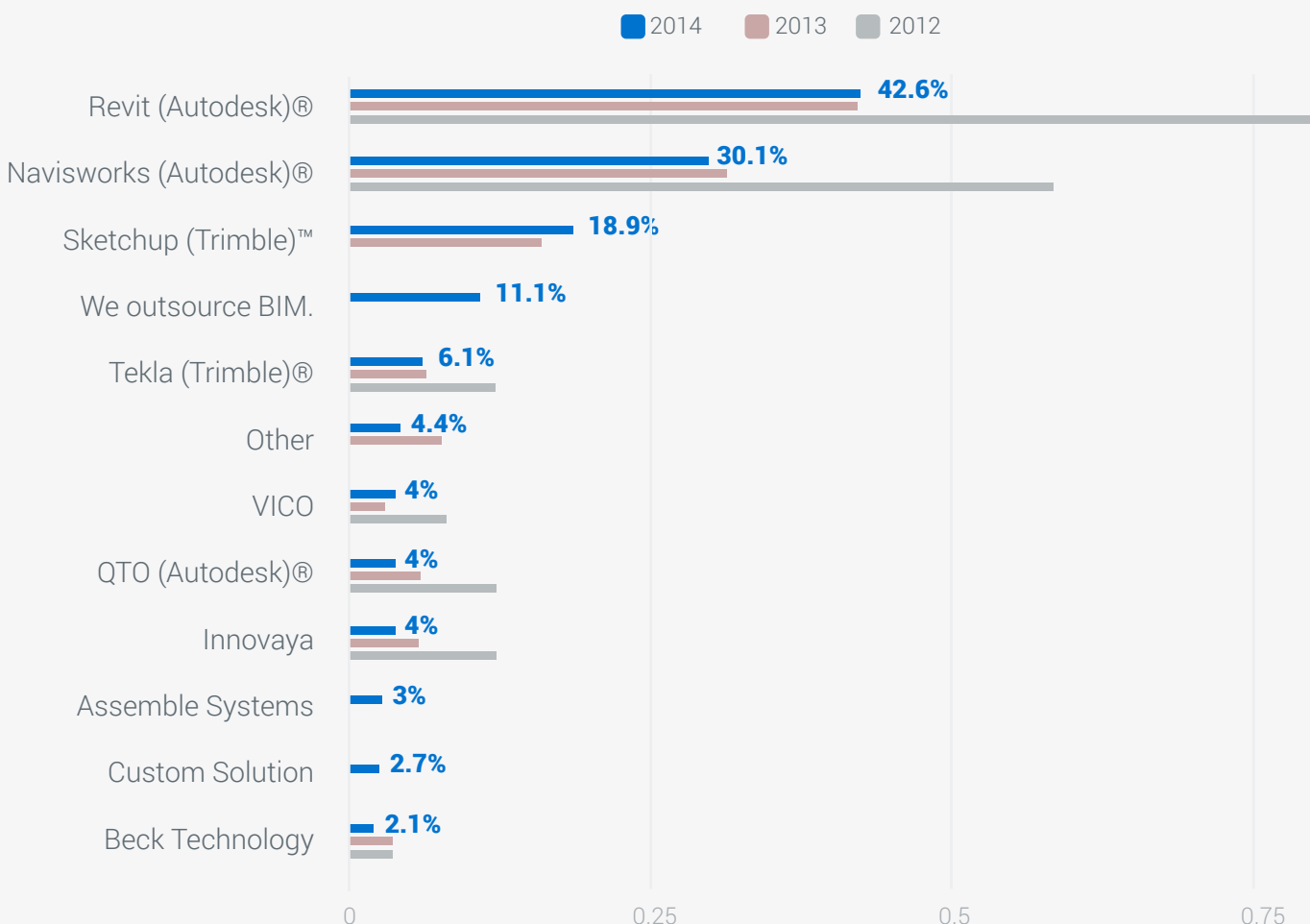
PROJECT MANAGEMENT & SCHEDULING



OTHER INCLUDED • ASTA Powerproject • FastTrack™

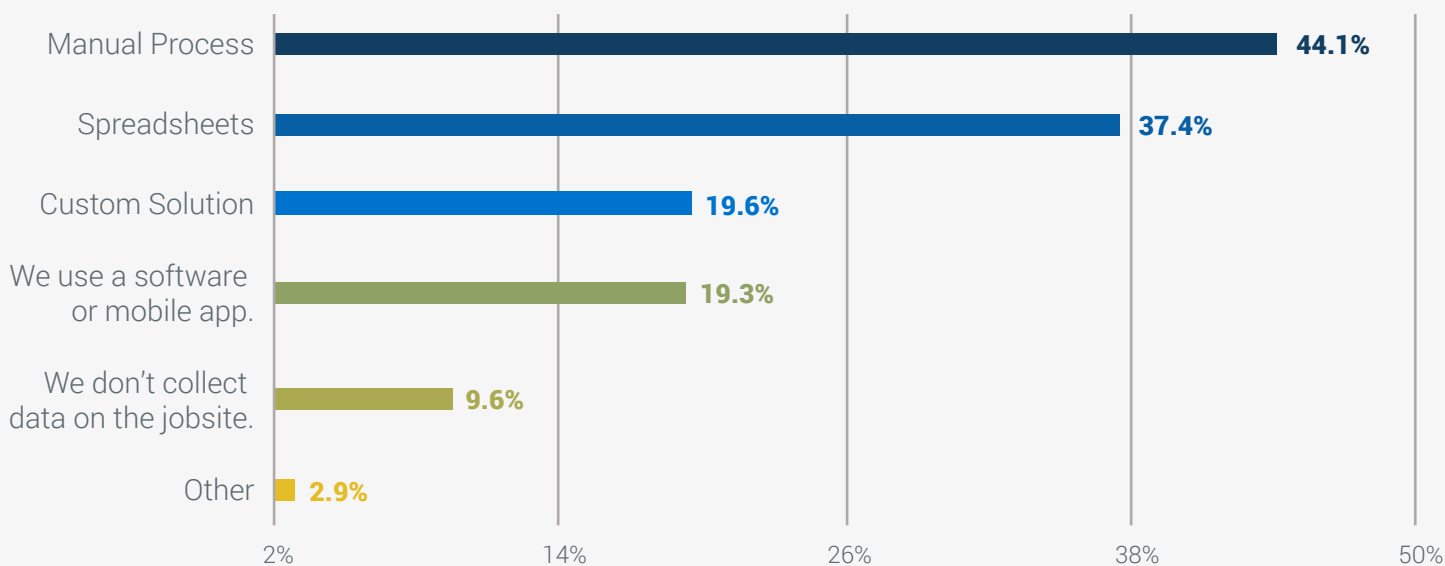
Both Microsoft® Projects and Primavera® continue to lead in project management and scheduling software offerings, and both nearly doubled in adoption from 2013 to 2014. The percentage of professionals using spreadsheets or manual processes significantly dropped, while the number of custom solutions tripled, but still remains below 5%. The Mobile-first solutions like Plangrid and SmartUse are making significant headway into this space, as are BIM solutions like Synchro (who released a free scheduling tool). The industry will see much higher rates of web-based and mobile-first solutions coming in the next few years as they perfect their business and technical models and win over the large anchor clients.

BUILDING INFORMATION MODELING (BIM)



Autodesk® and Trimble™ solutions continue to lead the Building Information Modeling (BIM) software offerings. BIM software preferences did not change much between 2013 and 2014, with no major new technology providers. Over 10% of survey respondents are outsourcing BIM. **Thirty-eight percent answered that they still are not using a BIM solution.** BIM solutions continue to be costly and cumbersome for companies without the hardware, software and IT staff to support them. Another major obstacle to BIM is the the collaboration on files across companies who are involved on a project, but not necessarily BIM savvy. Until interpreting and sharing BIM files becomes more intuitive and cost-effective, most likely with the help of the solutions like augmented reality (SmartReality®) and web-based BIM (Assemble) discussed later, the industry will not fully harness the power BIM can bring to projects.

COLLECTING DATA ON THE JOB SITE



OTHER INCLUDED • Autodesk BIM 360® • Viewpoint Mobile Field Manager® • HCSS Heavy Job® • ProCore™

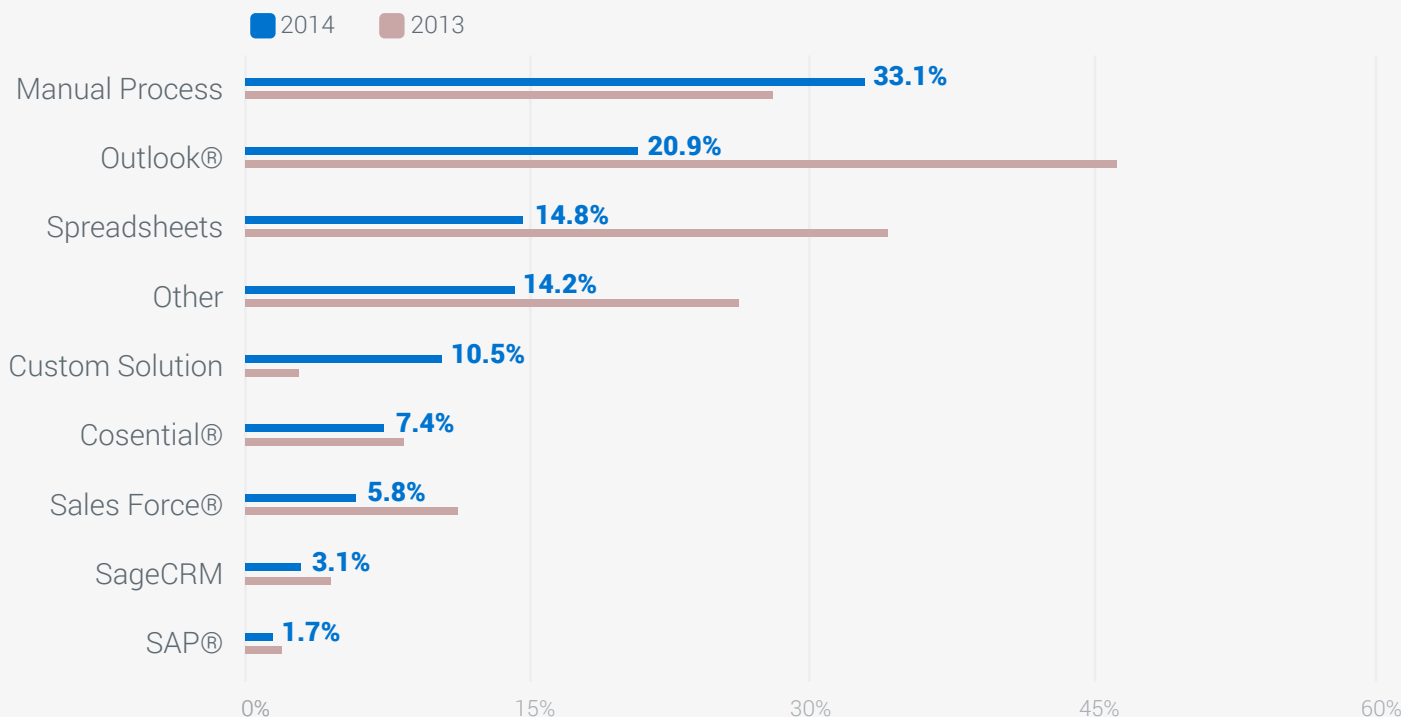
Over 90% of those surveyed collect data in the field, but only 19.3% use a dedicated software solution to do so. Nearly 75% of survey respondents use a manual or spreadsheet process to collect and transfer data from construction job sites in the field. Most of the write-ins were mobile apps for smartphones or tablets that track one aspect of field operations, i.e. time entry, plan viewing, crew alerts, GPS locators, etc. Very few construction professionals could identify an all-inclusive field data collection solution that they are using to integrate all field operations data, other than the project management solutions with mobile capabilities mentioned above in 'Other Included.' Survey participants frequently commented throughout the survey that field data collection is a process for which they sorely need more solution options.

ONE SURVEY PARTICIPANT COMMENTED



“ The availability of consistent mobile signal and cost of data transfer mean if you're committing to mobile data collection - you're also committing to a major investment in data plans. ”

CUSTOMER RELATIONSHIP MANAGEMENT (CRM)



OTHER INCLUDED • Act!® • Microsoft Dynamics™ • Deltek Vision®

Similar to 2013, the survey showed little to no adoption of CRM software in the construction industry for tracking and nurturing project leads, managing prospect information and keeping up with previous or current clients. While custom solutions increased from 2013 to 2014, so did manual processes. Few CRM solutions exist specifically for construction businesses, and so contractors are attempting to manage client and vendor relationships through other solutions, like project management software, or through an internal system of spreadsheets and email. The increase of CRM software in the construction industry could revolutionize business development and empower all professionals in contact with prospects or clients to monitor relations and ultimately drive future revenue. The old adage comes to mind here “If you can’t measure it, you can’t manage it.”

OTHER FREE DESKTOP & WEB-BASED SOFTWARE

Top 10



Dropbox



Google Earth™



GoToMeeting®



Google Drive™



Skype™



Box



Sketchup (Trimble)™



Microsoft Office 365 Live®



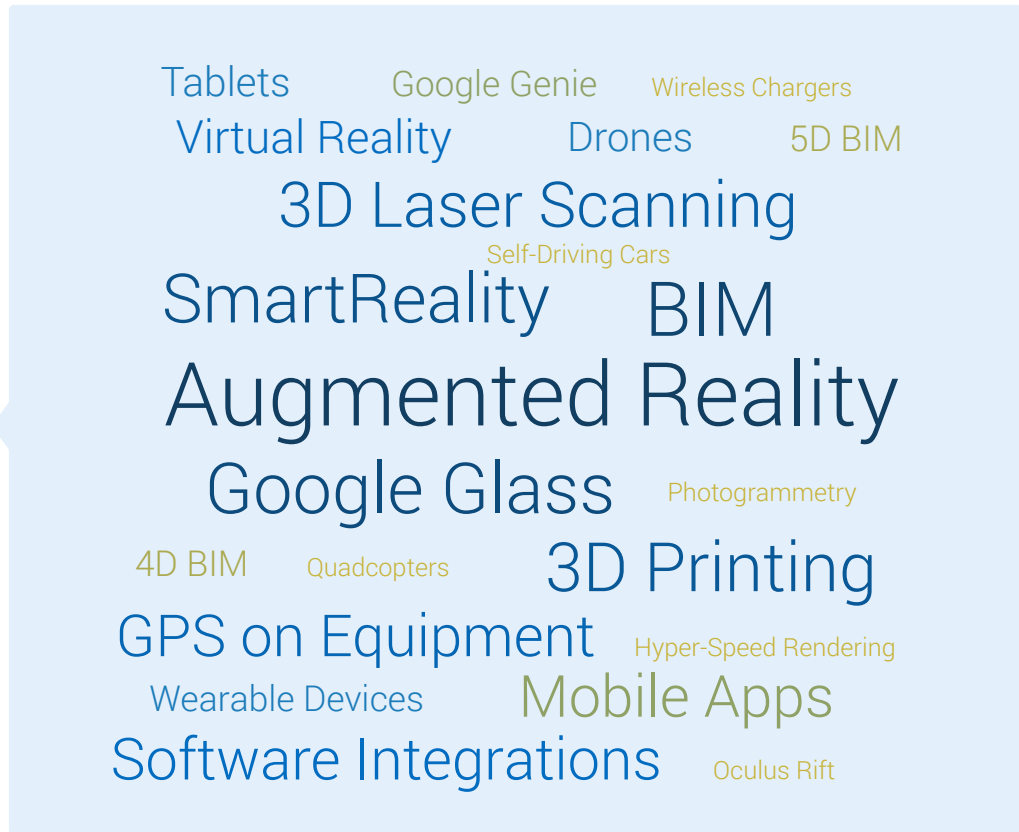
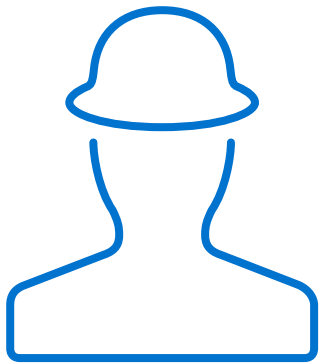
Join.Me™



YouSendit

All of these solutions are used by at least 15% of survey respondents to complement their enterprise software. From conference calls on Skype to sharing project documents on Dropbox, these solutions are used daily whether part of the corporate technology policy or not. In fact, even though all of these solutions are cloud solutions, over 41% of those who use the them answered earlier in the survey that their companies have no policies or procedures for the cloud. **Eleven percent of those who use one of the these solutions, when asked how their companies secure cloud data, claimed that they “Do not use any cloud solutions.”** Are companies culpable for not securing cloud data, or are employees culpable for not acknowledging that they have cloud data?

Learn what's coming in construction technology and how builders and technology providers are already shaping the jobsite of the future.



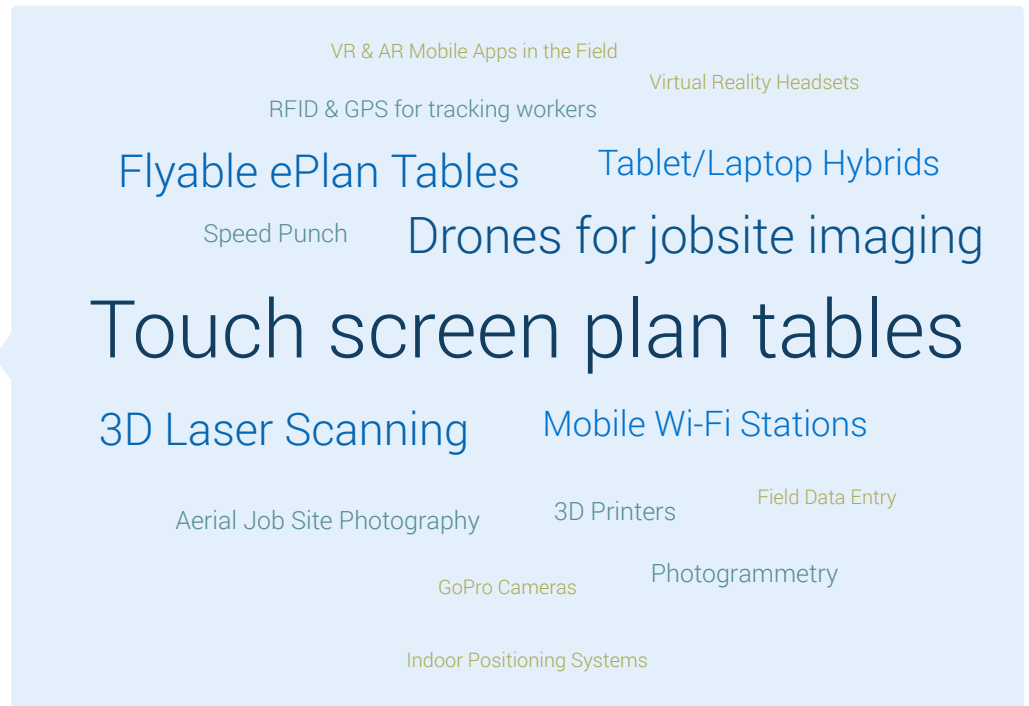
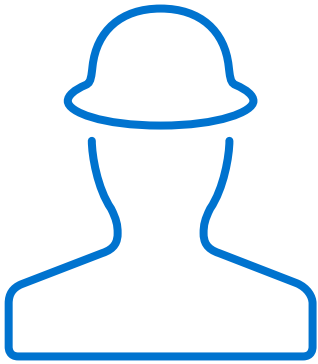
Survey respondents were asked to identify the most exciting technology they'd seen in 2014 and hoped to see applied to construction projects. Their responses ranged from the more general augmented reality to self-driving cars, but all technologies mentioned involve some combination of mobile devices and advanced imagery. **Construction professionals are excited about the latest developments of hardware that minimize manual effort and the software that immerses them in the graphic displays of that hardware.** They also understand now that consumer level technologies currently being pioneered have huge applications in business enterprise software. Self-driving cars lead to self driving construction equipment and more.

ONE SURVEY PARTICIPANT COMMENTED



“ I'm excited about Virtual Reality - using the BIM Model to see the building and its systems before it is built in relation to where you are standing on site. ”

RESEARCH & DEVELOPMENT



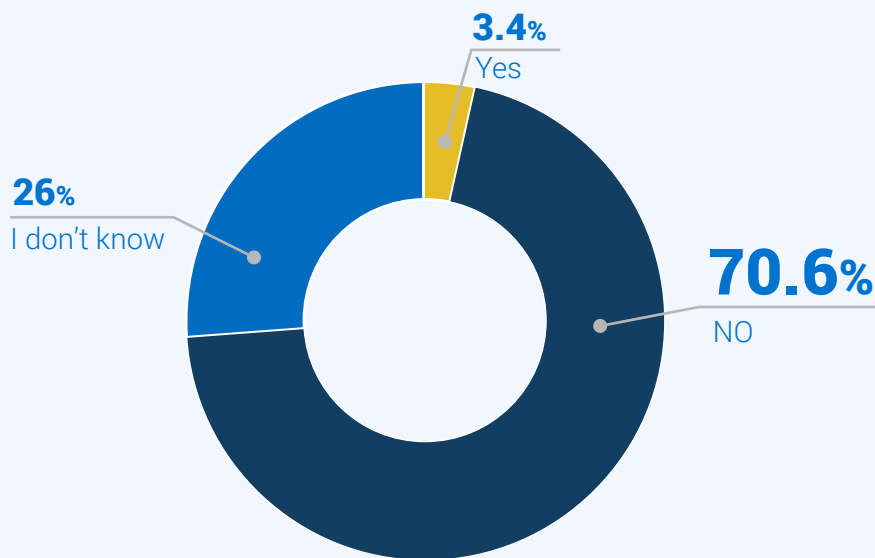
After asking what technologies construction professionals are excited about, we asked which technologies their companies are actually experimenting with and researching. The answers ranged in scope and cost, from mobile apps on smartphones to drones for aerial photography. **At a minimum, a large number of survey respondents said their firms are outfitting field and office crews with tablets to facilitate mobility and project collaboration using the cloud.**

Similar to the mobile section of the survey, in this section, construction professionals commented that either in deploying or considering innovative job site technologies, the cost of data plans and installing networks on site is an obstacle. Increased competition in wireless and fiber-to-premise deployment is appearing to drive down price of bandwidth and drive up the geographies covered by ultra-high-speed wired and wireless networks. Also mentioned was the lack of accuracy of GPS-based jobsite locations systems. As such, micro-location systems, like Apple's iBeacon, may therefore be in construction's future as companies work to collaborate and communicate more efficiently on site.

Drones and 3D laser scanning are two more exciting technologies on the precipice of truly changing how the industry builds. Companies are using drones to haul objects around the jobsite, perform safety checks that once endangered crew and provide aerial and terrestrial imaging that used to cost quite a bit more to capture via helicopters or machinery. 3D laser scanning and technology, like Google™ Project Tango, will see the most applause from estimators who no longer have to manually measure a space, but instead can point a device into a room and immediately read its dimensions.

VIRTUAL AND AUGMENTED REALITY

Is your company using an augmented or virtual reality solutions?



YES, WE USE • SmartReality® • Oculus Rift • VMWare® • 3DSMax® • AR-Media™ • Augment • Aurasma

Seventy-one percent of the construction professionals surveyed said their companies are not using any form of virtual or augmented reality on projects. A meager 3.4% are using AR and VR currently, most often one of the solutions listed above.

Virtual reality and augmented reality differ only in that augmented reality relies on real-world imagery to overlay computer generated data, while virtual reality creates an experience independent of the

real-world with the objective of delivering total presence. Both AR and VR solutions are revolutionary for one major reason - they are so intuitive a five-year old can operate them. Most AR apps, consumer or business, involve pointing a mobile device at a real-world target, and letting the app do the rest. Any developer will tell you how much happens behind the scenes, but a builder only has to point the device. If technology providers can make these solutions affordable, they will transform the way all construction companies, large and small, interact with plan files, guide heavy machinery, secure job site workers and so much more. As wearable viewers, like Epson Moverio™ BT-200, become better and more available, deployment of this technology will become even easier.

ONE SURVEY
PARTICIPANT
COMMENTED

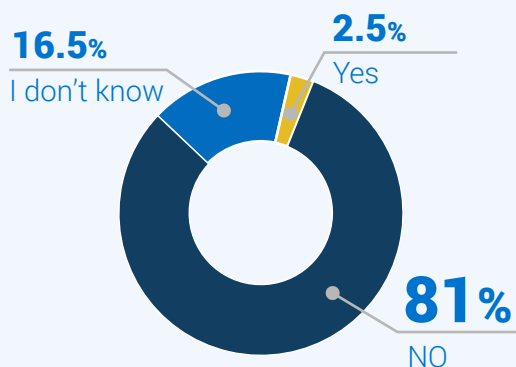


“

We have looked at a few but are waiting for the tech to become more "easy to navigate."

”

WEARABLE DEVICES



Is your company using wearable devices?

- YES, WE USE**
- Bluetooth® Headsets
 - Fitbit® for Health Tracking
 - Google Glass
 - GoPro® Cameras

When asked if their companies are using any form of wearable device, 81% of those surveyed said no. Only 2.5% of the construction professionals surveyed have seen wearables used on projects within their companies. Wearable device useage ranged from health monitoring bracelets to Google Glass. It's important to note that several survey respondents who answered "Yes" wrote in 'smartphone' or 'tablet' when clarifying the wearable device they use. Wearable devices seem to be understood as little as they are used.

Google Glass is the most widely recognized augmented reality wearable device, but Epson's Moverio™ BT-200 smart glasses and Oculus' Rift headsets are primed to provide more robust applications in construction. While Google Glass is a limited heads-up display in front of one's right eye, devices like Moverio™ provide an immersive, full-field-of-view augmented reality experience that could someday enhance construction goggles and helmets. Oculus Rift is less likely to be used on the jobsite, but very likely to be used in project visualization and training. Combined with increasingly affordable motion sensors, like the Leap Motion Controller, builders can use Oculus Rift products to walk through a virtual building and manipulate the life-like structure around them with their hands.

Wearable devices deploying AR and VR applications are changing the paradigm of computing. Mice, keyboards, and even touchscreens will be rendered obsolete when wearables with depth sensors truly hit the consumer and business technology markets.

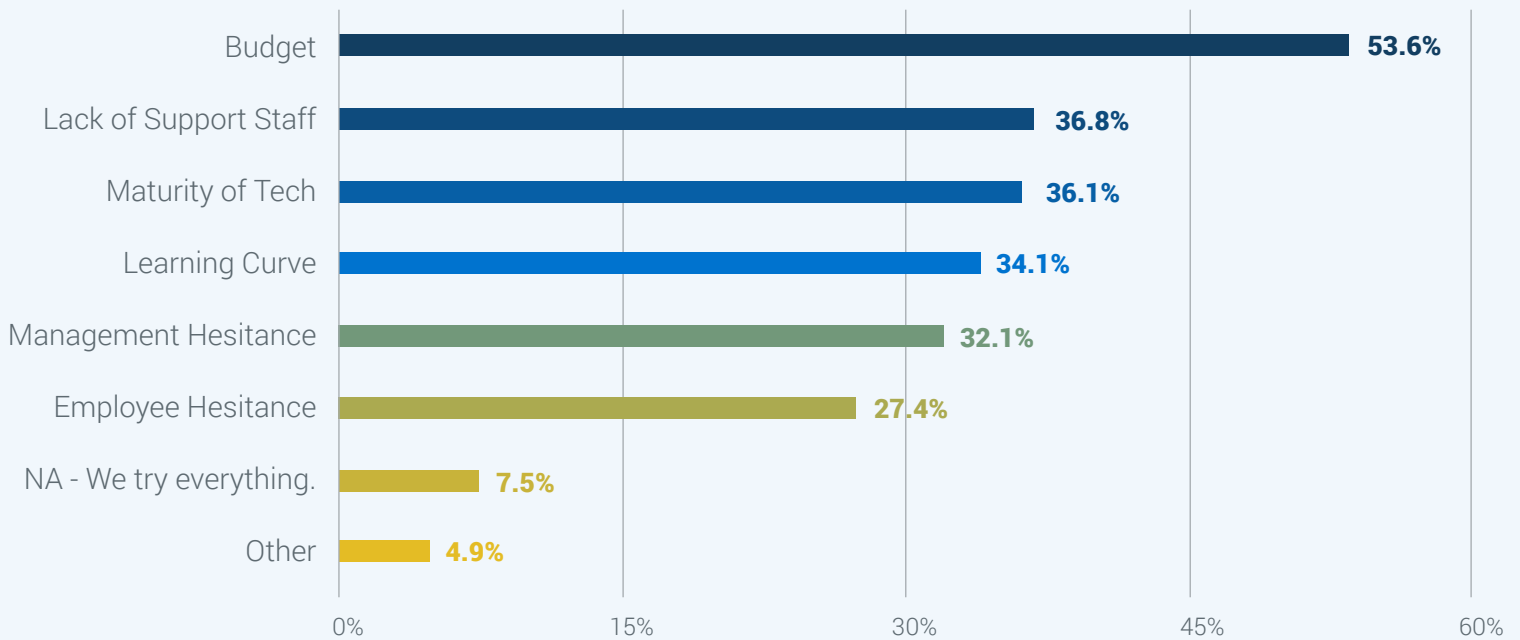
ONE SURVEY PARTICIPANT COMMENTED



“ We are in the process of reviewing platforms that include wearable technology for tracking and reporting manpower. ”

LIMITS TO ADOPTION

What prevents your company from adopting new technology most often?



OTHER INCLUDED • Time to Investigate and Approve • Data Security Concerns • Data Integration and Compatibility with Existing Systems • Lacking Proof of ROI

Finally, after detailing the emerging technology they've seen and experienced, construction professionals explained the most limiting factors in adopting and investigating new technologies for their firms. While budget is not the most limiting factor in determining IT staff, it is the most limiting factor in adopting new technology solutions. Interestingly enough, the staff to support those solutions is the second most limiting factor, followed closely by the maturity of proposed technologies, the learning curve to implement them and management's hesitance to update the IT strategy. Management hesitance, according to those surveyed, is a more limiting factor than employee hesitance. A few but progressive 7.5% answered that their company has no limitations and that they 'try everything.'

ONE SURVEY PARTICIPANT COMMENTED



“ While we test a lot of options, we only deploy when we are prepared to support it. ”

The 2012 Construction Technology Report survey was conducted to assess the status of cloud solution adoption and integration for commercial construction projects. The 2013 CT Report survey measured the progress of those solutions, the security of those solutions and further investigated how mobile capabilities were impacting their usage. The 2014 CT Report survey expounded on both the 2012 and 2013 survey and took a closer look at the IT strategies that support technology decisions and influence research and development of emerging technologies.

Many conclusions can be drawn from the contents of this report, and have been outlined within their respective sections. However it's important to highlight the overarching conclusions that permeate through every section, and stand to make a visible impact on the construction industry.

THE IT DEPARTMENT

Budget allocations for information technology in the construction industry are abysmally low - reportedly lower than most other industries. The 1,000 builders who contributed data to this report confirm that common assessment.

Builders were building long before the Internet and long before the computer. The Hoover Dam, to put things in perspective, was built without the power of the Internet or modern computers. It's easy to see how, despite the maturity of hardware and software in 2014, builders still think they can handle projects without the latest technology. They are forgetting that it's not about whether you can get the job done, it's whether you can get the job done faster and cheaper than the competition.

Information technology provides unprecedented competitive advantages across all industries. There is a reason other industries spend, on average, 2-3 times as much on information technology as the construction industry - IT done right, transforms resources, most importantly human resources, from expense lines into revenue drivers. Information technology is a sustainable resource with a disappearing learning curve - consumer technologies push business technologies to be easier and more intuitive every day.

The next generation of builders have been using Facebook® and Google™ since before they could drive. Their work and personal lives are centered around technology and they will be the driving force behind technology adoption over the next couple of decades.

Construction higher education programs are hiring more computer science faculty into their departments every year. Those departments recognize that computer science and construction science are merging as fields of research and study. IT budgets need to be ready to receive and deploy this upcoming generation of students raised in this methodology.

CLOUD SECURITY

Two years after the first survey was conducted, most participants finally understand what “the cloud” means but unfortunately their companies still have no better grasp of what it entails. The amount of data still being stored and transmitted without monitoring or protocol should alarm everyone who reads this report. Until data is lost, manipulated or stolen by a remote predator accessing your company’s cloud or your in-house computers, the data security threat may not be fully tangible. But the threat can be affordably mitigated and policies created to govern employees and how they handle critical corporate data. Companies are trusting their technology providers to protect their data, whether that’s in the contract or not. Knowing data vulnerabilities across every stage of construction is critical to ensuring that technology remains a competitive advantage.

SOFTWARE INTEGRATION

Companies are honing in on the optimal number of software solutions. They’re understanding the cloud, employing mobile and implementing the best combination of solutions to serve their corporate missions. Then they are reverting to pre-Internet tactics to communicate that cloud data across departments. The efficiencies of software solutions are severely undermined when dynamic data is seamlessly organized only to be exported to static spreadsheet files for rough imports into software for the next phase of construction.

Maybe construction professionals still don’t understand the power of integration - of two-way automatic data transfer from prequalification to bidding to estimating to project management to superintendents to subcontractors to owners and onward. More likely, construction professionals don’t think requesting integration from their solution providers will have much of a result. Organizations like COSA™, now powering the agcXML initiative as well, are striving to empower the end-user as well as technology providers with incentives to demand and develop integrations. It’ll be interesting to see how the industry responds as the need for integration becomes more and more evident.

THE GOOD NEWS

It's certainly not all bad news. This report has encouraging statistics. Builders are trusting the cloud, they are demanding mobile operability, and they are using fewer spreadsheets than ever before. Construction professionals are staying current on the next generation of technologies, like AR, VR, drones and wearables, even if their companies aren't budgeting for them yet. Survey participants are more receptive to IT solutions than ever before, even if those solutions come without the support of IT staff and involve a good deal of self-help.

The good news is that it's not too late for companies to reassess their information technology strategies, learn from what they are doing right, and remedy what could be done better. The good news is that construction companies have many compelling reasons to continue to investigate new technologies and improve on their current technologies. Those reasons include: an upcoming generation of tech savvy builders, IT's potential as a billable service instead of an operational expense and the next generation of technologies that will revolutionize visualization, communication and collaboration. All companies should establish a Research & Development fund that allows their technologists and tech-savvy employees to experiment with new technologies without having to go through a multi-month or year justification process. Expanding the broader IT budget to match cross-industry averages would also enable our industry as a whole to not only keep up with, but eventually surpass, our non-industry peers in innovation and technology adoption.

We look forward to hearing from you again next year as we follow the progress of data integration, cloud solutions, wearable devices and other next generation technologies in the construction industry. If you have additional questions that were not answered in this report or if you have feedback regarding this and future reports, please do not hesitate to reach out at jbknowledge.com/contact.

FINAL COMMENTS FROM SURVEY RESPONDENTS



"At times, the AEC world has lost how to do engineering work on paper."



"Great survey - gave me lots to think about!"



"Long survey - should have been working instead!"



"Seems like there is a technology explosion going on in our industry. Can be confusing with all of the choices at times."



"The construction world is changing because of software innovation. I can't wait to see what the next decade brings."



"We want to use technology more. However, I did not recognize some of the names of the applications. We have a 3rd party vendor helping us with our IT, but they have not provided any information about new technology."



"We would like to embrace functional technology at a faster pace, but a lack of standardization also holds us back. It is frustrating to follow one vendor down a path and find out everyone else went the other way!"



"Why is the Construction Industry one of the lowest IT spending industry? - Is it because they are 'afraid' of the highs and lows?"



"My current company is very, very stuck in the "it has worked for us for years" mentality. I have only recently began working here and it is one of the biggest hurdles I see. The last three companies I worked for had a very active approach to learning about and implementing new technology."



"Mobile field collection is one of the most critical needs for most construction entities to remain competitive yet it seems most vendors have been slow to develop applications to support this activity. We feel that mobile solutions (CRM, timekeeping, project document sharing, project management, service management/work orders, etc.) are an absolute requirement to any software solutions or we won't even consider them."



"In general, I am unaware of the forward future technology plans and development at my company. I become aware when company-wide use is required. I don't often get to be involved in the decision making process."



"There is a concerted effort to be more current with our technology, but we have a mixed bag of employees with different levels of technology comfort. Progress is slow and careful."

Thank you to every individual who completed the 2012, 2013 and/or 2014 Construction Technology Report survey. You took time out of your day to contribute to our industry research and we sincerely appreciate you doing so.

Thank you to our partners, the Construction Financial Management Association® and Texas A&M University's nation-leading Construction Science program. Your guidance and input on the production, distribution and analysis of the survey results was invaluable and we hope this report helps you continue to educate the next generation of leaders in our construction industry.

Thank you also to the many media publications, organizations, companies and other online mediums who distributed and shared the survey. We hope this report adequately met your expectations.

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President, Founder, & Public Speaker
jamesbenham.com

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