The Future of Technology and Its Role in Engineering

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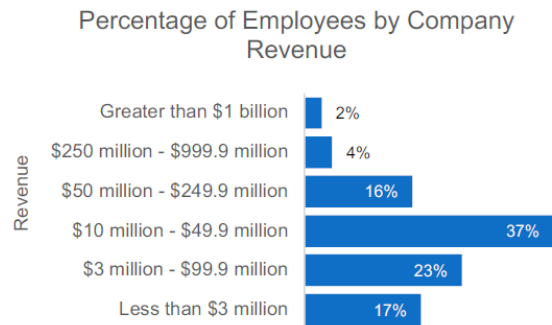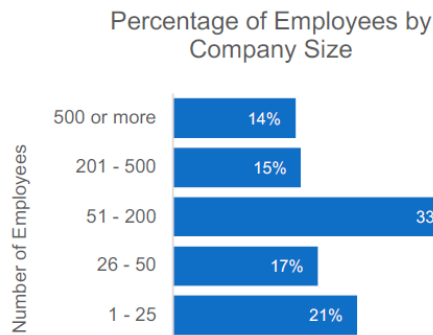# Table of Contents

Overview

Introduction

The ACEC Research Institute commissioned this study to better understand the technological landscape in the Engineering and Design Services industry in the US, how various tools were being used, and the value that they provide for various A/E Firms across the industry.

The study was conducted by Rockport Analytics, an independent market and economic research firm. As part of the framework for our analysis, we had to define a typology of technological tools used by Engineering and Design Services firms. The tools were categorized into 3 groups: engineering collaboration, 3D modeling and building information modeling (BIM) automation, and insight.

1.   Engineering Collaboration: These tools include PDF deliverables mark-up, connected data environment, transmittals, and RFIs. These tools allow people to work together more efficiently with improved communication.
2.   3D Modeling and BIM Automation: These tools include model design and review, digital twins, virtual reality (VR), and digital delivery. These tools help stakeholders see how a project will look before it becomes a reality, increase buy-in, and save money due to more informed decision making.
3. Insight Tools: Admittedly, this is the broadest of the three categories and includes tools and technologies such as big data, artificial intelligence, machine learning, GIS, and data analytics. Some of these tool automate tasks that were once done manually, and many of these tools are used in combination to innovate new solutions.

Methodology & Study Overview

The study included both qualitative and quantitative research components. In the qualitative phase, conducted between July 13, 2021 and July 22, 2021, we interviewed eight industry stakeholders with domain expertise on the use of technology in the Engineering and Design Services industry. The quantitative phase of research included a survey that was fielded online to a random sample of ACEC member firms. We collected a total of 793 responses. The survey was in the field from August 3, 2021 to August 23, 2021. As illustrated in the charts on the following page, the largest share of firms fell in the middle of the size distribution with 33% of responses coming from firms with 51 – 200 employees and 37% of responses from firms with $10 million to $49.9 million in annual revenue.

Percentage of Employees by Company Size

Number of Employees	Percentage
500 or more	14%
201 - 500	15%
51 - 200	33%
26 - 50	17%
1 - 25	21%

Percentage of Employees by Company Revenue

Revenue	Percentage
Greater than $1 billion	2%
$250 million - $999.9 million	4%
$50 million - $249.9 million	16%
$10 million - $49.9 million	37%
$3 million - $99.9 million	23%
Less than $3 million	17%

When categorizing the respondents by their titles, the greatest percentage of respondents were owners/principals/partners at 34% and another 15% of respondents were Chief Officers excluding CIOs (CEO, CFO, CMO, etc.) and an additional 1% identified as CIOs (Chief Information Officers). When looking at their role in the company, it's not surprising that 44% of the respondents were engineers with the second largest role among respondents being project managers (17%).

Percent of Respondents By Title

Title	Percentage
Owner/Principal/Partner	34%
Chief Officer excluding CIO…	15%
Vice President	13%
Manager	13%
Director	7%
Consultant	6%
SVP/EVP	4%
Analyst	3%
Supervisor	3%
CIO	1%
Assistant	1%

Percent of Respondents By Role

Role	Percentage
Engineer	44%
Project Manager	17%
Finance	6%
IT System Administrator	3%
Production Manager	2%
Construction…	1%
Business Analyst	0.8%
Document & Project Controller	0.5%
BIM/CAD Coordinator/Manager	0.4%
Architect	0.3%
UAV Drone Pilot	0.1%
Software Developer	0.1%
Reliability	0.1%
Estimator	0.1%
Asset Manager	0.1%
Other	23%

For our analysis, we also felt it was important to analyze differences between technology "practitioners" and technology "managers." These segments were defined based on the amount of time each respondent spent utilizing various technological tools in their everyday work with practitioners spending 20% or more of their average work week directly using these tools and managers directly using these tools less than 20% of the time in an average work week. Across, the entire sample, the distribution was evenly split with 49.8% of respondents identified as technology "practitioners" and 50.2% as technology "managers".

Distribution of Managers vs. Practitioners

Practitioner 49.8%

Manager 50.2%

Manager uses tools <20% of time;
Practitioner uses tools 20%+

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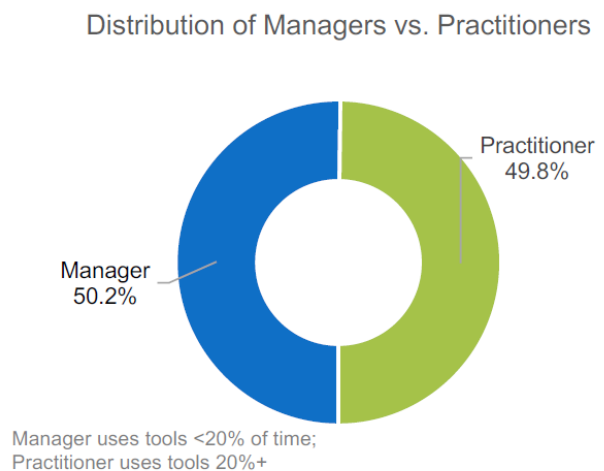
Key Takeaways

The majority of survey respondents were from:
- Companies with 50 – 200 employees
- Companies with revenue of $10-49.9 million
- Title of owner/principal/partner
- Role of engineer

The research clearly concludes that these technology tools provide value to U.S. firms:
- 78% find engineering collaboration tools valuable
- 66% find 3D modeling and BIM automation tools valuable
- 41% find insight tools valuable

Larger companies are more likely to use the tools overall and especially the more specialized insight tools. Key percentages on insight tool use:
- 69% of companies with 200+ employees use
- 36% of companies with 51-200 employees use
- 24% of companies with 50 of fewer employees use

Considering the percentage of one's day that these tools are used, engineers, the largest group of respondents by role, use these tools regularly:
- 45% of engineers use these tools 10-50% of their work time
- Another 25% use them 50% or more of their work time

The top 3 benefits of the 3 groups of tools combined were identified as:
- Higher quality design or construction
- Higher client/teaming partner satisfaction
- In order to stay competitive

The top 2 business objectives when choosing to utilize a new technology were identified as:
- Improved operational efficiency
- Higher productivity

Reasons why some firms don't use the different groups of tools are listed below by the highest incidence of use (engineering collaboration) down to the lowest incidence of use:
- Engineering Collaboration:
  o Lack of technology leadership
  o Cost
  o Not having the personnel to extract the value
- 3D BIM:
  o Lack of proven return on investment (ROI)
  o Incompatibility with client/teaming partner requirements
  o Not having the personnel to extract the value
- Insight:
  o Not having time to evaluate the benefit
  o Not having the personnel to extract the value
  o Lack of proven return on investment (ROI)

There is a clear correlation between the perceived importance of the various technologies and the respondent's satisfaction with their company's use of the tools. On average, the more important the tool, the higher the level of satisfaction. They are listed in order from most important to least:

- Engineering collaboration
- 3D BIM
- Insight

The single most valuable technology today and in the next 5-10 years was engineering collaboration software. Tools expected to rise in value in the future, compared to today, include:

- 3D scanning/imaging/printing
- Big data analytics
- Virtual reality (VR)/Augmented reality (AR)
- Automation
- Digital Twin
- Technologies in sustainability

The majority of respondents (76%) agree that their company is prepared to compete from a technological standpoint over the next 5-10 years. Larger companies are significantly more prepared to compete (85%) than midsize (71%) or smaller companies (74%).

Firms rated tools with respect to their estimated return on investment (ROI) in this order:

- Engineering collaboration: 16%
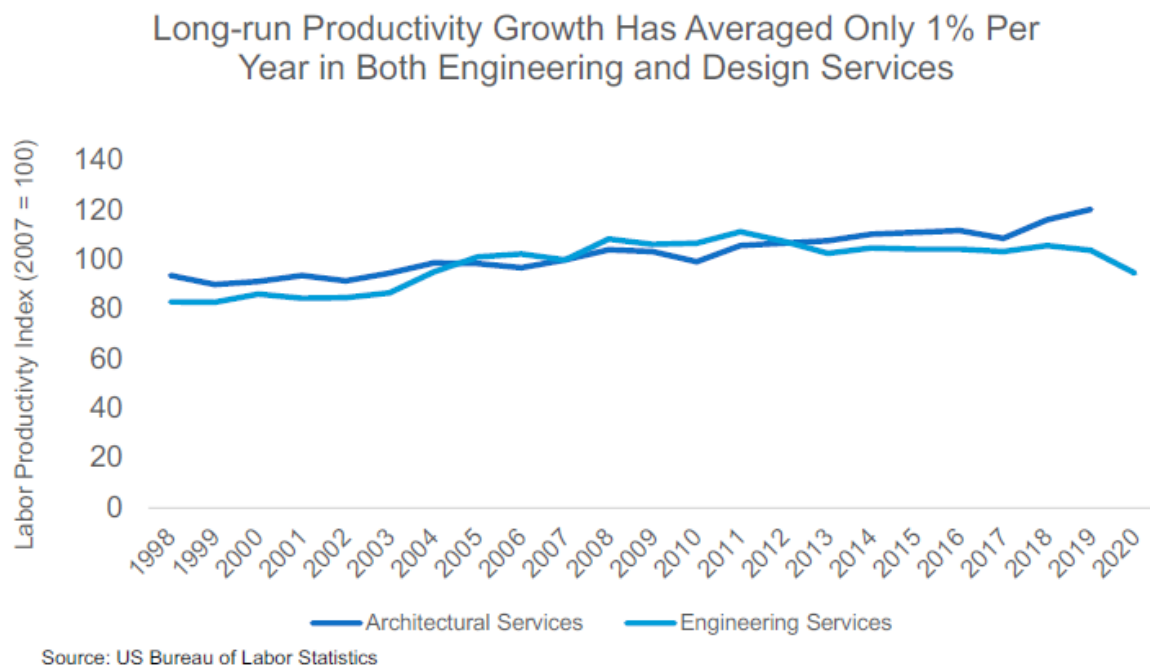- 3D BIM: 13%
- Insight: 11%

The Role of Technology in Engineering and Design Services

The Landscape of Technology in Engineering and Design Services Sector

Technology is a critical input to almost every sector of the global economy and is a key driver of economic efficiency, innovation, productivity gains and corporate success. Technology is advancing at a faster rate than any other time in history. A 2010 IBM study found that 90% of the world's data was generated over the preceding two years and the creation of data has continued to increase at an exponential rate since that point. The costs of acquiring that data are also decreasing dramatically as new tools and processes facilitates data collection and analysis. Many technologists and market observers believe that we are on the brink of the 4th Industrial Revolution (4IR).

The increasing utility of technology in the Engineering and Design Services sector is apparent as well, although in the US, the productivity gains within the sector have lagged those in the broader economy. This trend could be partially driven by reluctance among some firms or segments of the industry that are slow to change and adopt new technologies and processes. In replying to the question of why their company doesn't use insight tools, one survey respondent identified the "fear of being replaced by technology," a sentiment that has been echoed across industries and throughout time as automation of some human tasks becomes increasingly prevalent. This is largely an economic displacement issue and requires more training and shifts in human capital capabilities to be able to support more advanced systems and processes.

Long-run Productivity Growth Has Averaged Only 1% Per Year in Both Engineering and Design Services

Source: US Bureau of Labor Statistics

Any lags in A/E productivity gains could also be driven by the fact that many of the technologies with specific application to the Engineering and Design Services industry are just maturing and becoming more accessible to a larger number of industry stakeholders.

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This notion is supported by a comment made by a subject matter expert in one of our one-on-one interviews: "The AEC industry is moving through these areas of where technology was only used to make and to document things. Now we're moving into an era of optimization, which is using technology to improve outputs. But eventually things [will be] moving into connected and integrated systems."

No matter the reason for the productivity lag, our research clearly shows the value of technology to firms within the Engineering and Design Services sector. Although, not surprisingly, at this point in time the tools providing the most value are those that could be considered more mature: 78% of respondents find engineering collaboration tools valuable (valuable + extremely valuable), 66% find 3D BIM and automation tools valuable and 41% find insight tools valuable. We expect these trends will change (as implied later in the report) as emerging technologies improve and tools are more widely adopted. As stated by another industry stakeholder when discussing artificial intelligence in the Engineering and Design Services space, "The big [consideration] for architects and engineers with AI is in the same way that the industrial revolution changed the nature of production work, it is going to change the nature of knowledge work."

Value of Each Tool to Company's Overall Success
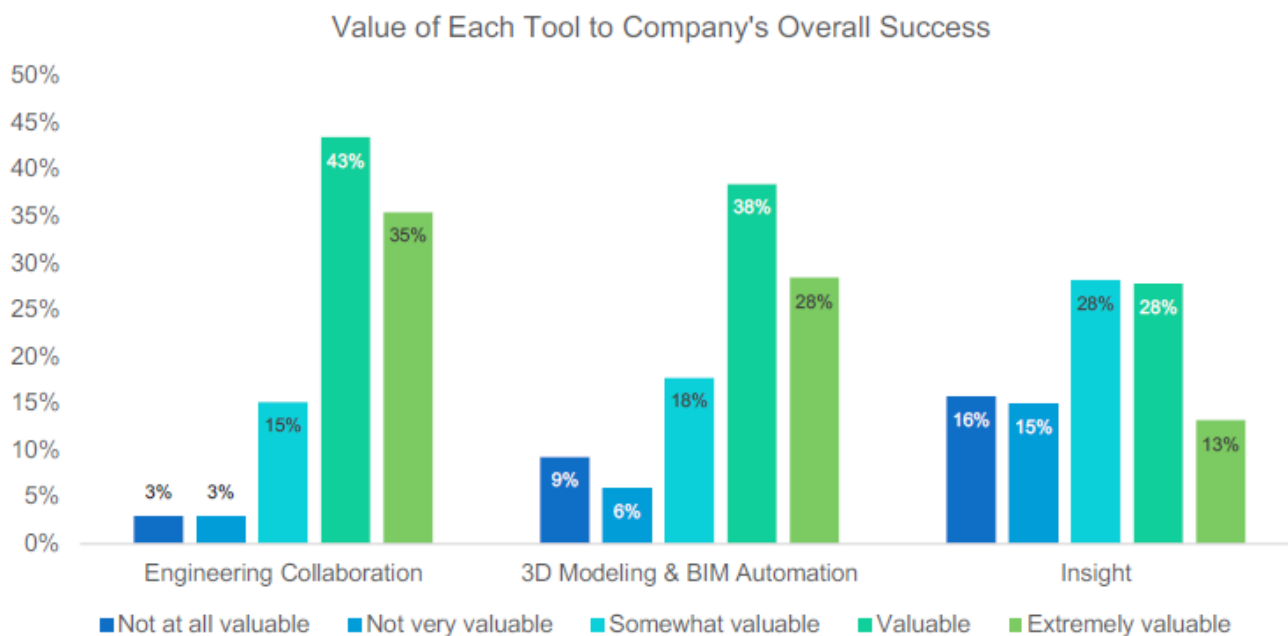
Awareness and Use of Tools and Technologies

Awareness and Use of Technology by Company Size and Title

Looking across the entire spectrum of technology in the Engineering and Design Services industry, there is a clear correlation between the size of a company (in terms of both employees and revenue) and the awareness and use of various technologies. Just more than 7 in 10 respondents working for firms with greater than $50 million in annual revenue were aware of some types of technological tools.
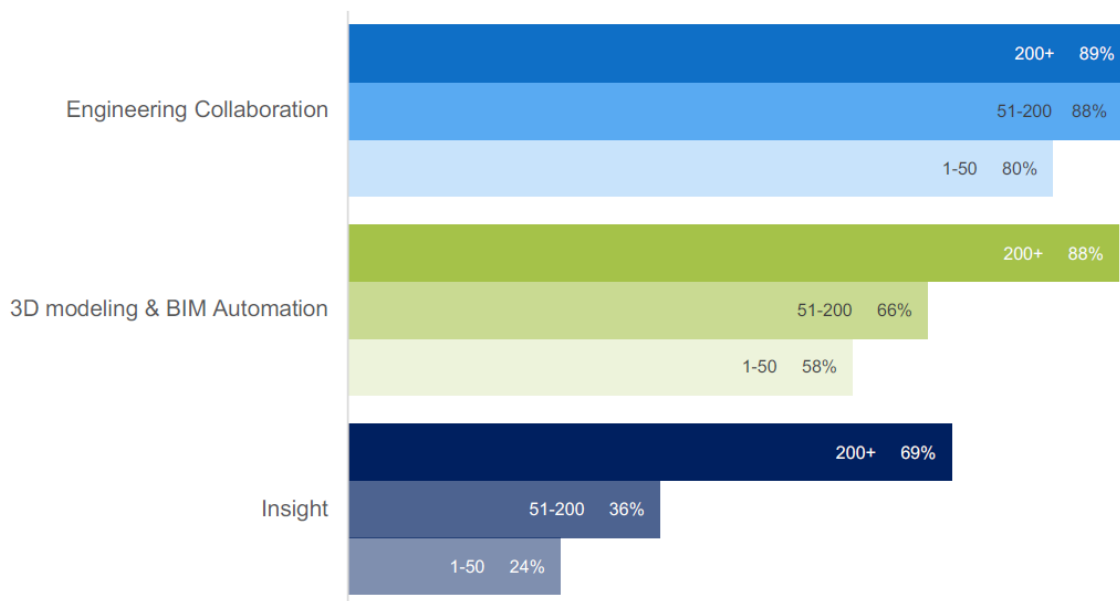
Awareness of All Technology Tools by Company Size

Company Size	
200+	69%
51 - 200	61%
1 - 50	53%

Awareness of All Technology Tools by Company Revenue

Company Revenue	
$50M+	71%
$10M - $50M	63%
Less than $10M	52%
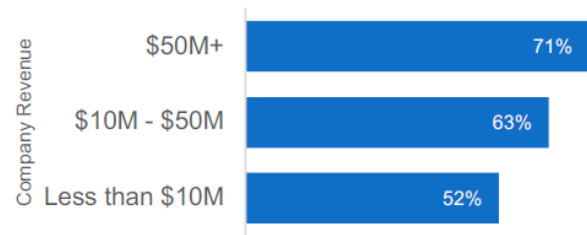
The survey results support a key theme from our one-on-one interviews as one of our interviewees expressed, "We know, anecdotally, that the larger firms are the ones that are leveraging these technologies." Larger companies are more likely to have budgets to afford some of the cutting-edge technology tools. In addition, employees in larger companies tend to have more specialized roles, in which case using specialized tools may be more likely. The data confirms these expectations for all three types of tools but this is particularly true for the more specialized insight tools (big data, machine learning, artificial intelligence, etc.) which are used by 69% of surveyed firms with 200+ employees and only 24% of firms with 50 employees or fewer.

Technology Use by Tool Type and Company Size

Tool Type			
Engineering Collaboration	200+ 89%	51-200 88%	1-50 80%
3D modeling & BIM Automation	200+ 88%	51-200 66%	1-50 58%
Insight	200+ 69%	51-200 36%	1-50 24%

Time Spent Using Tools & Techniques

The question respondents were asked was "What percentage of your average work week do you spend, personally, working with technological tools or platforms to do your job?" For most roles, the time spent using these tools varies. For engineers, which was the largest percentage of respondents, 45% of them use these tools 10–50% of their work time. Among project managers and production managers, 55% use these tools 10–50% of their work time. Of the IT system administrators surveyed, 80% use these tools more than 50% of their work time.

Time Spent Using Technological Tools

Role	Less than 10%	10% to 50%	More than 50%
IT System Administrator	10%	10%	80%
Finance	33%	33%	33%
Construction/Inspector Manager/Superintendent	38%	38%	25%
Engineer	30%	45%	25%
Project Manager	24%	55%	21%
Production Manager	36%	55%	9%
Other	40%	39%	21%

■ Less than 10%   ■ 10% to 50%   ■ More than 50%
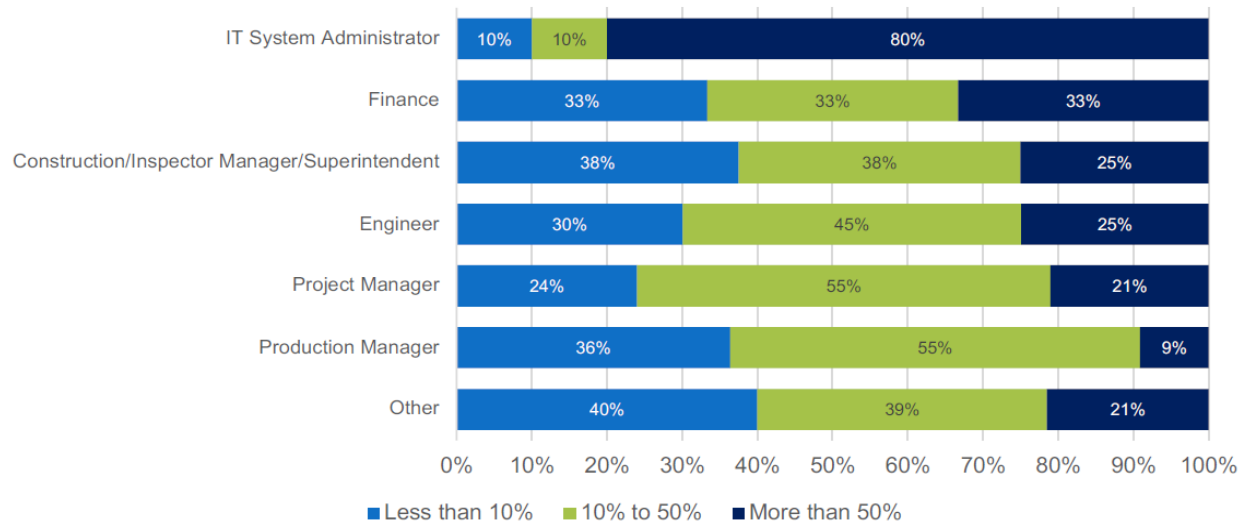
Quantifying the Value of Technology to the Engineering and Design Services Industry

Top Benefits of Technological Tools

Respondents were asked to rank the top-3 benefits of using technology across the three different tool types (engineering collaboration, 3D/BIM and Insights). In order to gain an overview of the key benefits of using tools, we combined the responses from the three different categories. The chart below highlights the key benefits across technologies as being *higher quality design or construction* (45%), *higher client/teaming partner satisfaction* (40%), and the *ability to stay competitive* (34%). Other noteworthy benefits include improved *operational efficiency* (33%), *higher productivity* (31%), and *more effective communication within the firm* (26%).

Top Benefits* of Technology Use

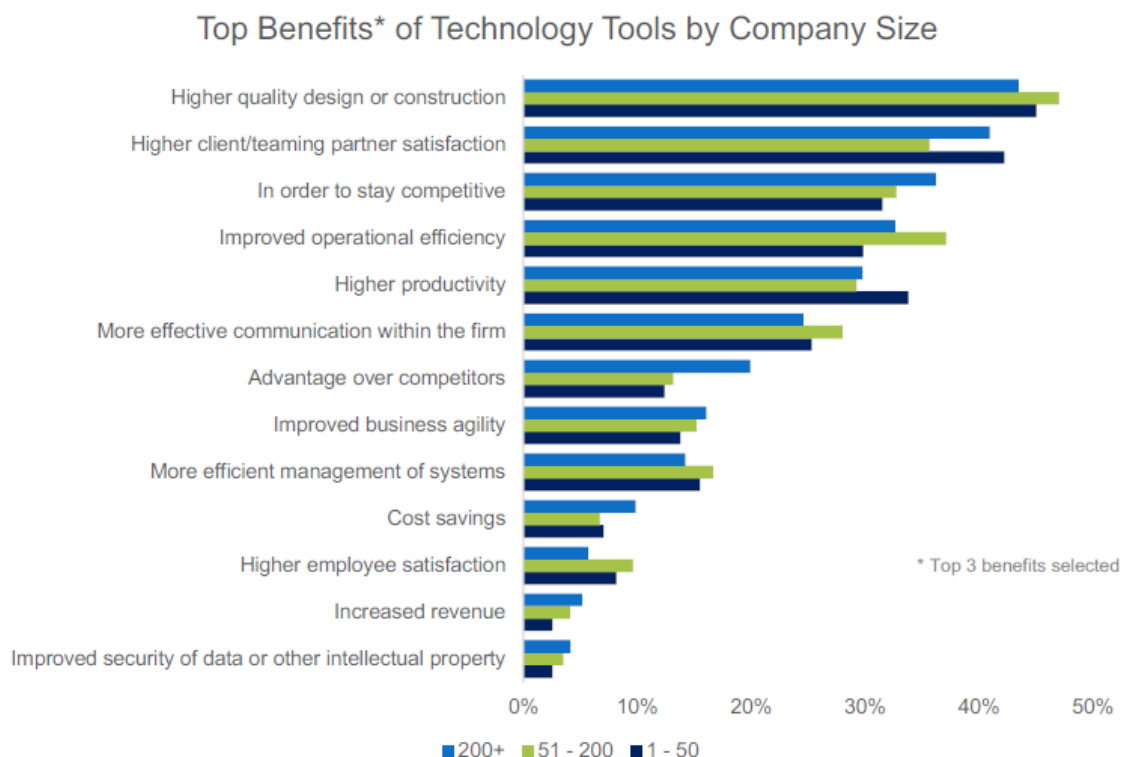| Benefit	Percentage
Higher quality design or construction	45%
Higher client/teaming partner satisfaction	40%
In order to stay competitive	34%
Improved operational efficiency	33%
Higher productivity	31%
More effective communication within the firm	26%
More efficient management of systems	15%
Advantage over competitors	15%
Improved business agility	15%
Cost savings	8%
Higher employee satisfaction	8%
Increased revenue	4%
Improved security of data or other intellectual property	3%

* Top 3 benefits selected
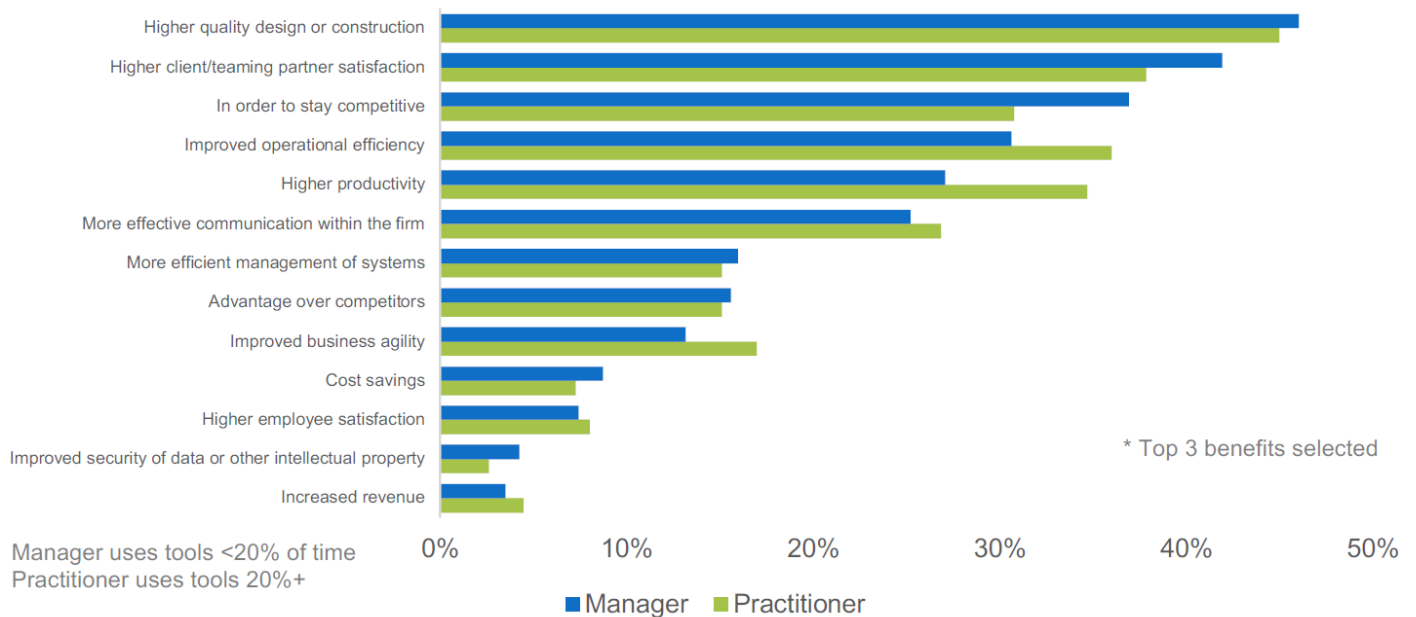
Top Benefits by Company Size

While rankings generally hold true across various different industry segments, there are some notable changes when segmenting by company size or the role of each respondent within the organization. Smaller companies chose *higher client/teaming partner satisfaction* at a greater percentage, which may indicate their relationships with partner companies as being more important. They also chose *higher productivity* at a greater percentage, as they may be required to do more work with fewer employees. As one respondent commented in the open-ended question about the value of these tools in their everyday work, "[The value is in] being able to get more done with less staff." Mid-sized companies (51-200 employees) stand out on *improved operational efficiency* while larger companies (200+) break away on their *advantage over competitors*.

Top Benefits* of Technology Tools by Company Size

Benefit	
Higher quality design or construction	
Higher client/teaming partner satisfaction	
In order to stay competitive	
Improved operational efficiency	
Higher productivity	
More effective communication within the firm	
Advantage over competitors	
Improved business agility	
More efficient management of systems	
Cost savings	
Higher employee satisfaction	
Increased revenue	
Improved security of data or other intellectual property	

* Top 3 benefits selected

Legend: ■ 200+ ■ 51 - 200 ■ 1 - 50

Top Benefits by Role

Not surprisingly, managers and practitioners receive different benefits from the technologies they use. Managers are defined here as those who use these tools less than 20% of their time. Practitioners are defined as those who use the tools 20% or more of the time. Managers more often than practitioners chose the need to stay *competitive*, develop *higher quality design or construction* or provide *higher client/teaming partner satisfaction* while practitioners more than managers chose *improved operational efficiency, higher productivity and improved business agility.*

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Top Benefits* of Technology Use for Managers vs. Practitioners

Manager uses tools <20% of time
Practitioner uses tools 20%+

* Top 3 benefits selected

■ Manager ■ Practitioner

Digging deeper on this and looking at title or role within the company reveals that chief officers chose *improved operational efficiency* at higher percentage than any other title and as their second highest benefit after *higher quality design* or *construction.*

Benefits of Technology Tools	Analyst/Manager Supervisor/Consultant	Director/VP/SVP/EVP	Chief Officer (CEO/COO/CIO/etc)	Owner/Principal/Partner
Higher quality design or construction	45%	43%	44%	47%
Higher client/teaming partner satisfaction	35%	40%	40%	43%
In order to stay competitive	29%	29%	39%	38%
Higher productivity	34%	32%	26%	31%
Improved operational efficiency	36%	33%	42%	27%
More effective communication within the firm	29%	24%	26%	25%
More efficient management of systems	17%	13%	19%	15%
Advantage over competitors	16%	16%	15%	15%
Improved business agility	15%	16%	16%	14%
Higher employee satisfaction	6%	9%	7%	8%
Cost savings	11%	9%	4%	7%
Increased revenue	4%	6%	5%	2%
Improved security of data or other intellectual property	3%	6%	3%	2%

Comparing Benefits Across the Tool Typology

When comparing the benefits of the different sets of tools to one another, engineering collaboration tools are most commonly chosen for *improved operational efficiency* and *more effective communication within the firm*; 3D modeling and BIM automation tools are most commonly chosen for *higher quality design or construction, higher client/teaming partner satisfaction*, and *in order to stay competitive*, whereas insight tools are chosen as an *advantage over competitors*.

Benefits* Comparison of 3 Different Types of Tools

* Engineering Collaboration   3D BIM   Insight

* Top 3
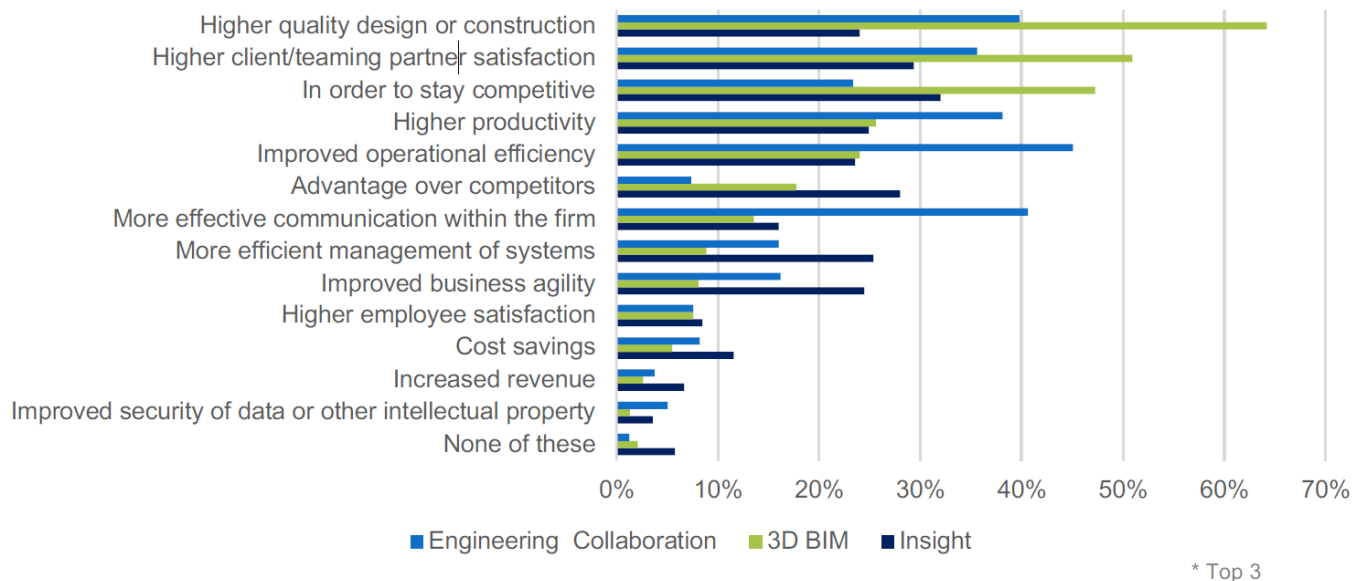
Using Technology as a Competitive Advantage and to Achieve Business Objectives

Respondents were asked what is the one most critical attribute or business objective they would hope to receive when utilizing a new technology. The top two objectives were *improved operational efficiency* and *higher productivity*. Combined, these two objectives were named as the *most important by 45%* of respondents.

Single Most Important Business Objective When Utilizing New Technology

Improved Operational Efficiency 23%

Higher Productivity 22%

Higher client/teaming partner satisfaction 14%

In Order to Stay Competitive 10%

Advantage Over Competitors 8%

Other 23%

## Reasons That Some Firms Are Not Utilizing Technological Tools

There were notable differences in the reasons that respondents might not use specific technologies. Engineering collaboration had the lowest incidence of respondents reporting that they did not use these types of tools or technologies. The reasons cited include a *lack of technology leadership, cost* and *not having the personnel to extract the value*.

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The second most used group of tools is 3D BIM. Those not using these tools cited a *lack of proven ROI, incompatibility with client/teaming partner requirements*, and *not having the personnel to extract the value* as the top reasons. Insight tools had the lowest incidence of users in the survey sample. The top reason for not utilizing these tools include *not having time to evaluate the benefit, not having the personnel to extract the value,* and *a lack of proven ROI.*

Reasons Not Using Tools	Lack of technology leadership	Cost	Don't have personnel that can extract the value	Don't have time to evaluate the benefit	Lack of proven ROI	Incompatibility with client/teaming partner requirements	Doesn't have the features I need	Incompatibility with current systems
Engineering Collaboration	20%	15%	14%	12%	11%	10%	4%	2%
3D BIM	13%	9%	14%	13%	18%	16%	6%	6%
Insight	13%	8%	19%	21%	16%	9%	6%	4%

Importance & Satisfaction of Technological Tools

Respondents were asked to rate the overall importance and their overall satisfaction of their organization's use of the three tool types. The responses were rated from 1 to 5 (where 1 = not-at-all important/not-at-all-satisfied), and then means were calculated in order to plot the data on the following chart. There was a clear positive correlation between the perceived importance of various technologies and the respondent's satisfaction with those tools. In other words, on average, the more important a tool to the organization, the more satisfied respondents were with those types of tools. The chart below also illustrates the relative differences between the three different tool types. Respondents rated engineering collaboration tools the most important, followed by 3D & BIM tools and, lastly, insight tools. This is not surprising given the lower incidence of use highlighted in previous sections. As insight tools become more prevalent in the industry, it will be important for product managers to better understand drivers of dissatisfaction with these tools among both practitioners and managers. It is also clear in the data mapping that practitioners rank the importance of both 3D BIM and engineering collaboration tools more highly than managers.

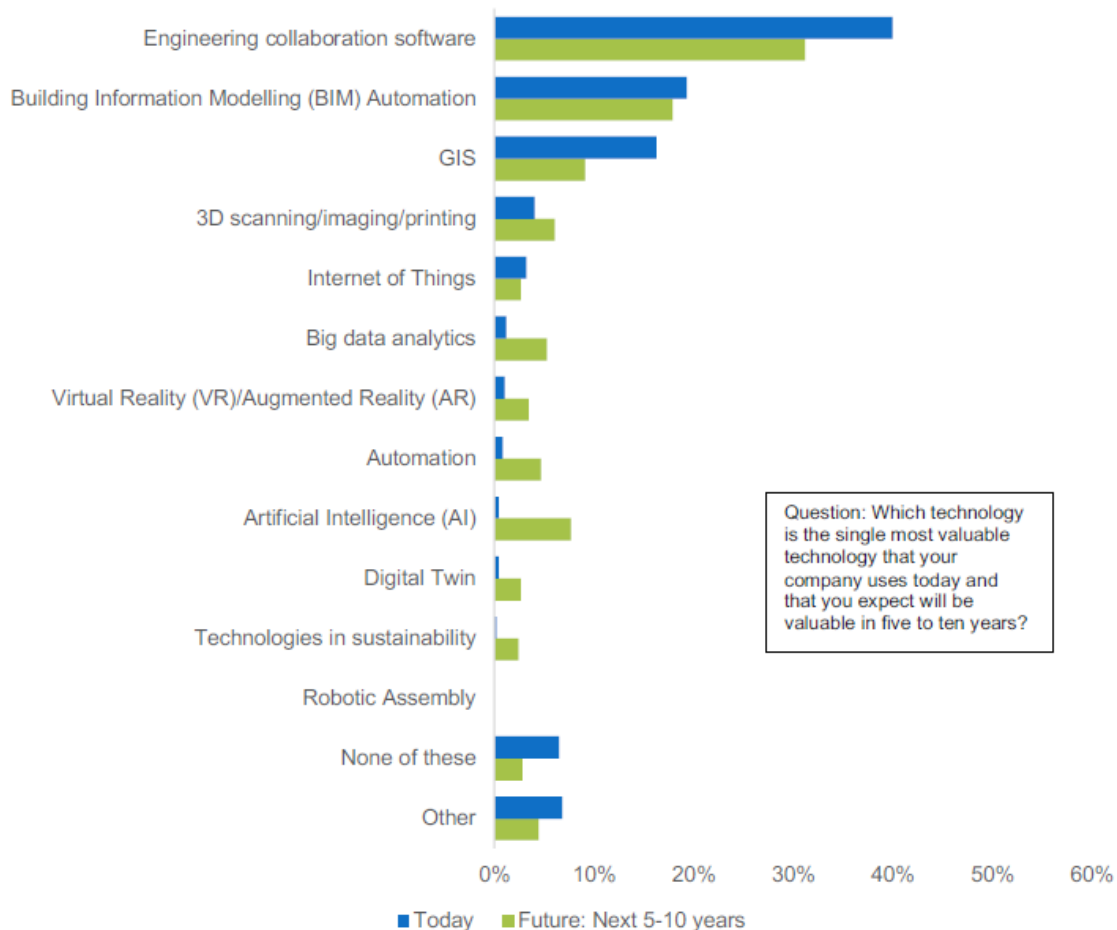Importance/Satisfaction of Technological Tools for Managers vs. Practitioners
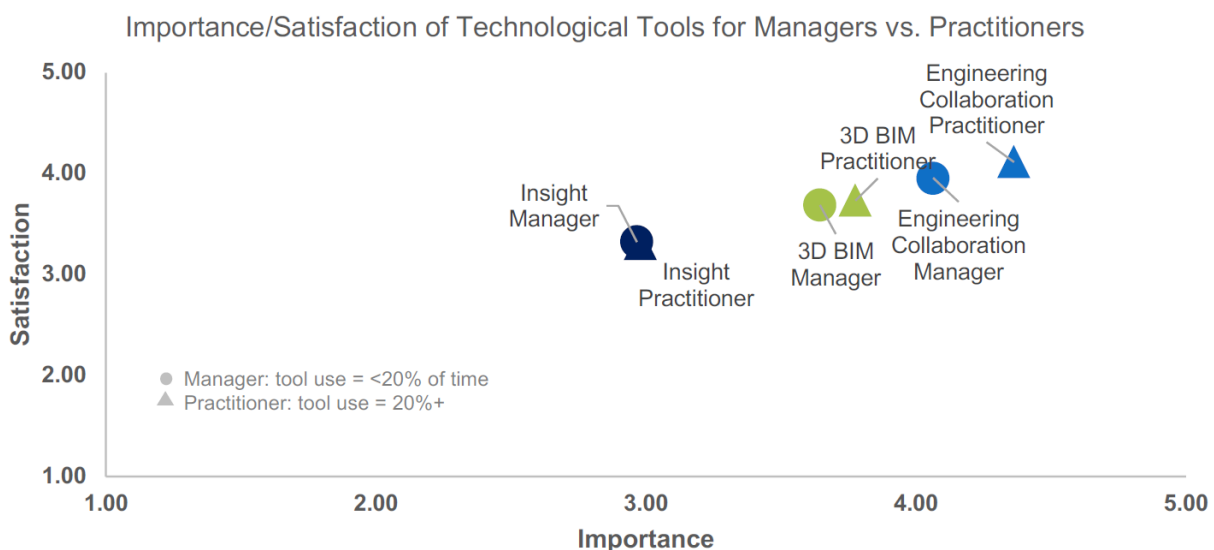
The Future of Technology in Engineering

The Most Valuable Technologies to Engineering and Design Services Industry Over the Next 5-10 Years

Technology is constantly evolving and being evaluated by users and managers across the Engineering and Design Services industry. The value of these tools is, in part, measured by the various different benefits highlighted in the preceding section of the report, such as developing higher quality construction, making staff more productive, providing an advantage over competitors and improving operational efficiency. As firms continue to seek out these benefits, it is critical that they focus not just on the value of technology today but also look toward the potential role that these technologies will play in the future.

The chart below illustrates engineering collaboration tools, BIM automation tools, and GIS as the most valuable tools to stakeholders both today and over the next 5-10 years. However, these three tools lose some relevance over the next 5-10 years relative to other emerging technologies including 3D scanning/imaging and printing, big data analytics, virtual reality, automation and artificial intelligence.

Single Most Valuable Technology Today and in the Future

Question: Which technology is the single most valuable technology that your company uses today and that you expect will be valuable in five to ten years?

Legend: ■ Today ■ Future: Next 5-10 years

The Future Value of Technology: Managers vs. Practitioners

There are also significant differences between the views of managers and practitioners in terms of which technologies will be most valuable in 5 -10 years. While the overall rankings of technologies is similar for both groups, practitioners are slightly more likely than managers to say that engineering collaboration software (33% vs 30%) and BIM (20% vs 17%) will be the most valuable technologies, while managers are more likely than practitioners to consider either GIS (9% vs 8%), AI (8% vs 7%), big data analytics (7% vs 4%), or automation (6% vs 4%) as the single most valuable technology in 5-10 years.
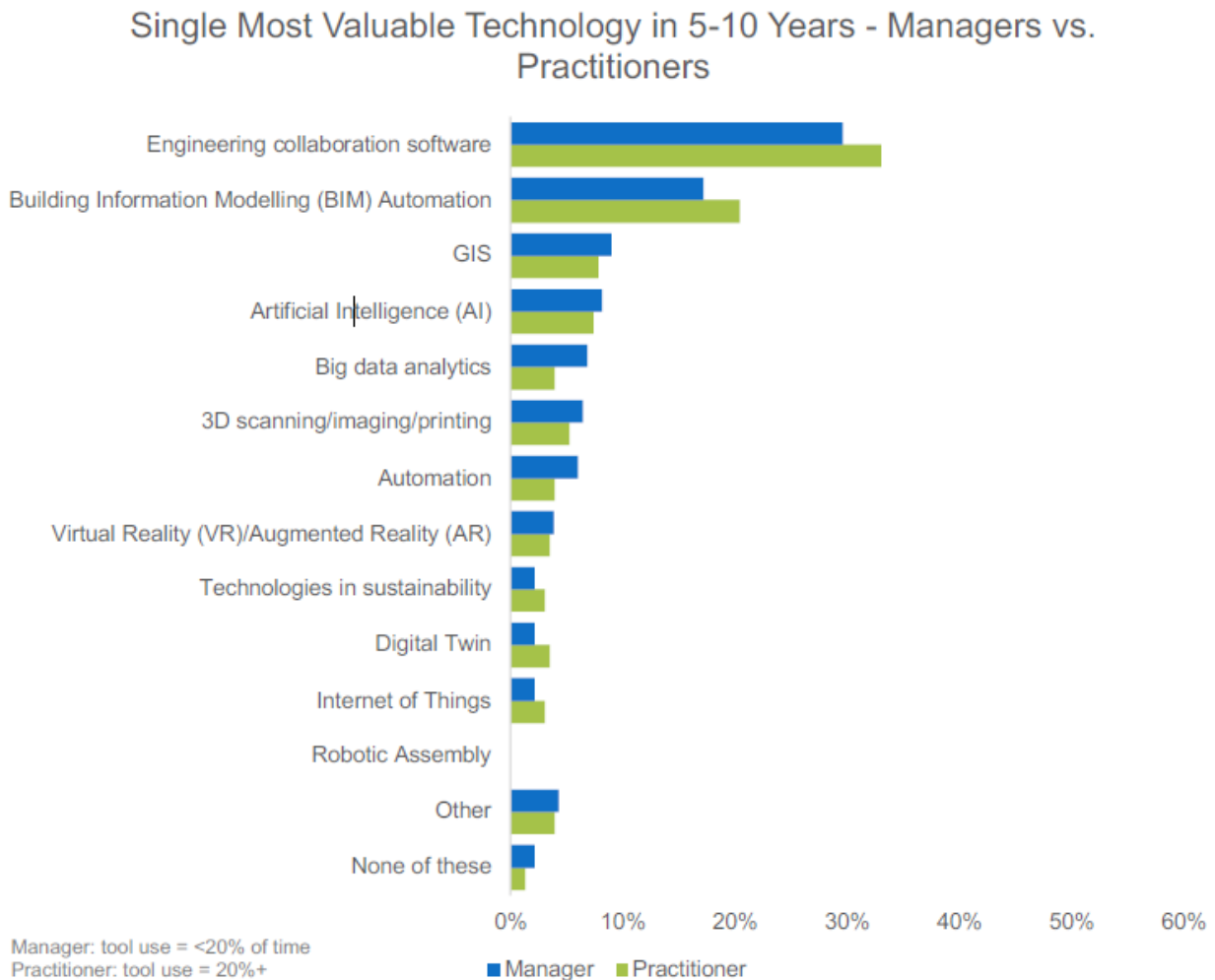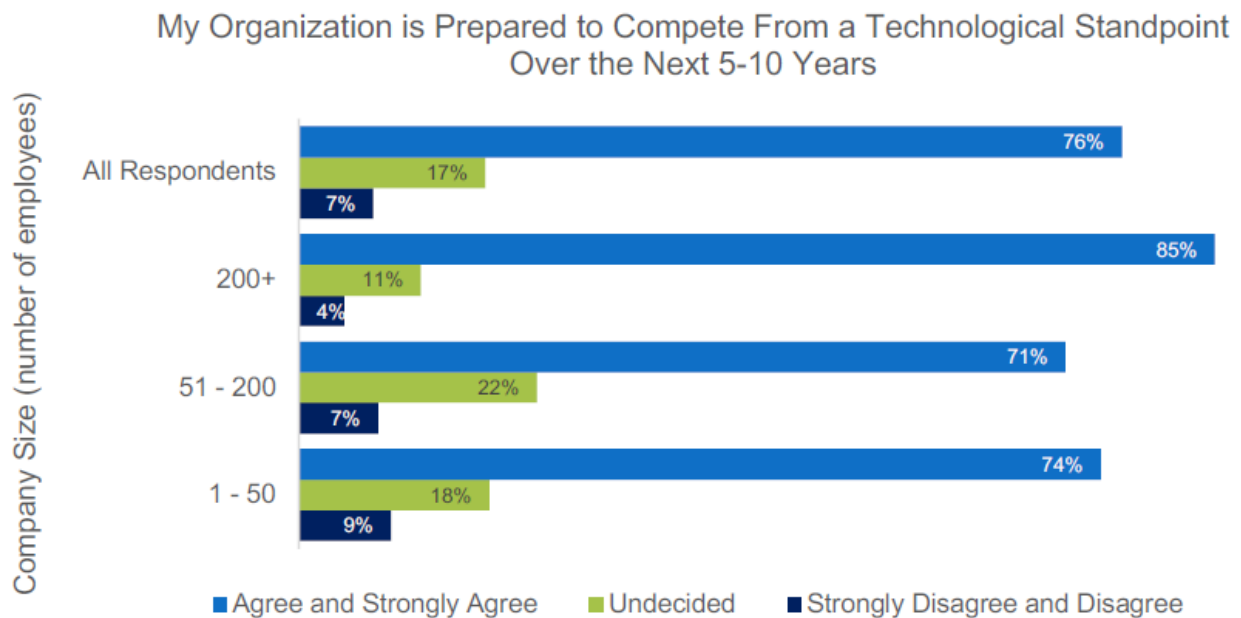

When breaking it out by company title and considering the single most valuable technology in the next 5-10 years, owners/principals/partners and analysts/managers/supervisors/consultants choose BIM automation at twice the rate of chief officers and 2.5 times that of directors/VPs. In the opposite direction, chief officers and directors/VPs choose artificial intelligence at twice the rate of owners/principals/partners and 3 times the rate of analysts/managers/supervisors/consultants. Finally, Chief Officers choose automation at a higher percentage than any other title (9%). All agree on engineering collaboration software being the single most valuable technology in 5-10 years.

Single Most Valuable Technology in 5-10 Years	Analyst/Manager Supervisor/Consultant	Director/VP/SVP/EVP	Chief Officer (CEO/COO/CIO/etc)	Owner/Principal/Partner
Engineering collaboration software	26%	40%	30%	29%
Building Information Modelling (BIM) Automation	23%	9%	12%	24%
GIS	10%	8%	9%	9%
3D scanning/imaging/printing	7%	8%	3%	6%
Artificial Intelligence (AI)	4%	11%	12%	6%
Automation	5%	2%	9%	5%
Big data analytics	5%	5%	6%	5%
Virtual Reality (VR) Augmented Reality (AR)	4%	3%	3%	4%
Technologies in sustainability	4%	2%	1%	3%
Internet of Things	2%	3%	4%	2%
Digital Twin	4%	3%	6%	0%

## Firms' Use of Technology as a Tool to Compete in the Future

Over three quarters (76%) of survey respondents agreed that their organization is prepared to compete from a technological standpoint over the next five to ten years. The agreement was even stronger among larger companies with 85% agreeing that their organization was prepared to compete. Smaller companies are somewhat less likely to compete from a technological standpoint with 74% of respondents from companies with 50 or fewer employees agreeing with the statement and only 71% of those from midsize (51-200 employees) companies agreeing that they are prepared to compete from a technological standpoint.

My Organization is Prepared to Compete From a Technological Standpoint Over the Next 5-10 Years

Company Size (number of employees)

	Agree and Strongly Agree	Undecided	Strongly Disagree and Disagree
All Respondents	76%	17%	7%
200+	85%	11%	4%
51 - 200	71%	22%	7%
1 - 50	74%	18%	9%

■ Agree and Strongly Agree ■ Undecided ■ Strongly Disagree and Disagree

Quantifying a Return on Investment in Technology

Perhaps the most critical consideration for a firm when investing in any technology or tool is whether or not that investment will result in a positive return to the bottom line. The view of one survey respondent is that "The ROI is always there with proper execution and adoption. It's just a matter of how long before that ROI kicks in." A question included in the survey asked what impact respondents would estimate the use of these different tools would have on their company's overall bottom line. From the answers we calculated an estimated return on investment (ROI). Respondents consistently rated engineering collaboration tools as providing the highest ROI and insight tools as having the lowest ROI. For 3D BIM and insight tools, smaller companies reported a higher return on investment
than larger ones.

ROI Estimate by Type of Tool and Company Size (Number of Employees)
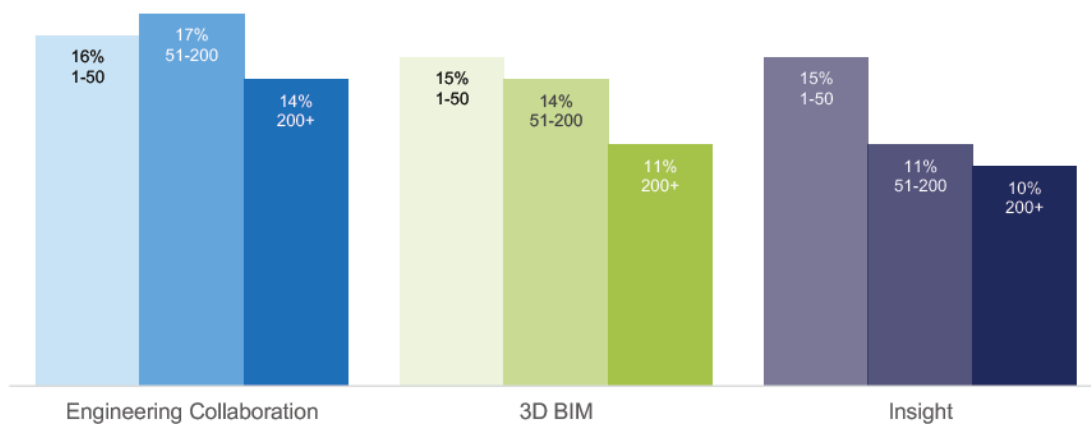
Conclusions

With the increase in technology, there is still much to understand about its utility to firms within the Engineering and Design Services sector. Some open questions include:

- What problems exist in the Engineering and Design Services sector that have yet to be solved by technology?
- How does the use of technology differ from one country or region of the world to the next?
- What are the impediments to growth in technology?
- Ultimately, how is technology impacting productivity?
- What are the implications for human capital in the Engineering and Design Services sector as technology continues to evolve?

Our research, however, clearly answers the question of whether or not technology provides value to firms in the US – it does. These benefits come across an array of business objectives such as higher quality design or construction, higher client/teaming partner satisfaction, in order to stay competitive, improved operational efficiency, higher productivity, and more effective communication within the firm.

The benefits differ significantly based on the size of the company, the title or role of the respondent, and among Practitioners – those that are directly working with technological tools on a regular basis – and Managers – those that play a more strategic and planning role with the utilization of technology. The benefits also differ by the type of tool, namely, there are different benefits associated with engineering collaboration tools, 3D modeling and BIM automation tools, and insight tools.

There is a clear correlation showing the greater the importance of tools, the greater the satisfaction of those tools.

Larger firms are clearly further along the adoption curve and better positioned to use technology as a competitive advantage over the coming years. While the usage of technology is more limited in smaller firms, these firms on average see a larger return on their technology investment. This may be due, in part, to more resources being put into core technologies and less investment in more experimental technologies and practices. As technology continues to evolve, many stakeholders expect to see shifts in value across both mature and emerging technologies.

Notable differences were referenced in open-ended responses in how different firms view technology adoption:

- A principal from a midsize company notes, "We depend on existing tools and we are always looking [at] and evaluating new and emerging tech."
- An executive from a small company states, "We have, so far, been content to stay in the middle of the pack and adopt new technologies as they become more standard, or when we have a contract that will support the investment."
- A supervisor and engineer from another midsize company remarks: "These tools make our everyday work more accurate. However, often to use these tools there is a large learning curve or a delay in production that is often hard to overcome before they can be useful."
- An SVP/EVP from a large firm commented that, "At times, our technology strategy separates us from the competition."

Among those firms that aren't using more basic technological tools like engineering collaboration, it's mostly about a lack of technology leadership, although cost, value and ROI are key considerations as well. In terms of the more cutting-edge technologies and insight tools, it's more about having the personnel that can extract the benefit and making the time to fully comprehend and evaluate the ROI of adoption.

Acknowledgements

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The ACEC Research Institute's mission is to deliver knowledge and business strategies that guide and elevate the engineering industry and to be the leading source of knowledge and thought leadership for creating a more sustainable, safe, secure and technically advanced built environment.

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