



PROCORE

TOP CIVIL & INFRASTRUCTURE TRENDS

TODAY'S INDUSTRY CHALLENGES AND OPPORTUNITIES



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CEO, AGC OF AMERICA

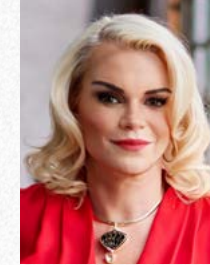
STEPHEN E. SANDHERR**A Note from AGC**

Civil and infrastructure construction is poised to play a greater role in the advancement of the U.S. economy than at any time in the past several decades, thanks in part to the massive federal investments in many types of civil and infrastructure construction that our association helped secure. Understanding the current state of these types of companies, their challenges and their potential is essential to making sure the opportunities ahead are captured to the fullest.

Civil and infrastructure projects and the companies that execute them both depend on and contribute to all other types of construction. This is why we are encouraging all our members to review this report and consider its findings as they make decisions about their future plans. The report also offers important lessons for policy makers, contracting officers and other public officials, and for private stakeholders ranging from suppliers, designers and service providers to researchers and media about the current state of the industry.

Both AGC and Procore share a commitment to better understanding the industry's current situation, challenges, opportunities and solutions. Our collaboration on this report should help do just that and we hope you, the reader, will get as much value out of this report as we did in compiling it.

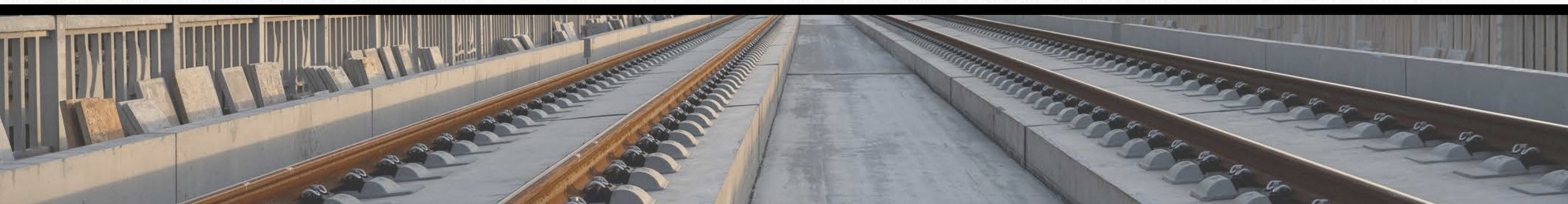
VP, INDUSTRY TRANSFORMATION, PROCORE

SANDRA BENSON**A Note from Procore**

We are excited to partner with AGC on this report to share the current state of the sector and ways in which civil and infrastructure organizations can optimize their business. Procore is keen to help such companies, whose distinctive work requires specialized avenues of support. We are heartened to see the growth and expansion of this segment as it achieves the vital work of building and maintaining communities.

With increased backlogs prompted by once-in-a-generation government investment in the U.S. and Canada, civil and infrastructure organizations are on the precipice of historic projects across North America. To achieve these massive undertakings, while also navigating the ongoing labor shortage, companies will have to find innovative solutions, improve self-performance and leverage clean data to build better.

Civil and infrastructure businesses face a unique set of challenges, and Procore is here to help as companies are keen to streamline office and field communications, upskill their workforces and find built-for-construction technology.



Introduction

Across the United States and Canada, the civil and infrastructure* construction segment acts as a backbone not only for other industry sectors, but for community development as well. These organizations are responsible for the roads, bridges, highways, public transit, renewable energy, airports, utilities, industrial projects and much more that are necessary for functional communities. Many businesses in this space also self-perform such vital work, despite the challenges.

To gain insight into how civil and infrastructure organizations in the U.S. and Canada are building today, the challenges they face and the opportunities that lie ahead, AGC and Procore teamed up with Illuminas to survey professionals in this sector. 486 respondents from this segment answered questions on a variety of topics, including market growth, government investment, project delivery methods, self-perform work, workforce challenges, data maturity and beyond.

This report takes a look at the current state of civil and infrastructure, challenges and solutions with labor, technology and data as business drivers — and in light of all these findings, our recommendations for running a successful business today.



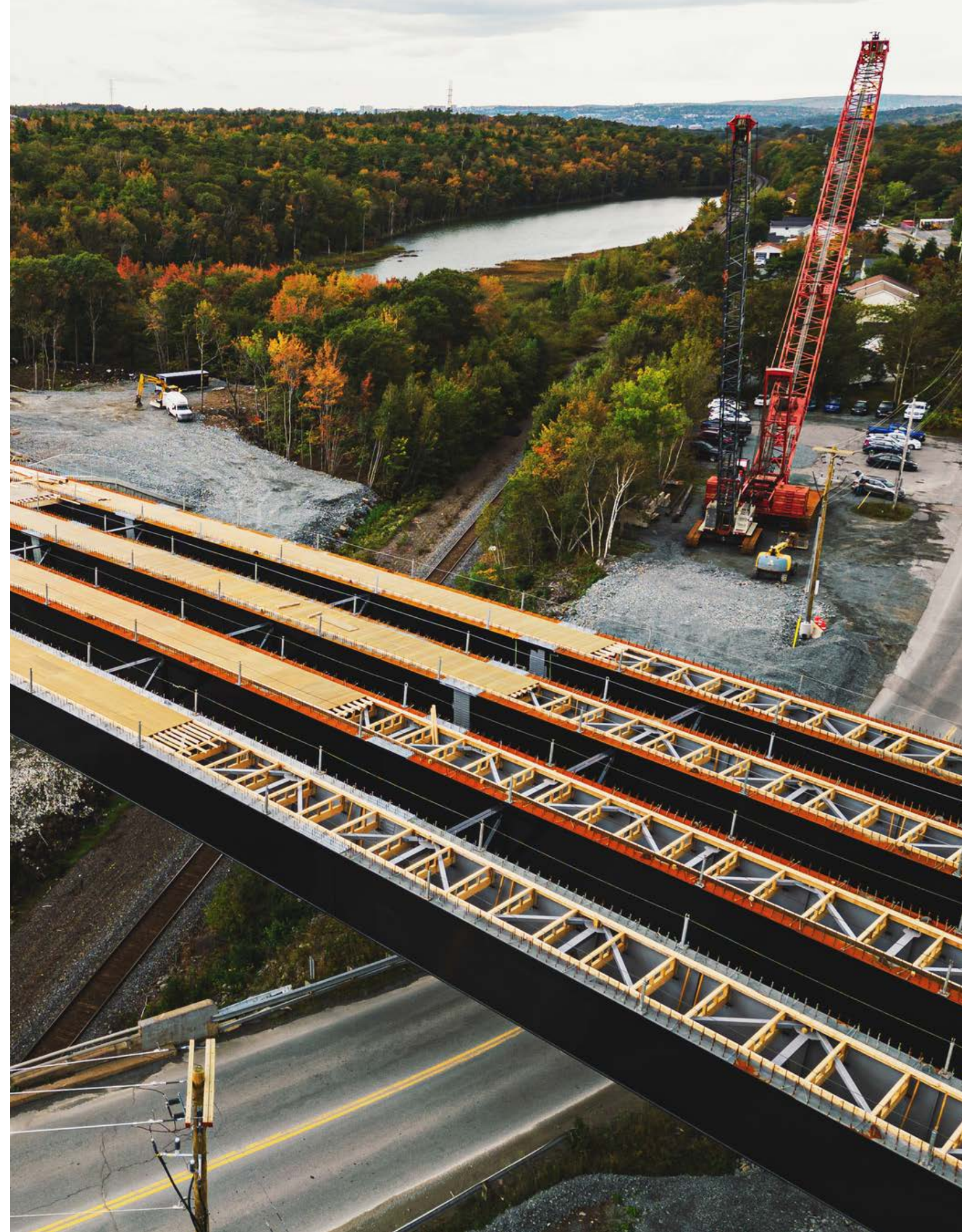
Be on the lookout for this icon to get insights into how self-perform work and investment in improving data maturity can better your business.

Procore and AGC are committed to helping civil and infrastructure builders gain accurate insight into the market. As a result of this survey, we aim to serve these organizations by anticipating challenges and opportunities in the sector.

Read on to discover more about the current state of civil and infrastructure — and how this vital segment can be supported to always build better.



**For purposes of this report, we define the civil and infrastructure sector as including these types of projects: aviation, dams/canals/waterways, industrial, ports/marine/docks, renewable energy, roads/highways/bridges, transit/rail, utilities.*



CHAPTER 1

**THE STATE
OF CIVIL AND
INFRASTRUCTURE**

25%

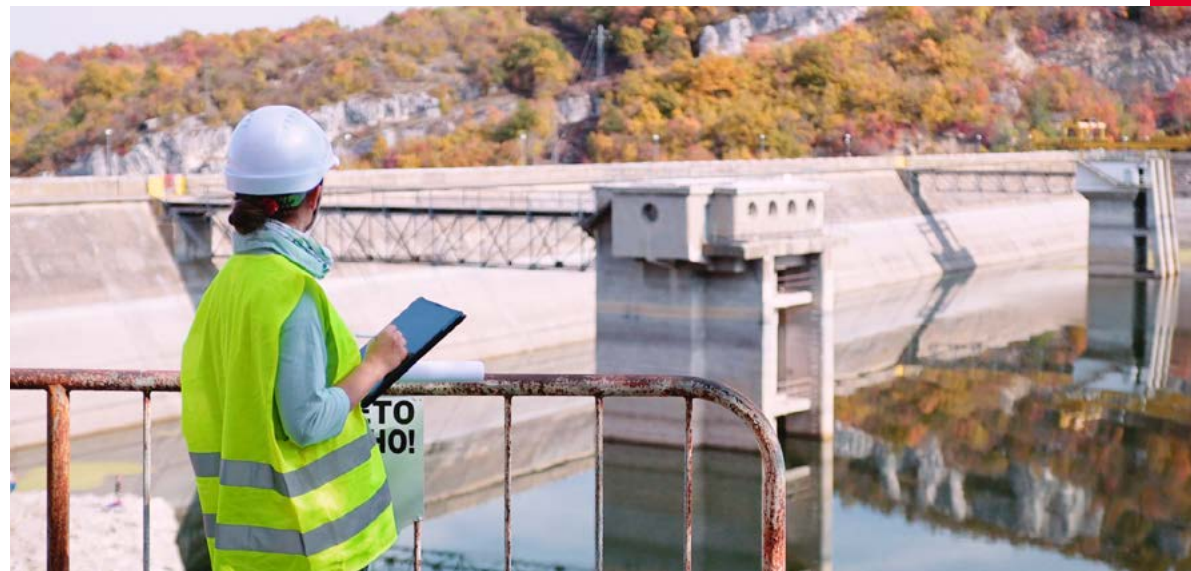
Average increase in civil and infrastructure backlogs since the pandemic.



The Accelerating Market is Driven by Federal investment

Civil and infrastructure construction provides a critical backbone to the community. This is why it's heartening to hear contractors reporting stronger backlogs than before the pandemic, indicating growth in approved and committed civil and infrastructure projects. Once-in-a-generation government investment in both the U.S. and Canada are key drivers behind this growth and expansion, creating countless jobs across North America.

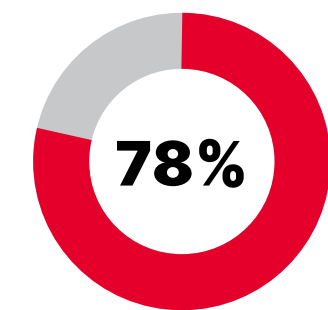
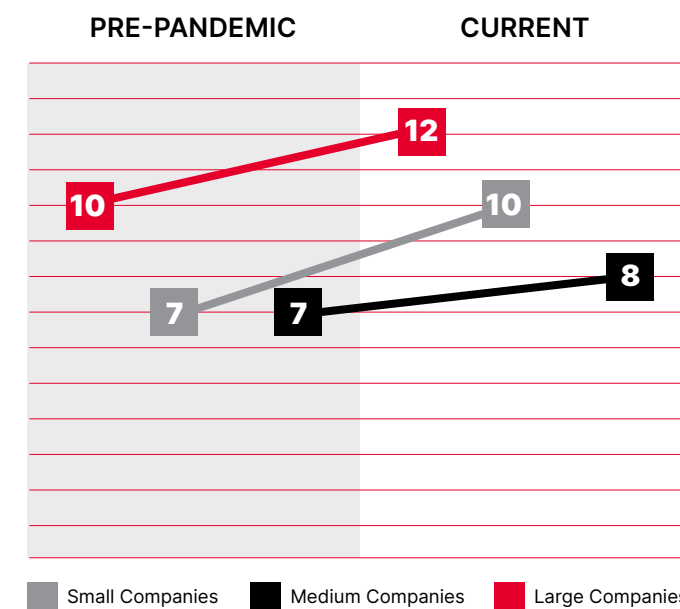
As a highly specialized segment within construction, civil and infrastructure is unique. For many small and medium companies* who operate in this space, the majority of their revenue comes from civil and infrastructure projects, while large firms are more likely to operate across other construction sectors. Additionally, civil and infrastructure builders are unique in their tendency to self-perform most of their work. While civil and infrastructure projects face sector-specific challenges and risks, they also provide significant impact within communities.



Growing backlogs underpin an expanding civil and infrastructure market.

Civil and infrastructure builders' backlogs are up, on average, from 8 months before the pandemic to 10 months today, an increase of 25%. Larger companies have fared even better, with backlogs of 12 months on average. This expansion shows no signs of slowing, based on responses.

Current vs. pre-pandemic project backlog averages, in months*



78%
of respondents expect the backlog to increase or remain the same over the next year.

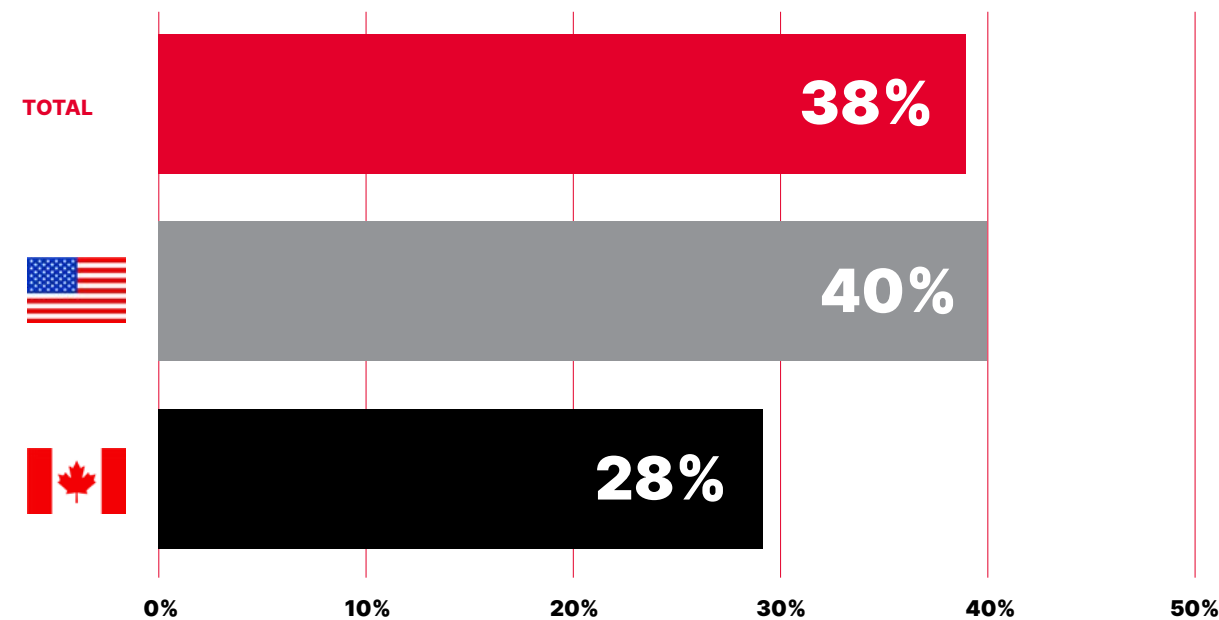
*For the purposes of this report, we define small companies as less than \$100 million in revenue, medium firms as \$100 to less than \$500 million and large organizations as more than \$500 million.

*What is the current backlog of civil and infrastructure projects that your company has? + What was the typical backlog of civil and infrastructure projects your company had before the pandemic?

Government spending supports a significant portion of the segment.

The flourishing of the civil and infrastructure segment is due in part to historic government investment across the U.S. and Canada.

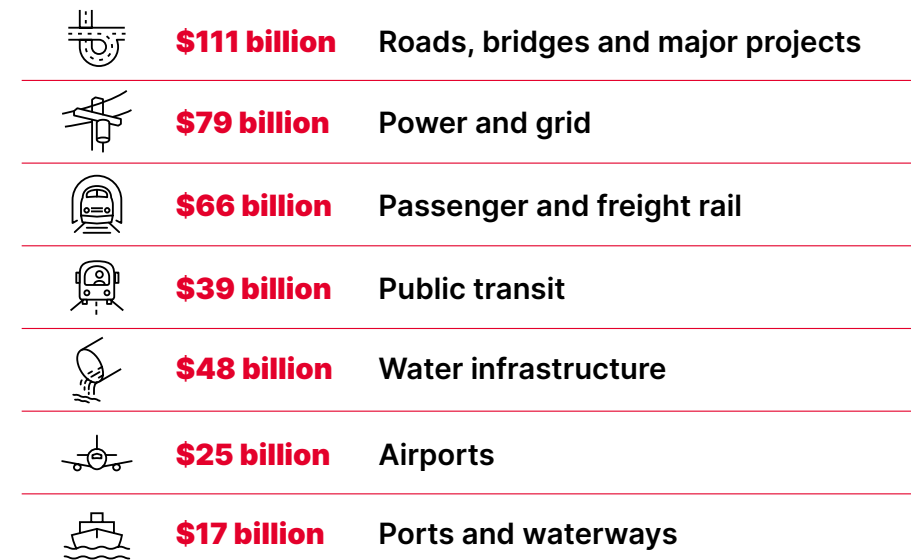
Average percentage of civil and infrastructure projects in current portfolios funded by government bills*



*What percent of your current civil and infrastructure projects have been funded by major government bills, such as the Infrastructure Investment and Jobs Act, CHIPS + Science Act, and/or Inflation Reduction Act /Investing in Canada Plan?

In the U.S., the CHIPS Act¹ directs \$280 billion in spending over the next ten years. Out of this, \$200 billion is for scientific R&D and commercialization, while around \$52.7 billion is allocated to semiconductor manufacturing, R&D and workforce development. Additionally, the Bipartisan Infrastructure Law², also known as the Infrastructure Investment and Jobs Act (IIJA) is set to make a huge impact on transportation, broadband, climate, energy and the environment. The IIJA provides \$1.2 trillion in spending, \$550 billion of which will be new federal spending to be allocated over the next five years.

This \$550 billion³ will be allocated towards:



In Canada, government funding is presented in the Investing in Canada Plan⁴, which launched in 2016 and pledges an investment of \$138 billion over 12 years.

This government spending includes:



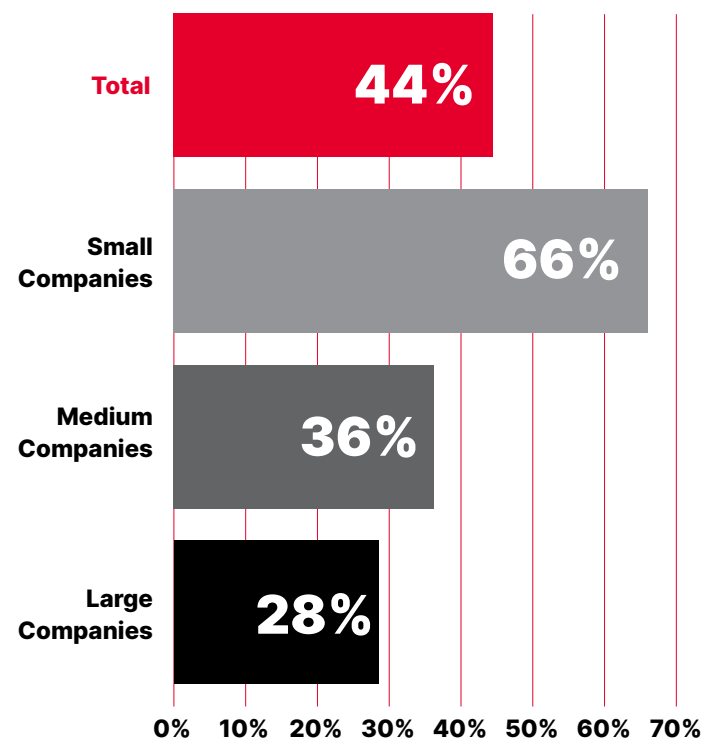
¹McKinsey | ²The White House | ³EY | ⁴Library of Parliament
All numbers in U.S. dollars

Civil and infrastructure is typically a specialized segment within the industry.

Civil and infrastructure projects tend to account for the majority of revenue for organizations in this space. A significant amount of attentiveness is necessary on such projects, which require careful management of large scopes of work and many stakeholders. In fact, 44% of contractors who work in this sector focus solely on civil and infrastructure projects, with smaller companies far more likely (68%) to have this sole focus than larger companies (28%) with diverse portfolios. However, across all company sizes, it's common to have at least some exposure to one other market segment at minimum.

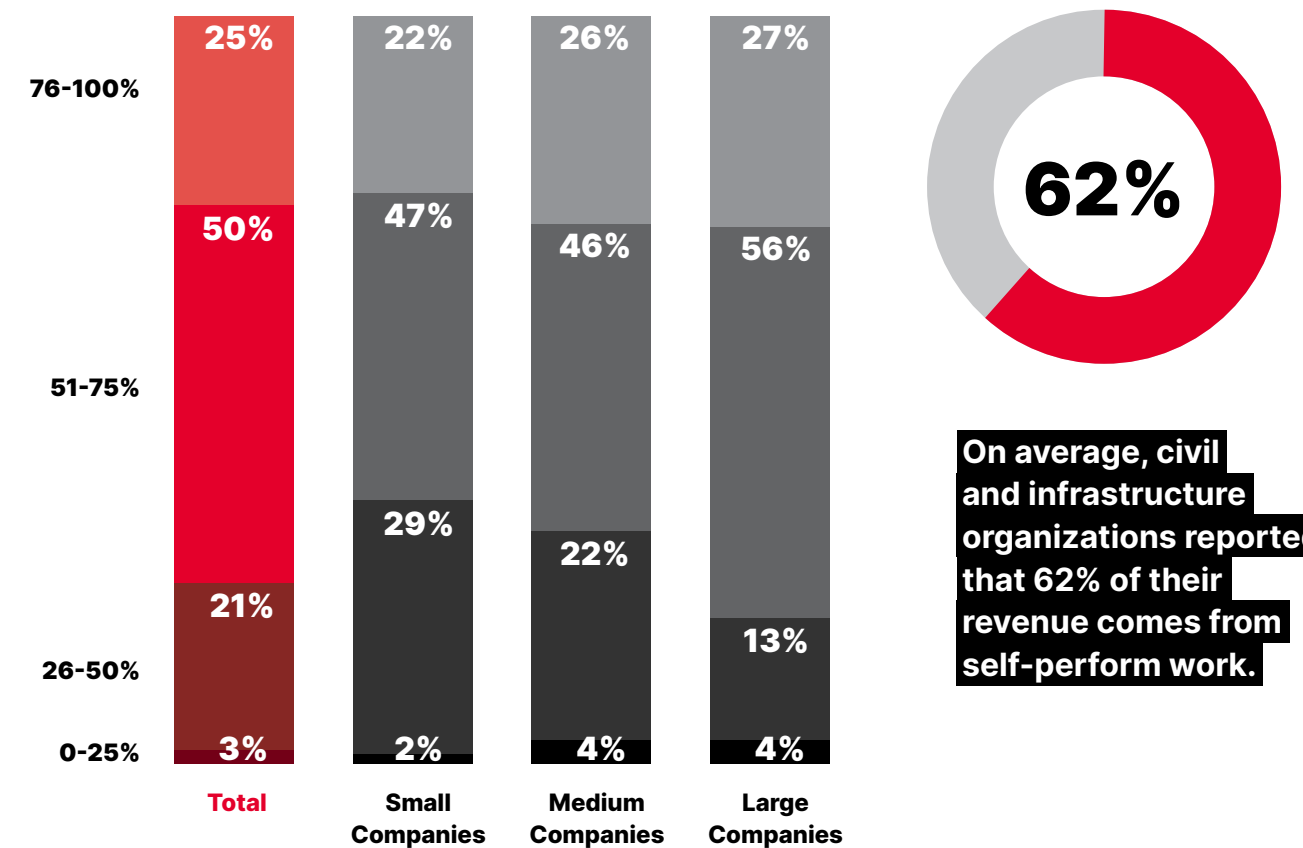
On average, respondents work in two major sectors of construction.

Respondents solely focused on civil and infrastructure*

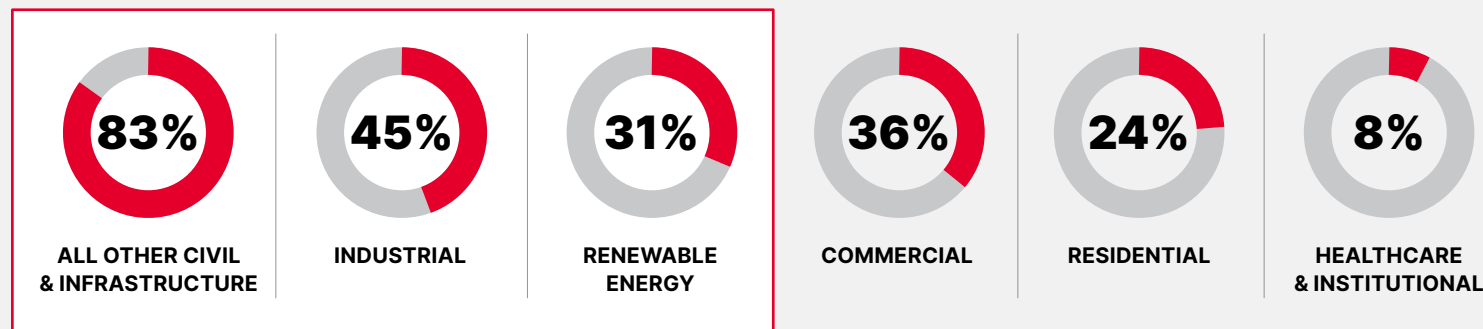


Another distinctive trait of civil and infrastructure is the prevalence of the self-perform business model. 75% respondents said that over half of their revenue comes from self-performed work. The capability to self-perform gives builders tighter control over variables that affect productivity in the field, schedules and overall cost-effectiveness, as this report will continue to explore.

Companies with more revenue have a larger percentage of their revenue coming from self-performed work*



On average, civil and infrastructure organizations reported that 62% of their revenue comes from self-perform work.



*Which of the following sectors does your company work in? Respondents who selected at least one of Civil & Infrastructure, renewable energy, and industrial.

*What percentage of your company's revenue comes from self-performed work?



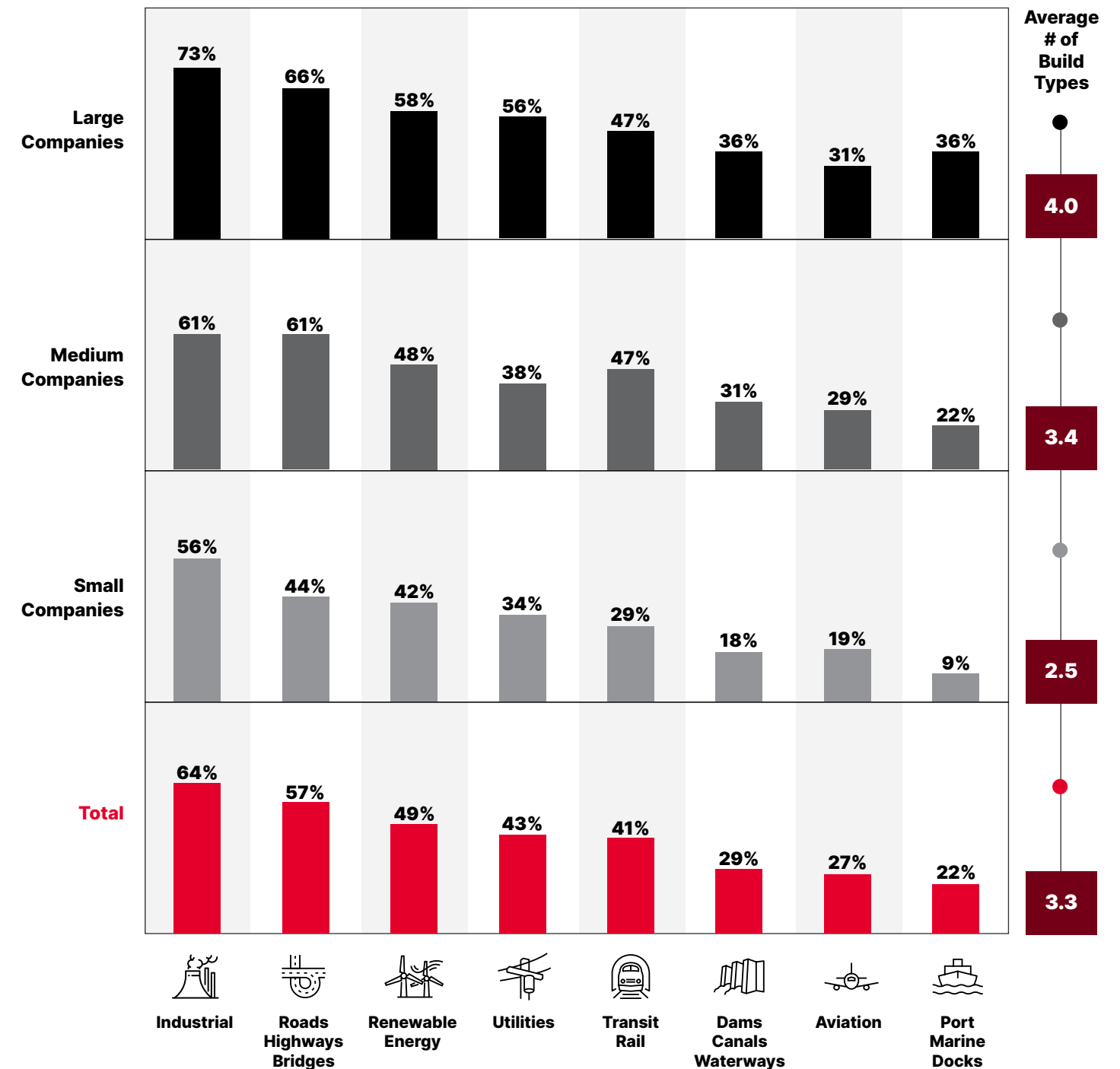
Builders tend to specialize within a broad spectrum of project types.

Civil and infrastructure is the segment responsible for constructing works that provide shared services, resources or benefit to the public and business community at large. As such, it's incredibly diverse in terms of project types. Respondents report highest focus on project types including industrial, roads/highways/bridges, renewable energy, utilities and transit/rail.



Civil builders tend to focus on only a subset of the sector. Respondents from small companies reported that on average, their companies have been involved in about two (2.5) project types over the past five years. This number increases to about three (3.4) for medium-sized companies and four for large companies. Certain project types such as utilities, transit/rail, ports/marine, docks and aviation seem less accessible to small companies. This can put them at a disadvantage, especially as government legislation accelerates investment in some of these types of projects.

Top project types within the last five years*



*Which of the following types of projects has your company been involved in over the past 5 years?

There's opportunity for improvement in project outcomes.

In this broad landscape of varied project types, it can be difficult to meet every challenge head-on. For each of the key indicators below, roughly two-thirds of projects are reported to achieve the targeted outcomes. In a market segment characterized by large, expensive, multi-year projects, many complicated by technical challenges and layered constraints, it's clear there's a significant amount of risk and thus an opportunity for high-impact improvement.

Larger companies are more likely to meet project objectives*

	Total	Small Companies	Medium Companies	Large Companies
% that meet safety goals	72%	65%	76%	76%
% that meet quality specifications	71%	63%	74%	75%
% completed on time	69%	63%	72%	72%
% completed on budget	67%	58%	71%	72%
% that hit profit margin	65%	58%	69%	68%

*Percentage of projects according to respondents that meet their defined core objectives.

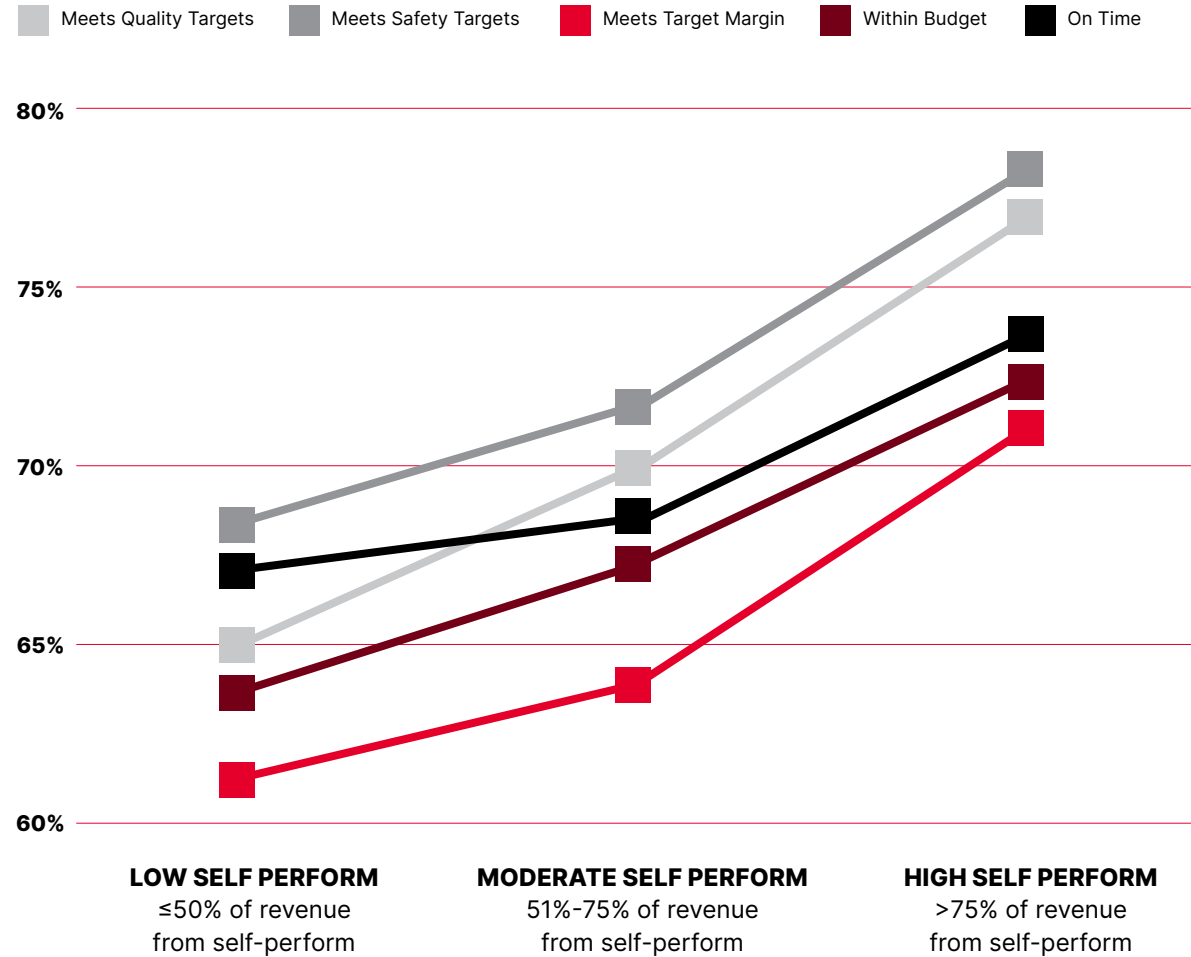


On average, civil and infrastructure contractors are meeting core objectives for roughly **2 out of 3** of their projects. Meeting financial objectives represents the greatest challenge.

Larger companies are more likely to meet safety, quality, schedule and financial objectives for their projects. This may point to the increasingly sophisticated capabilities necessary to construct modern infrastructure, especially in the context of existing urban communities.

Companies that self-perform show better project outcomes*

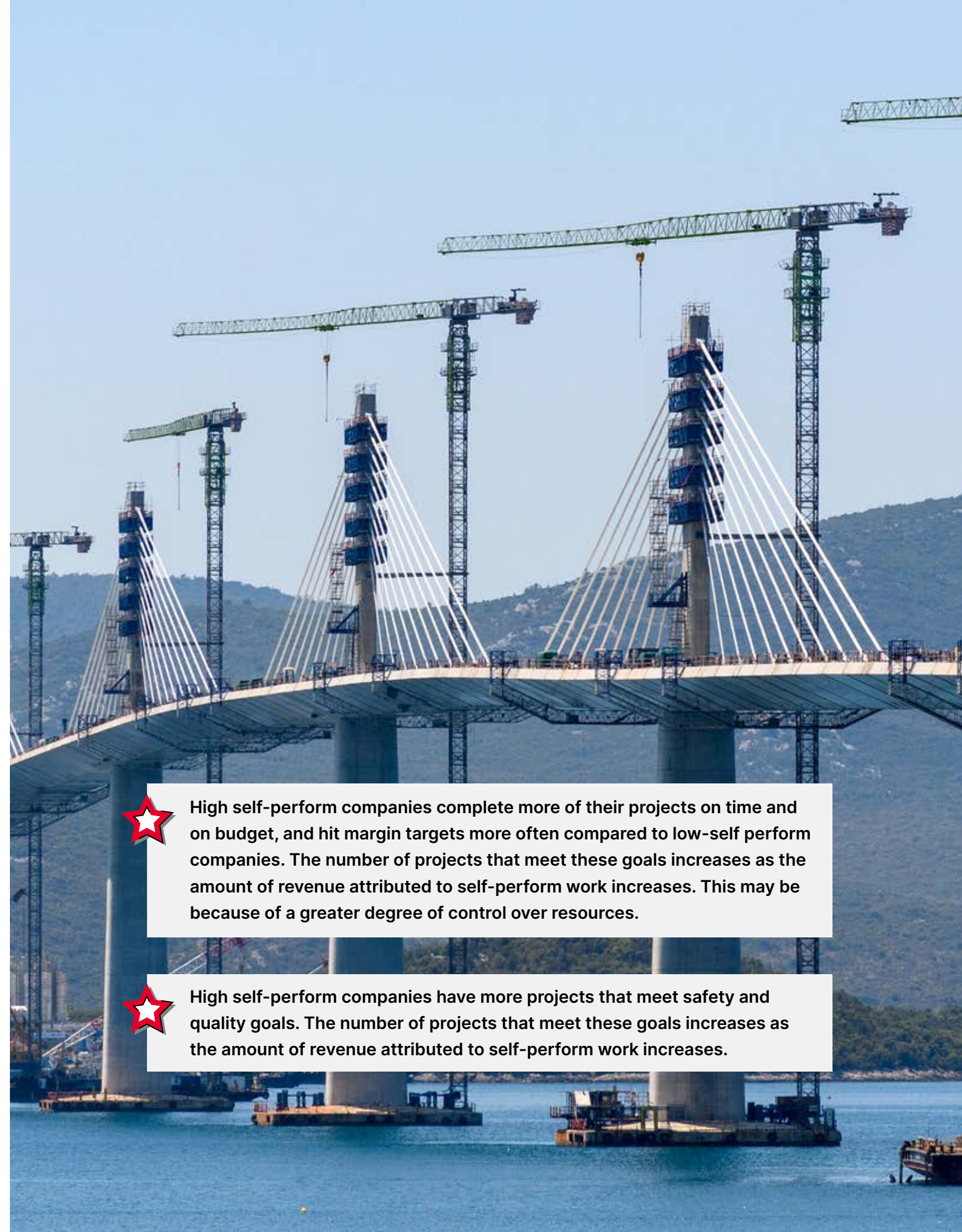
Project outcomes by percentage of self-performed work



14%↑

High self-perform contractors meet specific objectives an average of 14% more often than low self-perform contractors.

*Percentage of projects according to respondents that meet their defined core objectives. + What percentage of your company's revenue comes from self-performed work?



★ High self-perform companies complete more of their projects on time and on budget, and hit margin targets more often compared to low-self perform companies. The number of projects that meet these goals increases as the amount of revenue attributed to self-perform work increases. This may be because of a greater degree of control over resources.

★ High self-perform companies have more projects that meet safety and quality goals. The number of projects that meet these goals increases as the amount of revenue attributed to self-perform work increases.

Early Builder Involvement is Beneficial on Civil and Infrastructure Projects

Public and private owners alike have recognized the value of early builder involvement in civil and infrastructure projects. In a setting where unfavorable project outcomes can have significant impact for a broad array of stakeholders, the potential for early builder involvement to help minimize risk on a project is an important opportunity. In much the same way that builders are leveraging the self-perform business model to improve project outcomes, the segment is taking similar advantage of project delivery models that feature early builder involvement. This dynamic is leading to an increase in collaboration and risk distribution within the industry.

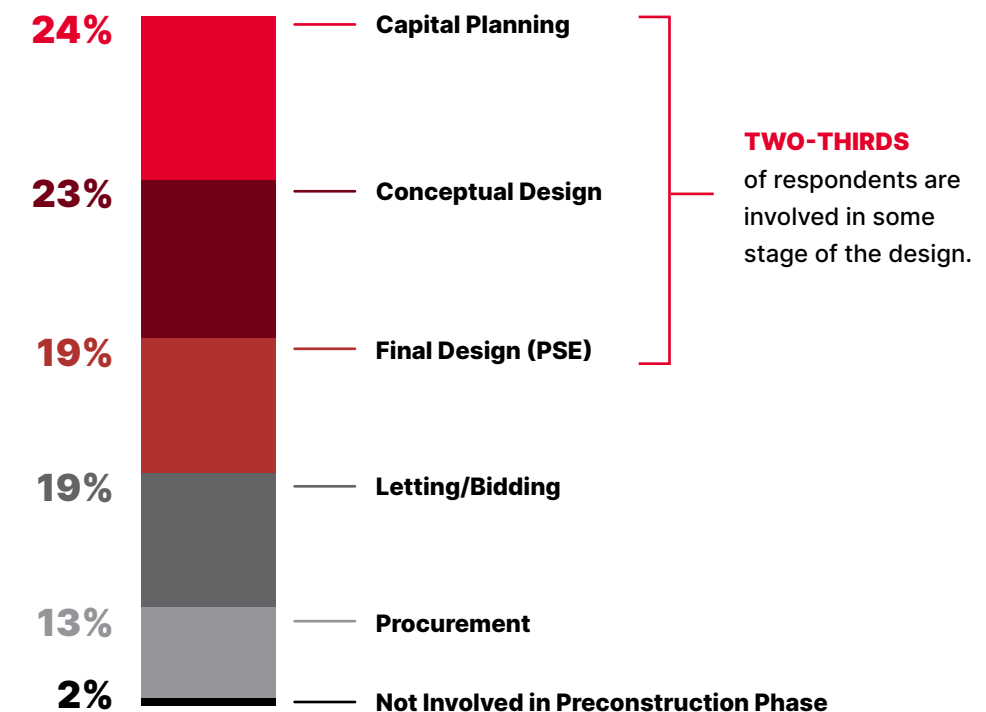
Preconstruction is critical on civil and infrastructure projects.

While most segments in construction can benefit from a thorough preconstruction phase, it's particularly important to civil and infrastructure projects. Due to their large geographic and economic footprint, these projects have a singularly large potential to impact their communities and environment — whether positively or negatively. The opportunity to leverage a careful and rigorous preconstruction process to mitigate negative impacts and magnify positive ones is acutely important.

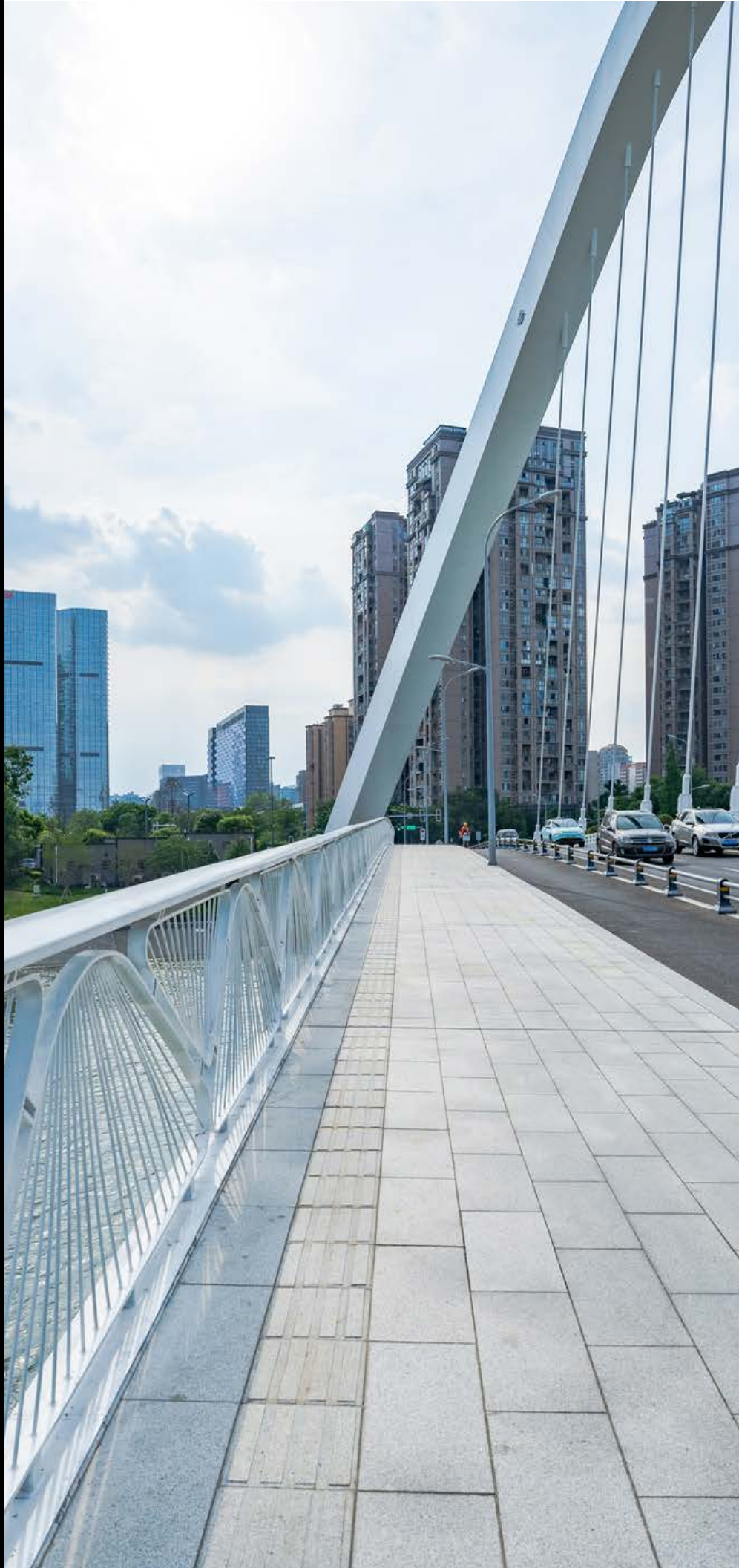
This opportunity is not lost on stakeholders in the civil and infrastructure segment. In fact, almost half (48%) of respondents get involved at the capital design or conceptual planning phases of a project, and two-thirds (66%) are involved in some stage of design.



Civil and infrastructure builders get involved in projects early*



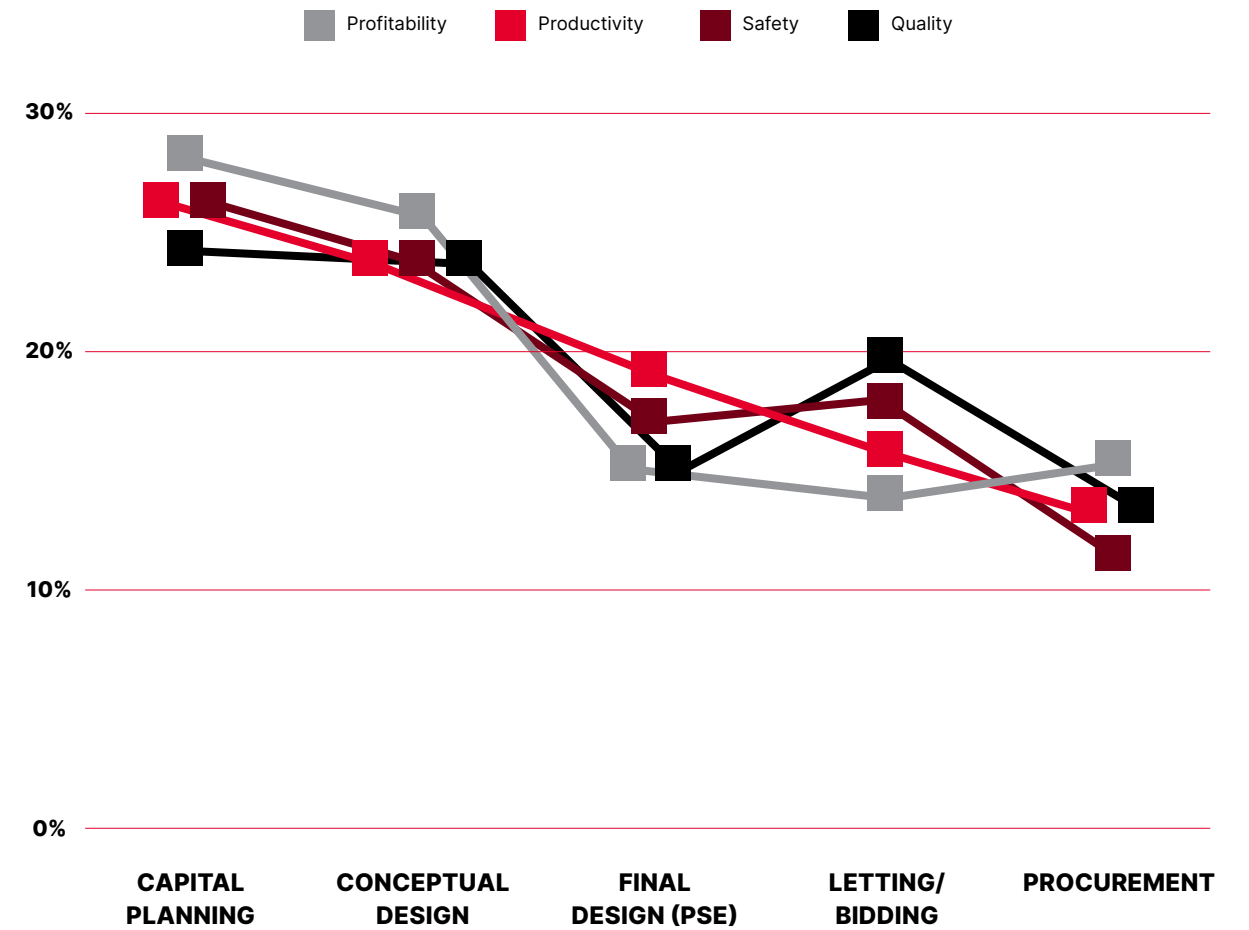
*At what point of the pre-construction phase does your company typically get involved in civil and infrastructure projects?



The value of preconstruction is evident, with companies who get involved early reporting more confidence in hitting their goals against key outcomes, such as profitability, productivity, safety and quality.

Positive project outcomes are more likely when builders are involved earlier in the preconstruction process*

Specific project outcome goals met by phase of preconstruction involvement



31%↑

Respondents who get involved during the design phases of construction are 31% more likely to meet specific project objectives than those who get involved later.

*Percentage of respondents who agree that their projects always meet goals related to these outcomes. 2% of overall respondents said they're not involved in the preconstruction at all; those responses not shown.

Collaborative delivery methods are on the rise.

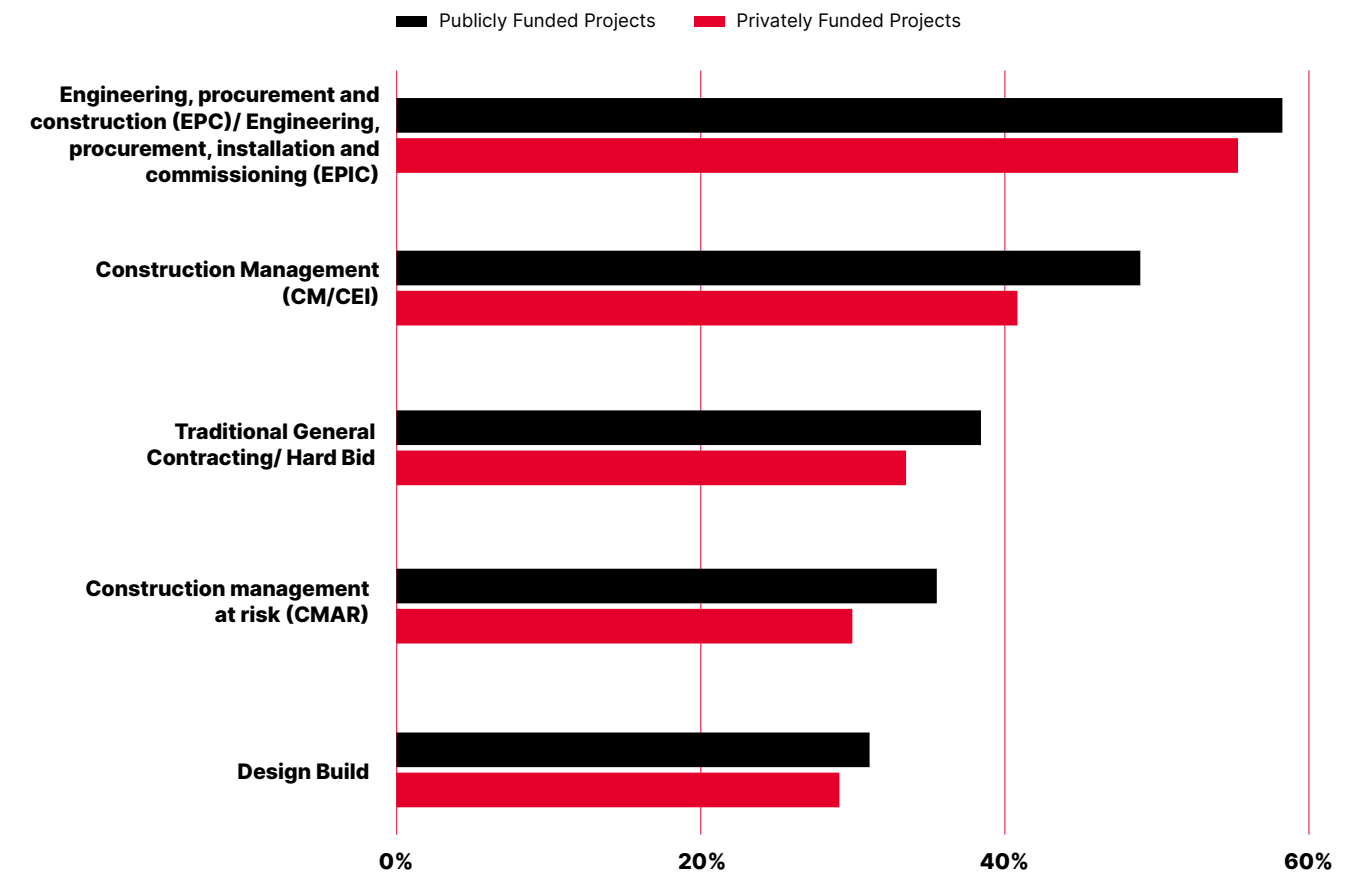
The conventional wisdom is that the civil and infrastructure segment is ruled by Hard Bid/Traditional project delivery. However, on average, respondents report having utilized three delivery methods across their publicly (3.1) and privately-funded (2.8) projects.

Despite the fact that Hard Bid delivery is still in prominent use, the use of more collaborative methods is notable. Methods such as Engineering, Procurement and Construction (EPC) and Design Build not only bring builders onto the project team early, but give them responsibility for project design. Respondents reported involvement in EPC at a higher rate than any other method and Design Build shows considerable traction as well.

Larger companies are more likely to engage in collaborative methods (EPC, CMAR, or Design Build) on their projects compared to smaller companies. This may indicate that larger companies have more developed capabilities around design and preconstruction activities; it may also be a function of larger companies' greater ability to win project types where these methods are in play. Larger companies are also more likely to be involved in a greater variety of delivery methods compared to smaller companies on both public and private projects.



Top delivery methods based on source of funding*



*Through which of the following delivery methods does your company typically perform publicly/ privately funded civil and infrastructure projects?

CHAPTER 2

**SECTOR-SPECIFIC
LABOR CHALLENGES
AND SOLUTIONS**

60%

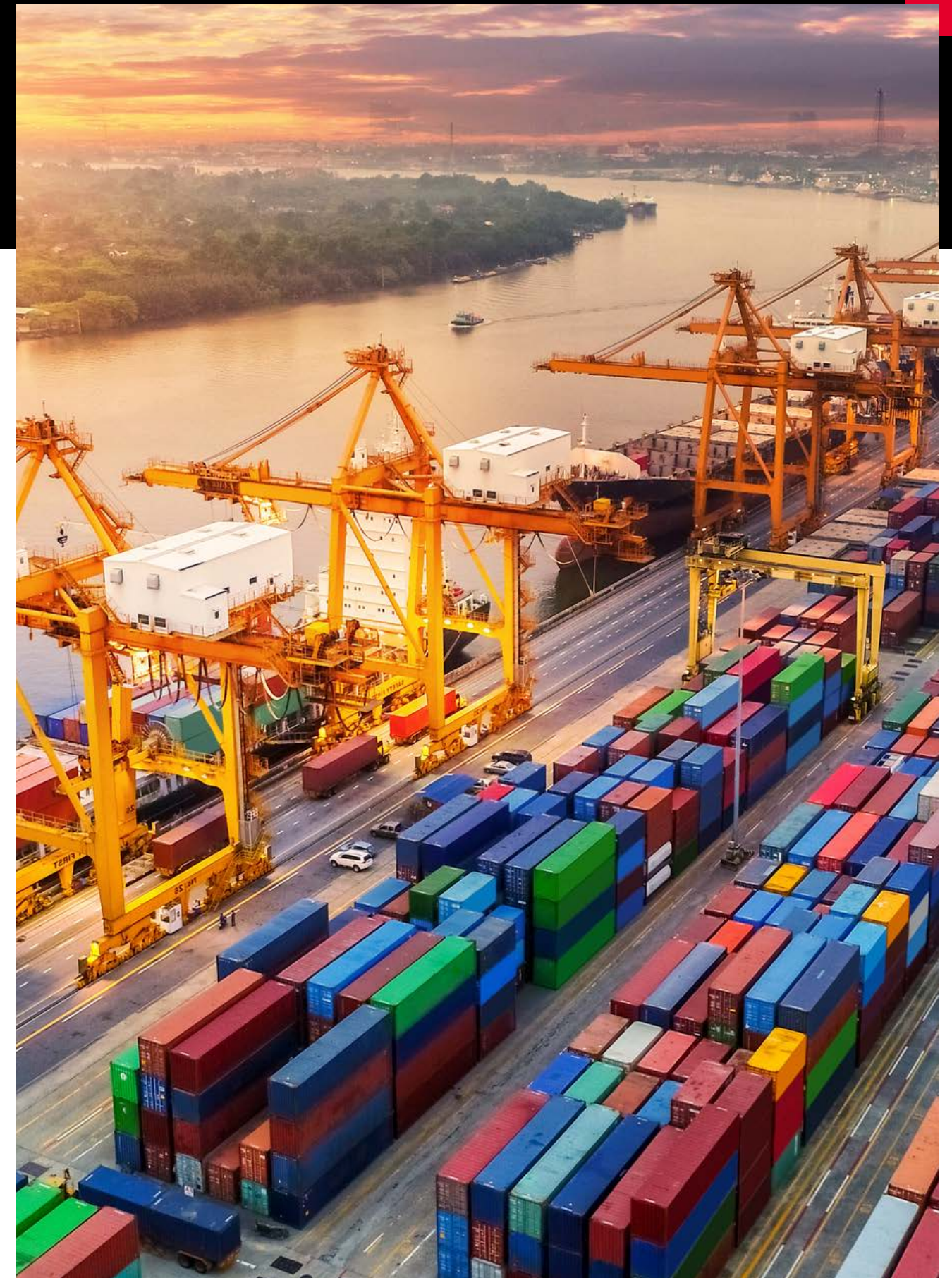
of top success factors cited
by civil and infrastructure
builders are workforce-related.



Overcoming Workforce Challenges is Vital to Success

Labor challenges are among the most pressing for all segments of the construction industry. Availability of skilled talent required to produce the scope of work is a key risk for projects of all types. Further, as veteran construction professionals retire without sufficient incoming new talent to fill their shoes, the industry risks losing the opportunity to achieve the generational transfer of skills, knowledge and business information. Civil builders are no stranger to these challenges. As primarily self-performing organizations, a skilled workforce isn't just nice to have — it's critical.

As a result, there are two main strategies to overcome these difficulties, both of which lean on the right people and the right technology to help with navigating this challenging time. Firstly, firms are keen to get the best out of their existing workforce. This is achieved by focusing on retention and employee wellbeing, investing in technology to help improve productivity and upskilling their team through growth and development opportunities. Additionally, organizations are looking to attract a more diverse workforce that taps into the next generation of talent through education and training. Focuses in this area include making construction a more attractive place to work, using technology to appeal to software-savvy young workers and recognizing how technology can also reduce barriers, even acting as a ladder for historically underrepresented groups in construction. Finally, civil contractors are also working hard to improve field and office communication as this has a significant impact on overall workforce productivity and engagement. What's clear is that no single solution is adequate to the scope of the challenge on its own; civil and infrastructure builders are applying all these strategies and more.





Respondents are focused on a variety of tactics, both internally and externally, when it comes to tackling workforce shortages. Internally, they are looking to improve workplace satisfaction by investing in the existing workforce (56%) and by offering continuing education and training opportunities (43%). Investing in construction software to get the best out of the people they have is the second most-used strategy by civil and infrastructure builders (49%).

Workforce challenges substantially impact success.

Respondents clearly had the labor shortage in mind when providing feedback about what affects project outcomes. When asked about the top factors they felt will impact project success, most (three out of five) were workforce-related.

Top factors that impact project success*



While market factors like material and labor costs top the list of challenges, civil and infrastructure contractors recognize other operational aspects like training, project management and efficiency are just as important to their success.



41%

Material and Labor Costs



40%

Worker Skills and Training



39%

Project Management



38%

Supply Chain Management



35%

Workflow Efficiency

Large companies and those who self-perform most of their work **are more impacted.**

*Which factors have the greatest impact on the success of your company's civil & infrastructure projects? Top five of 15 total answer choices shown.

Response to labor shortages*	Total
Investing in existing workforce through increased wages, benefits, etc	56%
Investing in construction software (e.g., project or workforce management, etc.)	49%
Using innovative recruiting and retention tactics	43%
Offering continuing education and training opportunities	43%
Streamlining workflows to reduce time spent on unproductive tasks	40%
Investing in solutions to retain institutional knowledge	40%
Investing in automation	34%

53% of small companies are investing in construction software, while larger companies are focused on investments in their current workforce.

Externally, respondents are using innovative recruiting and retention tactics (43%) to better attract the next generation of talent and improve overall industry diversity. Companies with higher revenue are more likely to be investing in multiple tactics (large companies use an average of 3.4 of these tactics, while small companies use 2.8 on average). Smaller companies are more likely to prioritize investment in construction software (53% vs. average 49% across all company sizes).

*How is your company mitigating labor shortages? Select all that apply.



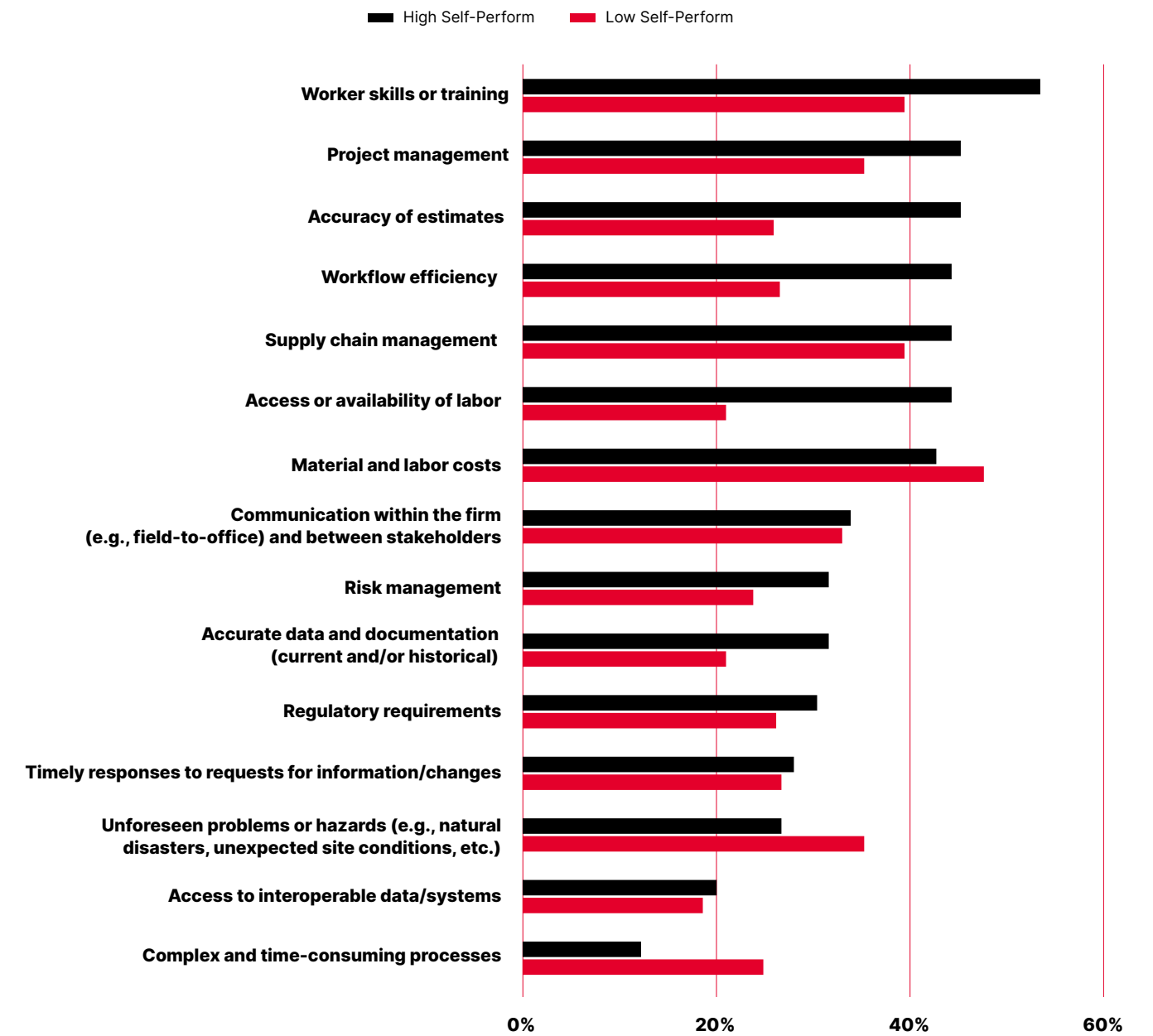
Self performing brings success factors into internal control.

Across all respondents, the most important factors that impact project success are tied to a contractor's people and materials, with material and labor costs, worker skills or training, project management, and supply chain management as the four most important areas.

Not all factors that may impact civil and infrastructure builders' success can be controlled internally. Some, like labor costs, are externally imposed. However, builders that self-perform more work report more internal control over their success. In fact, the top five success factors reported by builders with more than 75% of revenue from self-perform work are all internally controlled factors. As builders self-perform less work, they indicate more external factors impacting their success.

For example, material and labor costs are the number one factor for low self-perform contractors, but only the seventh most important factor for high self-perform contractors. Instead, worker skills and training are the number one factor for high self-perform contractors, and third for low self-perform contractors.

Top factors that impact project success*



When contractors self-perform, there are more project success factors that they can directly control as a business.

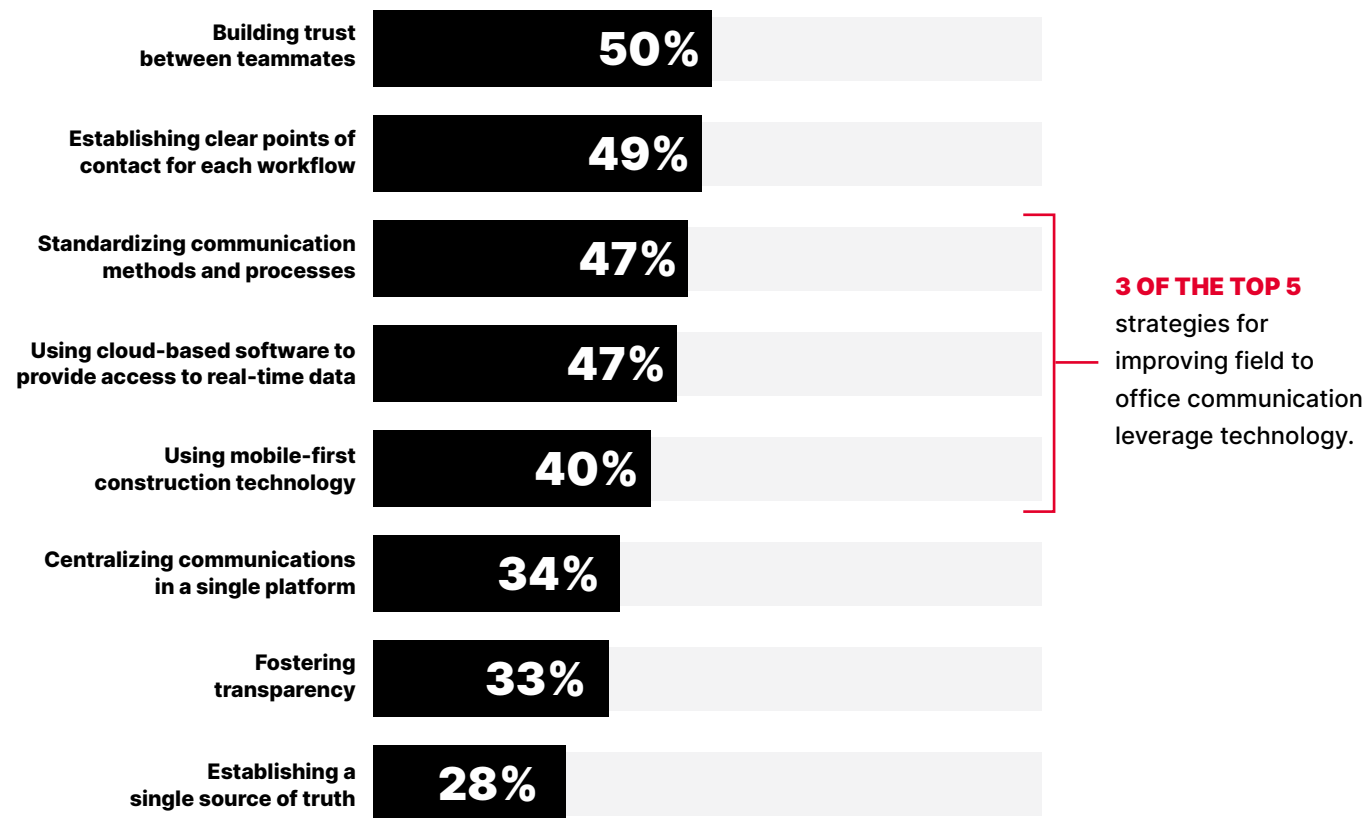
*Which factors have the greatest impact on the success of your company's civil & infrastructure projects?



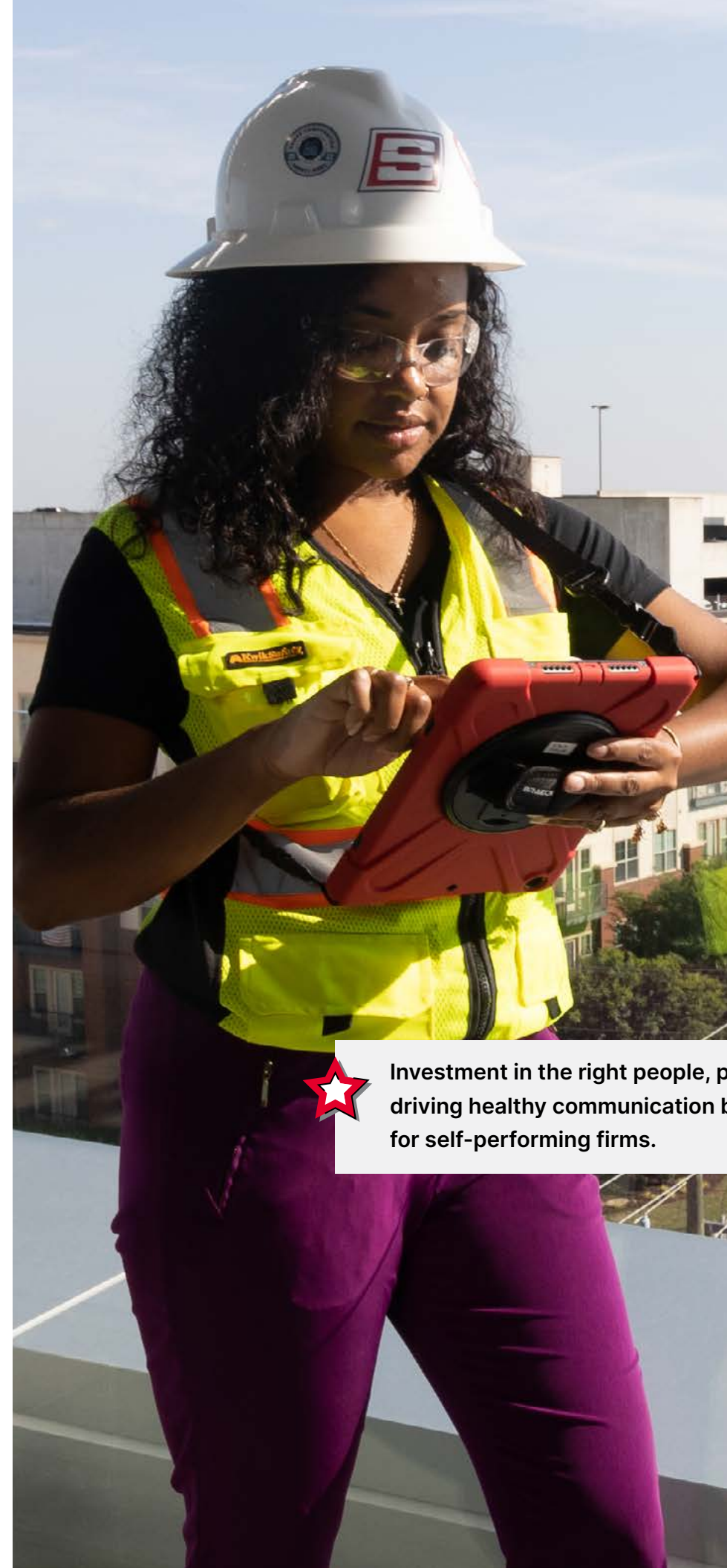
Maintaining and improving healthy field and office communication is vital.

Fostering healthy and accessible connections between the field and office is critical, especially for self-performing organizations. Because of this, civil and infrastructure organizations have placed considerable focus on this challenge, and today, a majority (83%) of respondents rate their field to office communication as good or excellent. Technology is a mainstay of this success. In fact, of the top five strategies employed in support of strong field to office communication, three directly leverage technology.

Strategies employed to address communication between field and office*



*What strategies, if any, are your company taking to address communication challenges between office and field teams?



Companies with higher revenue are more likely to address their challenges with cloud-based software and mobile-first technology due to the comparative ease of scalability of these strategies. It's clear from these strategies that the symbiosis of the right people, technology and protocols can help to support the desired process improvements.



Investment in the right people, processes and technology is critical to driving healthy communication between the field and office, especially for self-performing firms.

CHAPTER 3

**TECHNOLOGY AND
DATA AS BUSINESS
DRIVERS**

76%

**of civil and infrastructure
builders say they are not
realizing the full potential
benefit of their data.**



Non-Construction Specific Workflows Lead to Inefficiencies

Civil and infrastructure builders view technology as a lever to manage business risk with impact areas spanning across improved estimates, productivity and overall financial management. However, many industry workflows continue to be shaped and guided by technology that's not designed with construction in mind. This leads to inefficiencies and inhibits technology's overall ability to help contractors reduce risk.

When organizations rely on such inefficient solutions, it can cause lower technology adoption in the field and can ultimately create more serious problems than those the software was intended to solve. Built-for-construction software can help mitigate such issues at the forefront by providing not just a user-friendly tool, but also one that alerts teams of problems immediately.

Technology investments are a key risk management strategy.

Civil and infrastructure projects have an outsized impact on the surrounding communities and environment. Whether that impact is positive or negative is a result, in large part, of the efficacy of contractors' overall risk mitigation strategy. Civil contractors recognize that technology has an important role to play in that strategy.

When asked about specific ways in which companies were investing in software to better manage risk, the top three areas of impact identified by respondents were estimating, labor, equipment and materials (LEM) tracking, and financial management.



Top three areas of impact from technology investments



52%

Adopting tech solutions that improve financial visibility and cost controls on projects



50%

Utilizing solutions that help schedule and track labor, equipment and materials

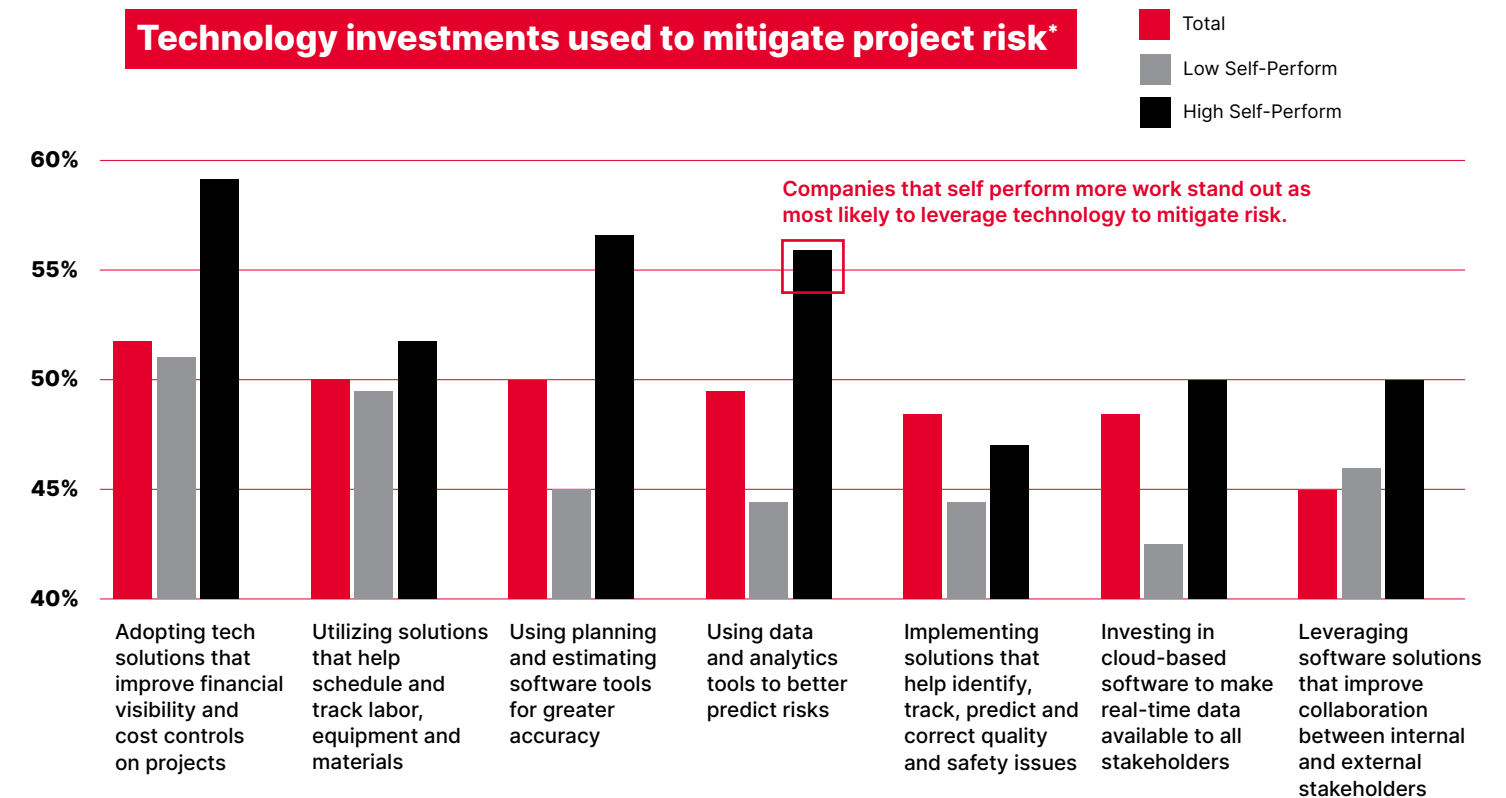


50%

Using planning and estimating software tools for greater accuracy

The high incidence of self-perform work in the civil and infrastructure segment only magnifies the potential benefit of technology to civil builders, because risk is less distributed when self-performing and has a higher potential impact on the builder's profitability. Here, technology can help civil and infrastructure firms to improve productivity, labor efficiency and safety. It's no surprise that companies that self-perform more work stand out as most likely to leverage technology to mitigate risk.

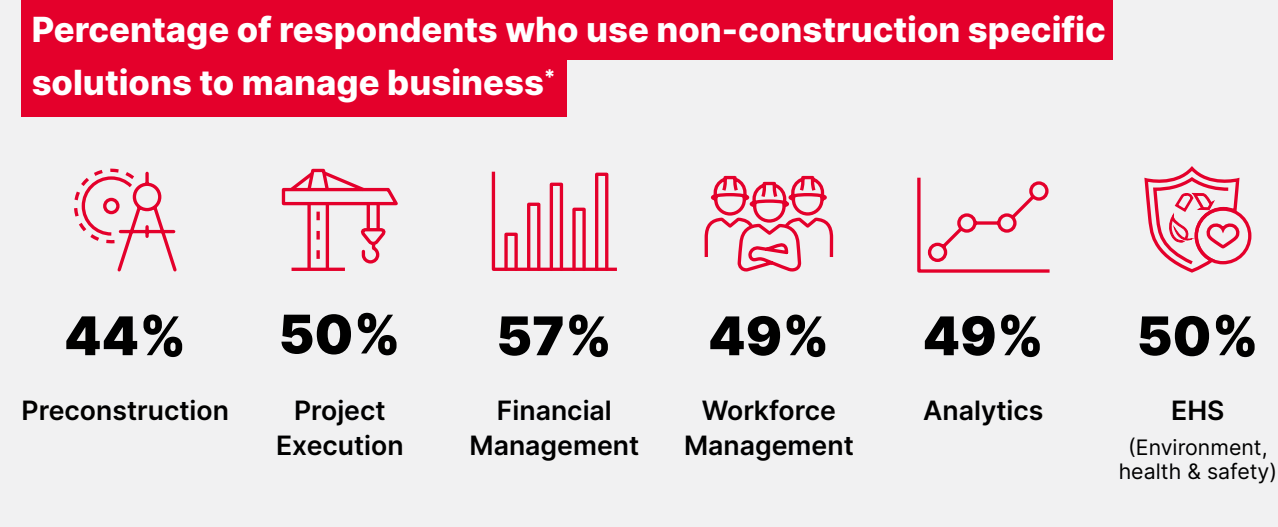
Technology investments used to mitigate project risk*



*What are some of the ways your company is investing in software to better manage risk and improve end outcomes on projects?

Workflows shaped by non-construction specific software are prevalent.

Despite civil builders' clear recognition of the role of technology in managing risk, many are still using generic software not built for the construction industry to support and shape key workflows. On average across the categories shown, 50% of civil and infrastructure builders use non-construction-specific technology. The risk in this choice is that such software can introduce limitations and constraints into the workflow, forcing teams to accept reduced capabilities or to add manual steps to shoehorn a solution into an application it wasn't designed to address. In the worst case, this can lead to decreased transparency and actually reinforce silos across the business.



There are several factors that make these firms hesitant to make the shift to modern, built-for-construction technology. According to respondents, the top three challenges (out of 12 shown) when adopting new technology are:

- 30%** Cost of new technologies
- 27%** Lack of integration across solutions
- 27%** Too much change management and training requirement

*What tools does your company primarily use for the following activities? Percentages shown here include respondents who selected paper-based records, standard productivity software or software used across industries as their choices for each of these activities.

With on average only a quarter of respondents using software designed for construction (excluding proprietary software), organizations may need to weigh these challenges against the risks and inefficiencies of generic technologies. Additionally, in light of these responses, it's clear that construction-specific technologies need to prioritize integration-friendly, easy-to-adopt solutions in order to better serve this sector.



Data Exists in Abundance, but Potential Benefit is Untapped

Data is plentiful in construction today, yet isn't always accessible, clean or used to its potential. Organizations recognize the value of having access to accurate data, both current and historic, but may struggle to use it to take action, according to survey responses. Even when high-quality data is available, most organizations are not fully leveraging their data as a competitive business differentiator. Civil and infrastructure builders who have realized that full potential in their data have committed to a journey of improving data maturity across their organizations.

The industry is keen to tap into accurate historical data.

Data may be plentiful in construction, but if it's not readily on hand, its value is degraded. Respondents recognize the value of accessible, accurate historical data, with 84% agreeing that it's critical to current and future projects. The specific benefits of data are all factors in risk mitigation and informed decision-making.

Top three benefits of data access for current and future projects*



52%

Better forecasting
and future planning



47%

Improved
decision-making



45%

Improved
cost estimates

*Which of the following are the top benefits of having access to accurate historical data for your current and future projects? Top 3 of 6 total answer choices shown.



Further highlighting the value placed on data, **80% or more** of respondents agree or strongly agree that:

- **Having access to historical data is critical to current and future projects**
- **Having data connected across teams is imperative for project success**
- **Accurate historical data significantly helps reduce financial risks**

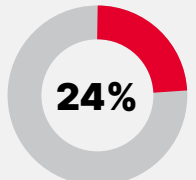
However, even though the critical benefits of data are acknowledged broadly, barely a quarter of respondents (24%) are realizing the full potential of their data as a business differentiator, as will be further discussed in the rest of this report as data maturity is unpacked.

Improving data maturity is a journey for civil builders.

Accessibility is only a part of the journey towards being able to leverage data as a differentiator for an organization. One way to measure how much value an organization is getting from their data is through a data maturity scale or framework. This framework is made up of four levels. As organizations move up through the levels of data maturity, the value they generate from their data increases exponentially as it becomes a business differentiator, and ultimately, a competitive advantage.


Data maturity model*

LEVEL 1: Foundation	At this stage, companies are setting up systems to align how data is collected across the organization and enabling teams in those systems.
LEVEL 2: Learning	With a foundation in place, companies can now start learning from data. This means exploring data sets, building reports and dashboards, and fixing data quality issues.
LEVEL 3: Leveraging	At this stage, companies are adopting reports and dashboards across the organization and using data to monitor overall business and make decisions. There is a high level of trust in the data.
LEVEL 4: Optimizing	In companies at this level, data is recognized as a strategic asset across teams. Data is now a competitive advantage for the organization.



Only 24% of civil and infrastructure builders report that they are getting the full benefit of their data

Data maturity in civil and infrastructure*




- 10%** are very immature
- 29%** are immature
- 37%** are mature
- 24%** are very mature


The majority (66%) of respondents place themselves at a learning or leveraging stage (Level 2 or 3) in this framework and thus in the middle of their data maturity journey. Only 24% of respondents report that they are realizing the full potential of their data as a business differentiator, meaning that over three-quarters (76%) of civil and infrastructure builders acknowledge they could get more benefit from their data. Data maturity correlates with size of company as well as self-performance. Larger organizations and organizations that self-perform more of their work are more likely to be at a leveraging or optimization stage (Level 3 or 4).

*Which of the following statements best describes your company's use of data?

Data maturity has significant downstream operational impact across a contractor's business.



The number of delivery methods a contractor uses and its data maturity are correlated. For example, respondents with optimized data maturity say they're engaged with an average of 3.4 delivery methods, while firms with foundational data maturity say they're only engaged in 2.3. More data mature organizations are more likely to leverage various delivery methods, which in turn can increase data maturity even further.



Data maturity has a positive correlation with the likelihood of meeting project goals around all of the following: quality, safety, budget, schedule and profitability.

Companies with better data maturity show improved project outcomes*

	Safety	Quality	On Time	Budget	Profit Margin
Total	72%	71%	69%	67%	65%
Very Immature	58%	62%	57%	55%	54%
Immature	68%	65%	64%	62%	60%
Mature	76%	74%	72%	70%	68%
Very Mature	78%	75%	76%	73%	71%

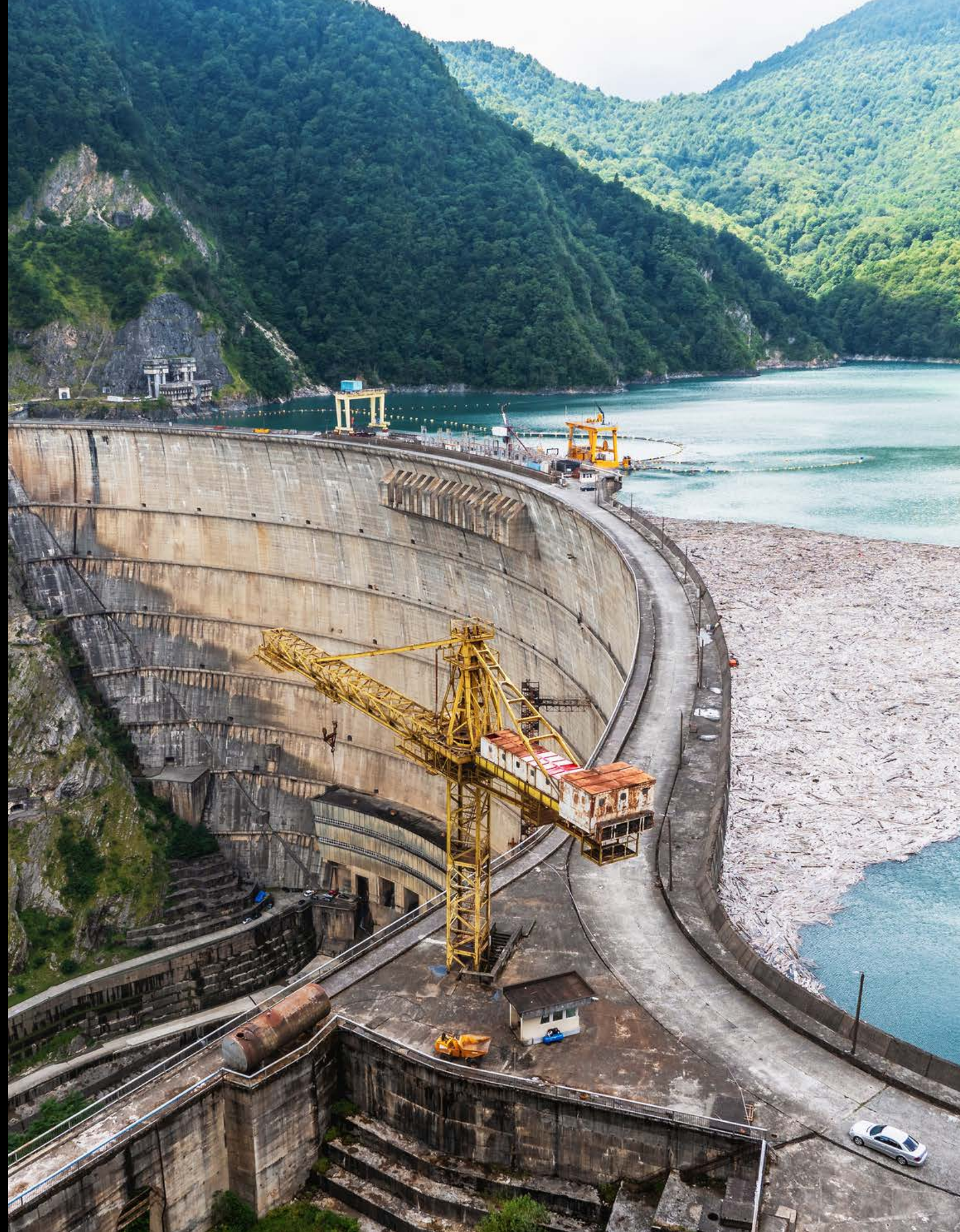
*Percentage of projects according to respondents that meet their defined core objectives. + Which of the following statements best describes your company's use of data?

CHAPTER 4

RUNNING A BETTER CIVIL AND INFRASTRUCTURE BUSINESS



Self-perform and data maturity support positive outcomes for civil builders.



Self-Perform is the Optimal Business Model on Civil and Infrastructure Projects

Companies that self-perform are able to juggle the complexities associated with civil and infrastructure projects in order to deliver better outcomes. With expertise in and control over means and methods, they are able to provide more insight during design, and offer more effective and creative value engineering options. They also have a greater degree of flexibility and control in minimizing schedule delays, mitigating cost overruns and rework. Alongside equipment, labor is the highest cost for these companies, so self-performance also helps manage costs by bringing labor inefficiency and productivity variables into a greater degree of direct control.

Self-performing work is beneficial as a business model for civil builders.

Throughout this report, we've highlighted how increasing self-performance influences the way civil contractors operate. These include:

- **High self-perform companies bring more value to preconstruction due to their expertise in means and methods across specific trade disciplines.**
- **Companies that self-perform more have more projects completed on time and on budget and are more likely to hit target margin, quality and safety goals due to having direct control over a significant portion of the work.**
- **Self-performing brings success factors into internal control. Companies that self-perform less than 25% of their work say they're more exposed to external variables as impactful success factors, compared to companies that self-perform more work.**



Civil and infrastructure projects pose unique challenges that make self-performing builders a great fit. These projects often span multiple years, involve public entities and include many contracts awarded to the lowest qualified bidder. There's a lot of uncertainty regarding site conditions, and the trade work required is highly specialized in terms of both skills and equipment. Since labor and equipment costs heavily impact project expenses, it's crucial for these builders to have control over factors affecting field productivity.

Given the combination of narrow profit margins and the specialized nature of the work, self-performance becomes a valuable tool for improving profitability and predictability.



The positive impact of an optimized self-perform division.

Given the nature of civil and infrastructure work — large projects that are often awarded in competitive bid environments with specific work sequences — builders have limited ways to manage costs and maximize profits. Achieving targeted outcomes comes down to managing resources efficiently, and self-perform practices can help with that. Better management of labor and equipment through self-performance means that builders have direct control over achieving targeted outcomes. Bearing this in mind, the most impactful way to optimize and grow a self-perform division is to improve the ways in which this workforce and equipment is managed.

Optimization starts at the beginning. While the business decision to build strong preconstruction capabilities around dedicated staff can be separated from the decision to develop self-perform capabilities, self-perform contractors are uniquely positioned to provide value to their clients during the design and preconstruction project phases of civil and infrastructure projects. Building both capabilities together can result in a compelling competitive advantage.

Self-performance can also be optimized by use of the right technology. Built-for-construction software can provide specialized solutions to better manage resources and mitigate risks throughout the project lifecycle. Since civil and infrastructure work is driven by labor, equipment and materials productivity, any solution that helps efficiently allocate these resources will be impactful.

When it comes to workforce challenges, the average age of construction workers in the U.S. is 42 years, while 22% of this workforce is 55 years or older, and thus likely to retire within the next decade.¹ This means that if the labor shortage continues to create difficulties for the industry, businesses will need to figure out how to optimize their existing workforces. To help avoid burnout, the implementation of the right processes and technology that puts the right person at the right place at the right time is critical. These risks are more acute for civil and infrastructure builders leveraging the self-perform business model — but so are the potential positive impacts of good mitigation strategies.

¹ Bureau of Labor Statistics, Labor Force Statistics from the Current Population Survey

Data Maturity Investment Can Reap Rich Dividends

Companies with more sophisticated data collection, management and usage capabilities are better able to deliver positive outcomes on civil and infrastructure projects. However, data maturity is not always consistent throughout an organization. Often, one department or business unit may be more advanced in their data usage than others. As companies further invest in their data maturity journey, they can generate more and more value from their data.

Foundationally data mature (Level 1) companies are making the first step of investment — creating the building blocks to empower them in the future. Beginning to form a data strategy and identify in-house champions will pay off as the organization increases in data maturity. Companies at the learning stage (Level 2) are already starting to reap rewards by exploring and learning from their dashboards. It's critical at this stage to fine-tune and fix quality issues to refine data strategy and build KPI reports.

Data maturity model

LEVEL 1: Foundation	At this stage, companies are setting up systems to align how data is collected across the organization and enabling teams in those systems.
LEVEL 2: Learning	With a foundation in place, companies can now start learning from data. This means exploring data sets, building reports and dashboards, and fixing data quality issues.
LEVEL 3: Leveraging	At this stage, companies are adopting reports and dashboards across the organization and using data to monitor overall business and make decisions. There is a high level of trust in the data.
LEVEL 4: Optimizing	In companies at this level, data is recognized as a strategic asset across teams. Data is now a competitive advantage for the organization.



Organizations at a leveraging level of data maturity (Level 3) have a firm grasp of their datasets and the resulting reports are helping to make business decisions. With meetings now run using key dashboards and reports, everyday operations are benefiting from this stage of data maturity. Companies who have optimized their data (Level 4) are

harvesting the highest levels of value from their data. At this point, data isn't just a strategic asset, it's increasing efficiency, project margins and decision-making. While improvements are always ongoing, this journey shows the importance of persevering through each stage of data maturity to reap rewards.

Growth can be accelerated by data maturity.

Data maturity has a positive correlation with better outcomes for civil builders. Some of these include:

- **Data maturity has a positive correlation with confidence around meeting key outcomes such as quality, safety, productivity and profitability.**
- **More data mature organizations are more likely to leverage various delivery methods, which in turn can increase data maturity even further, as well as confidence in project delivery.**

As data maturity increases, so does an organization’s ability to leverage data as a key differentiator for the business. In a civil business, the value of historical data informing future estimates is immense, as is the ability to extrapolate outcomes based on real-time, current data.



How to start a data maturity journey.

No matter where an organization is in their data maturity journey, improvements can always be made. Beginning a data maturity journey may require the implementation of new technology, but also, importantly, the investment of people and the optimization of business practices. To begin, it’s important to understand where the organization currently stands.

	People	Process	Technology
LEVEL 1: Foundation	Identify data strategy executive sponsors, champions and team members.	Think about forming a data strategy, digitizing workflows and centralizing access to data.	Consider tech investments such as construction management, data warehousing and visualization solutions.
LEVEL 2: Learning	Implement technical training and staff as necessary.	Focus on refining your data strategy, fine-tuning data quality issues and automating all manual reporting processes.	Put KPI reports and dashboards in place now if they aren’t already. Keep collecting feedback and iterate as required.
LEVEL 3: Leveraging	Users should ask for more insights, training and support as data culture is now widespread in your organization.	Run most meetings using dashboards and reports. Reassess the data governance processes you have established to scale.	Roll out additional KPIs and reports as needed and keep identifying any additional system adds to your data strategy.
LEVEL 4: Optimizing	Data is seen as a strategic asset across the organization.	Begin to establish predictive analytics, identifying and resolving problems much earlier than in the past.	Make continued investments as needed, especially on the predictive analytics side.

CONCLUSION

As civil and infrastructure builders continue to field unique challenges, there are several avenues to achieve better outcomes and improve the bottom line. Ensuring your workforce has opportunities to upskill and dive deeply into the highly specialized equipment and training required in this sector can help ease the gaps left by retiring industry veterans. Additionally, focusing on innovative recruiting and retention tactics can allow organizations to attract fresh talent while.

Self-performance is another strategy to gain internal control over key success factors. Early builder involvement in projects, even from the design phase, can allow for expertise to be shared and risks mitigated from the start. Early involvement also provides the opportunity to leverage different delivery methods, ensuring project delivery fits the needs and priorities of each project and client. Mature data infrastructure (people, processes and technology) supports the capability to execute a breadth of project delivery methods, which, in turn, can improve the data maturity level of the organization. All of these strategies can contribute to an optimized business model for civil and infrastructure companies.

Procore and AGC are heartened to see the growth and expansion within this sector and look forward to continuing to partner with all those who perform this vital, community-building work everyday.



AFTERWORD:

Civil and Infrastructure Trends and Outlook

Civil and infrastructure construction is in the midst of a boom — one that may prove to be unprecedented in size and duration. From July 2022 to July 2023, U.S. employment increased by 3.5% at heavy and civil engineering companies and 5.9% at nonresidential building construction firms, far outpacing the 2.2% gain in employment in the overall economy.¹

The biggest contributor to this growth has come from manufacturing construction. Spending on manufacturing structures in the U.S. soared by 74% in the first half of 2023 compared to January-June 2022.² Spending on major infrastructure categories also grew faster year-to-date than most other types of construction in the first six months of 2023. These increases have occurred before most of the funding promised by recent federal legislation has been awarded. Programs authorized by these laws could substantially boost infrastructure, renewable energy and manufacturing projects over the next few years.

Civil and infrastructure firms have shown their capability to deal with supply-chain challenges, price shocks and a limited workforce. But to launch these projects, let alone receive their benefits, governments must accelerate procedures for awarding funds and permits, adopt or clarify regulations on required or permissible activities, expand employer-based immigration of needed workers, and improve support for relevant career and technical education.

Civil and infrastructure firms are increasingly turning to technology that enables them to pinpoint the timing, number and skillsets of workers needed for each project. They also seek technology that reduces the number or skills of workers required, improves the learning process for workers and facilitates HR and payroll functions.



AGC and some of its chapters have used targeted digital advertising to make specific categories of individuals aware of the great opportunities in construction. Several chapters have sponsored events that expose students, parents and educators to actual machinery, simulators and software.

However, in an economy in which both the overall unemployment rate and the rate of unemployment among workers with construction experience have stayed below 4% for months³, there is a limit to how much civil and infrastructure firms can do to attract new workers or job-switchers. There is an urgent need for an employer-based immigration program that enables contractors to sponsor foreign workers when employers can document a shortage of qualified U.S. workers. In addition, to meet upcoming needs for workers to replace retirees and handle a growing demand for projects, governments should invest much more in relevant career and technical education programs.

In short, civil and infrastructure firms face a wealth of opportunities in the next several years, but they will have to adapt to a market with unprecedented competition for labor, as well as uncertain supply chains, regulations governing project awards and execution.



CHIEF ECONOMIST, AGC OF AMERICA

KEN SIMONSON

¹ Bureau of Labor Statistics, Current Employment Statistics

² Census Bureau, Monthly Construction Spending

³ Bureau of Labor Statistics, Data Retrieval: Labor Force Statistics (CPS)

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APPENDIX

Methodology & Demographics

Survey design, fielding, and analysis in partnership with Illuminas us.illumina.com

RESEARCH OBJECTIVES

- Understand the state of the current civil and infrastructure market in terms of profitability, workforce trends, data usage, digitization and tech usage
- Identify the key challenges faced by contractors operating on civil and infrastructure projects
- Gather insights to inform a research report focused on the civil and infrastructure market

GEOGRAPHICAL COVERAGE



METHODOLOGY



METHOD

Web-based survey, 17 minutes in length on average



SAMPLE SOURCE

Online panels and AGC members



FIELD DATES

June 12 – July 3, 2023

RESPONDENT PROFILE

- General and Specialty Contractors
- Personally involved in civil and infrastructure projects for at least 40% of their work
- Working for companies with at least \$30M in revenue, with 20 or more employees

Produced by
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