The Future State of Construction

PROCORE

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“ The future of construction is fueled by people, connected platforms, and data. By empowering our workforce with integrated technology and by leveraging the power of AI, we can unlock new levels of efficiency, reduce risk, and enable teams to make smarter, faster decisions. Together, we can build a better, more resilient industry — helping us make an even greater impact on the communities we serve.”

Tooey Courtemanche PROCORE FOUNDER & CEO

INTRODUCTION

As a purpose-built technology company with a vision to improve the lives of everyone in construction, Procore has been tracking and gathering insights on construction and technology trends for years. We've seen a steady march toward a world where technology works hand-in-hand with general contractors, specialty contractors, and owners to address the challenges facing the construction industry today.

Based on the data we've gathered, it's clear that construction will undergo a paradigm shift in the next decade, using AI, automation, data, and connected systems to address challenges like labor shortage, safety, efficiency, and profitability.

To create this report, we surveyed and interviewed more than 1,200 construction decision-makers in the US, Canada, United Kingdom, Ireland, Kingdom of Saudi Arabia, United Arab Emirates, Australia, and New Zealand to better understand the current state of construction, and combined that data with conversations about the future with experts at leading construction companies.

In this report, we explore the future of the industry through its impact on four key elements of construction:

The future of construction isn't a distant vision — it's unfolding right now. Leading companies are collaborating, innovating, and taking action to drive meaningful change today. Because when we build together, anything is possible.

FUTURE OF PRODUCTIVITY

How advancements and technologies will enable improved efficiency, safer jobsites, lowered financial risk, and maximized human expertise.

FUTURE OF DECISION-MAKING

How data is primed to become construction's silent partner on every project — enabling teams to drive decisions based on historical and projected outcomes instead of relying on intuition.

FUTURE OF THE WORKFORCE

How technology, cultural shifts, and the demands of a new generation will shape the future workforce, bridge the labor gap, and change the way the industry thinks about its most valuable asset: its people.

FUTURE OF DESIGN

How technology and the drive for efficiency will shift the role of design to the people who understand the project best: those who are actually building it.

CHAPTER 1

The Future of Productivity

THE FUTURE OF PRODUCTIVITY IS DRIVEN BY AUTOMATION AND AUGMENTATION

Productivity is not just the concept of doing more with less or at a faster pace—it's radical shifts in the capability of workers and teams to get work done. Increased productivity will require a willingness to invest in new methods, tools, and training.

Jobsites will be safer and more efficient.

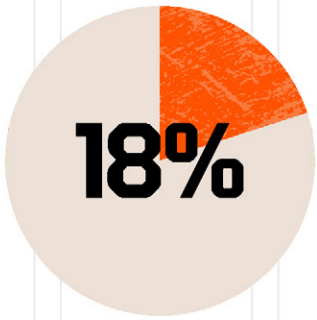
Automation on the jobsite will ensure that **tasks that are dull or dangerous are handled by technology,** while those that require human insights are handled by the crew. The results will be a higher quality product at a faster pace while creating a safer jobsite.

Robotics will also support the shift to safer, more efficient jobsites, as work becomes augmented by machines. Robots will perform tasks alongside their human counterparts, saving workers from the hazards of repetitive, brute work, like carrying supplies, and preventing bodily injuries while providing more accurate results. **This will not eliminate workers but will empower them to do more of the work that requires their specific talents.** Some companies are already seeing gains from this shift — according to the How We Build Now report, 27% of construction firms were actively using robotics, while 33% were planning to adopt robotics within the next 12 months.[1]

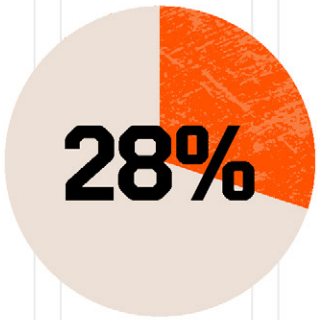
While the role of humans on the jobsite may evolve, there will always be a human instructing, controlling, and directing the machine. This shift means upskilling will be required to take advantage of new technologies. According to the state of construction survey, in some cases it's training that drives digital transformation — 42% of construction leaders said upskilling has one of the biggest impacts on effective digital transformation,[2] while **45% of workers cite technical skills as one of the capabilities they want to develop most.[3]**

Data-driven preconstruction will drive future productivity gains.

According to the How We Build Now Report, 18% of project time is spent searching for data.[4] A further 28% of a project's total time is spent on rework or rectifying issues. **This has a massive impact on performance and contributes to nearly half of all projects going over time and budget.[5]**



OF PROJECT TIME IS SPENT SEARCHING FOR DATA



OF PROJECT TIME IS SPENT ON REWORK OR RECTIFYING ISSUES

"Robotics lets your foreperson entrust layout to less experienced workers, freeing up the foreperson to focus on running teams, coordinating, and making sure the right work gets done.

On average, Dusty's customers complete their layout process about 10 times faster than with traditional layouts. Then, when your project manager and superintendent walk the floor, they can literally look down and understand how all the components of the project come together. That reduces rework, RFIs, and change orders to drive down the total cost of the project.

Plus, layout is a job that requires you being on your hands and knees, bending over, snapping chalk lines, and marking things with a Sharpie all day, for weeks on end, when a jobsite is at its most chaotic. It's bad for you in the long term from a health and safety point of view. Robotics can literally and directly extend the careers of really talented people in this industry."

ZACHARY REISS-DAVIS, SENIOR DIRECTOR OF MARKETING AT DUSTY ROBOTICS

Advanced preconstruction processes allow teams to plan for the tools and techniques needed for a specific job and make informed decisions before teams hit the jobsite. **The driver behind this shift is access to multi-dimensional, real-time project data.** Jobs with data-driven preconstruction will yield new productivity data points of their own, helping to improve processes for the next project. The accumulated data then becomes a data lake, from which insights and recommendations can be drawn to inform future productivity gains.

The AI revolution is already upon us. According to the How We Build Now report, 59% of construction leaders across the U.S. and Canada were already using AI or machine learning (ML), or planned to do so in the next 12 months.[6] AI and automation makes the information transfer from unstructured data to actionable insights faster and more efficient. AI-driven solutions will use data accumulated through digitalization to create workflows, automatically update timelines, and provide real-time answers to critical questions.

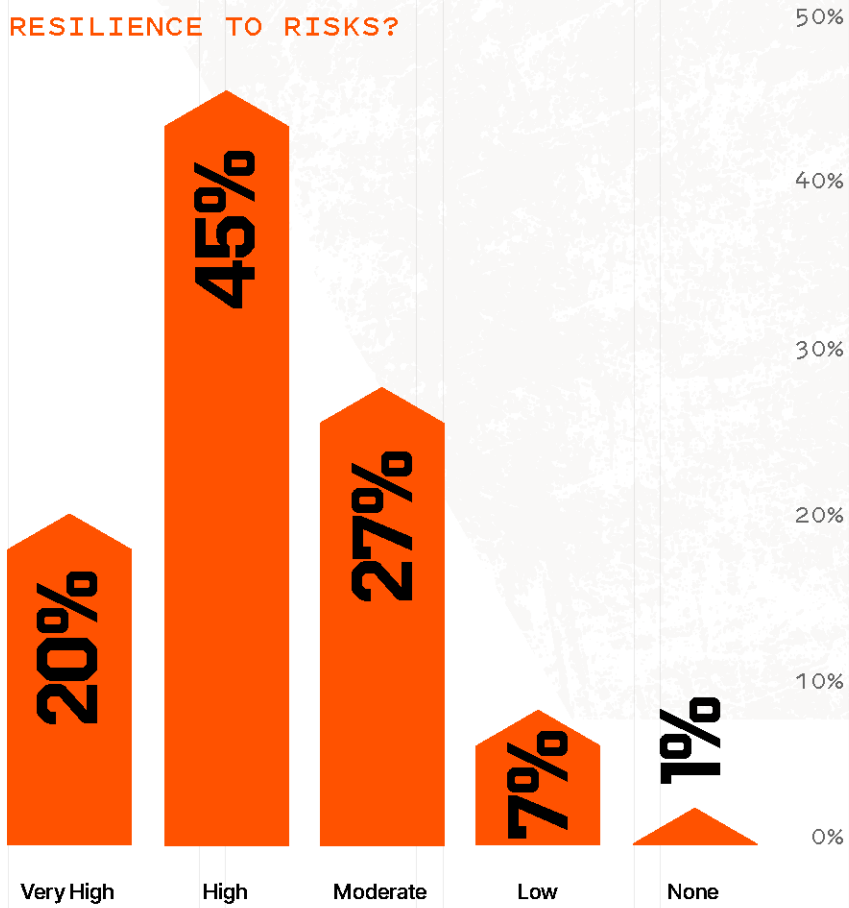
59%

OF CONSTRUCTION LEADERS ACROSS THE U.S. AND CANADA WERE ALREADY USING AI OR MACHINE LEARNING, OR PLANNED TO DO SO IN THE NEXT 12 MONTHS

Improved preconstruction processes driven by the insights of AI-enabled data will be a game changer for unleashing new productivity gains throughout the project lifecycle. The industry is optimistic about this potential as the state of construction survey indicates that 55% of construction leaders believe it is extremely likely or very likely that automation will disrupt the industry in the next 5 years.[7]

Companies that invest in these advancements now will be positioned to reap the benefits on the jobsites of tomorrow. In fact, 65% of construction professionals surveyed said **the adoption of new technology has a high or a very high influence on their company's culture and resilience to risk.**[8]

TO WHAT EXTENT DO YOU BELIEVE THE ADOPTION OF NEW TECHNOLOGIES INFLUENCES YOUR COMPANY'S CULTURE AND OVERALL RESILIENCE TO RISKS?



"I used to think of AI and robotics as two separate tracks, and now I think of them as one. What actually matters the most is making robots smarter and more capable. That's what's going to unlock the actual change in productivity.

It's humans orchestrating robots and scanning and imaging a site completely from top to bottom, creating this visual twin of what's there, which isn't something that we can do today with a human. None of our brains work quite that way. Then, you have these AI agents that are deployed within this visual twin. You're unleashing these agents to work inside this visual copy of your jobsite and perform a lot of the quality, safety, and progress-checking tasks that normally would have required a human.

Data needs to be looked at through multiple different lenses to understand: Is there an OSHA safety risk here? What is the severity of that risk? Where is the risk on the site, and how many risks are there? A safety team often doesn't have enough people to walk every single jobsite. Now, every person who has a camera becomes a safety agent who can then feed that data to the safety team.

It's like having a million eyeballs everywhere looking for risks across the job site."

- MATTHEW DALY, CHIEF MARKETING OFFICER AT DRONEDEPLOY

CASE STUDY

Moss Construction's AI systems work together to make jobsites safer.

When a worker at a solar farm construction site worried about a piece of plywood being used as a makeshift bridge, Moss Construction's extensive AI expertise helped make a safer decision in less time.

First, the worker sent a picture of the plywood bridge over a trench to Moss' AI system trained on OSHA expertise. The AI wasn't quite sure where the standards fell in this situation, so it automatically consulted with Moss' engineering AI. Then, the engineering AI analyzed and vectorized the image of the bridge to understand what it was looking at.

Working with dimensions from the site photo, the engineering AI calculated the material dynamics of the gap and its plywood bridge, showing its work at each step. While its calculations indicated the bridge could hold an average worker, the consulting AIs also knew that OSHA requires a safety factor of four in these situations. The stopgap solution was not up to code.

Finally, the team of artificial specialists looped in Moss' legal AI to draft a notice to the subcontractor about removing the plywood bridge. With a potentially hazardous situation resolved, work at the jobsite continued — safely.[9]

CASE STUDY

Winvic multiplies jobsite efficiencies with robotics.

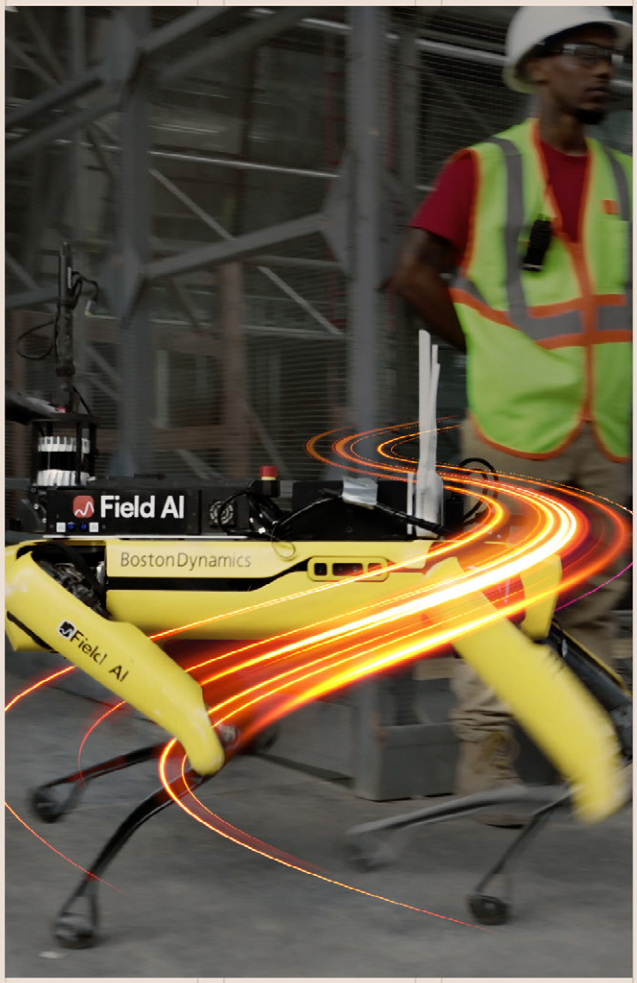
Robotics are reshaping construction. For proof, look no further than Winvic's Crown Place Birmingham project. With plans for Winvic's highest-ever build in a very constrained urban space, the multidisciplinary contractor needed every possible advantage to keep work moving smoothly.

To prevent time- and resource-wasting rework and clashes, Winvic brought in a layout robot. This small, self-propelled device needs only the oversight of a single employee to set out the positions of partitions, sockets, ducts, and more, all printed directly onto the floor of each level with impeccable precision.

Winvic also used a remote-operated robotic tower crane driven by a worker seated safely several stories below. With a suite of screens presenting an immersive view, a heads-up display showing wind speed, radius data, and more information, it was as easy to operate from the ground as it would be from within its cabin. The crane system also gathered and analyzed usage data to intelligently suggest how to optimize common tasks.

These additions to the jobsite paid off almost immediately: after 12 stories of layout, there still had been no clashes between MEP, dry lining, and joinery. And, on top of being easier to use, the tower crane's analysis helped Winvic improve lifting efficiency by about 10%.[10]

Key takeaways:



1. **Technology will not replace workers, but will augment them.**

2. **Jobsites will become safer by using machines to perform dull or dangerous tasks.**

3. **Data-driven preconstruction, AI, and automation will help reduce rework and loss of productivity.**

CHAPTER 2

The Future of the Workforce

THE FUTURE OF THE WORKFORCE LIES IN EMPOWERING PEOPLE

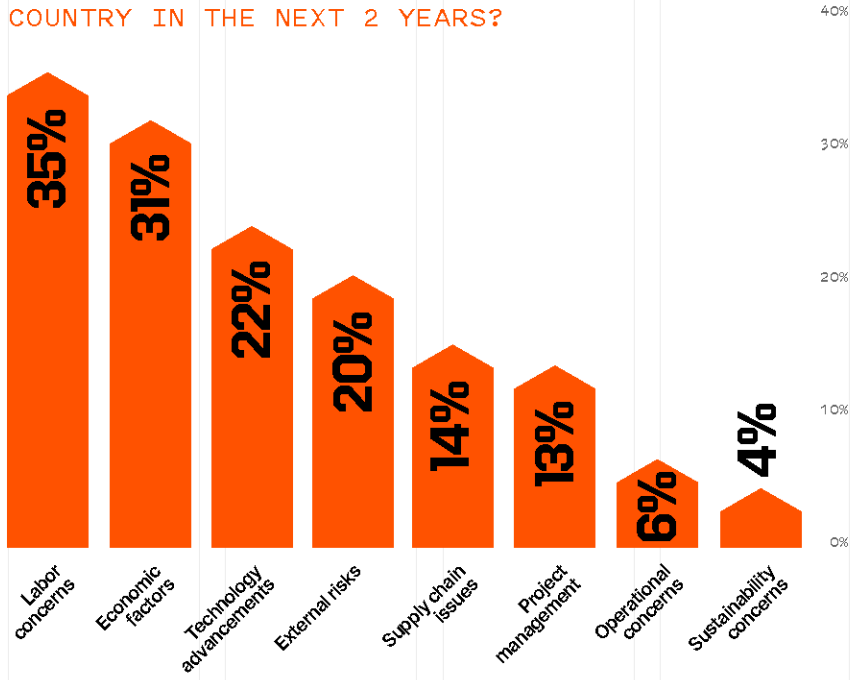
Labor concerns are the most cited challenge for construction companies according to the state of construction survey, creating an opportunity for seismic shifts in how we define, attract and retain the future workforce.

To address labor concerns, the workforce of the future may have non-traditional backgrounds and a broader array of skills. **Company culture will evolve as well, with an increased reliance on skills like programming, business development, project management, collaboration, and people management, over physical ability.** This shift will help to offset the labor shortage, building resilience as workers retire or leave the industry.

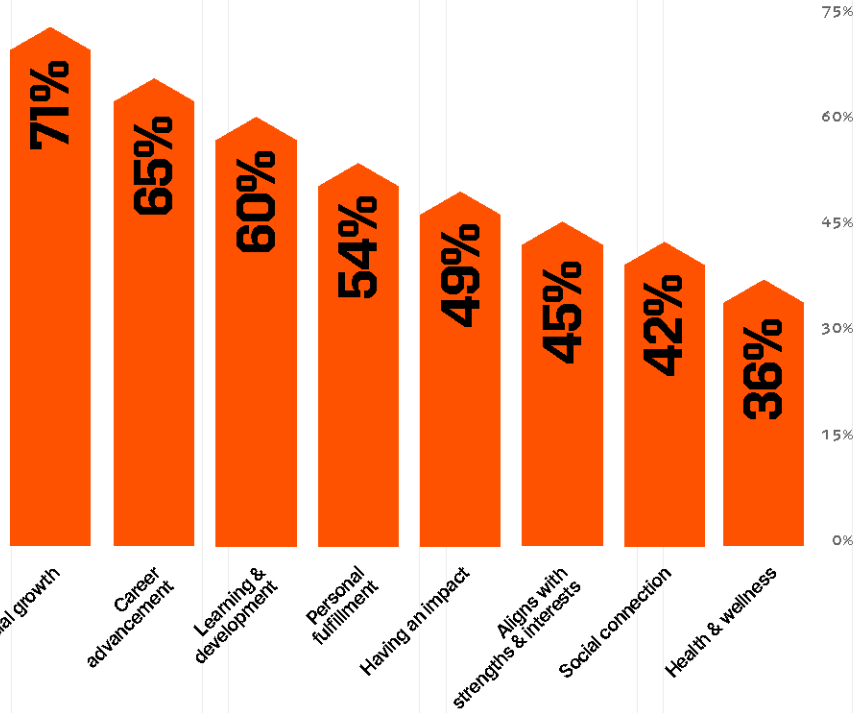
It's going to be increasingly important to prioritize worker upskilling in order to attract and retain a skilled workforce. As new workers seek out opportunities to develop professionally, companies proactively providing growth opportunities will retain the competitive edge. According to the state of construction survey, more than 60% of construction leaders say they stay in construction for financial growth, career advancement, or skills development.[12]

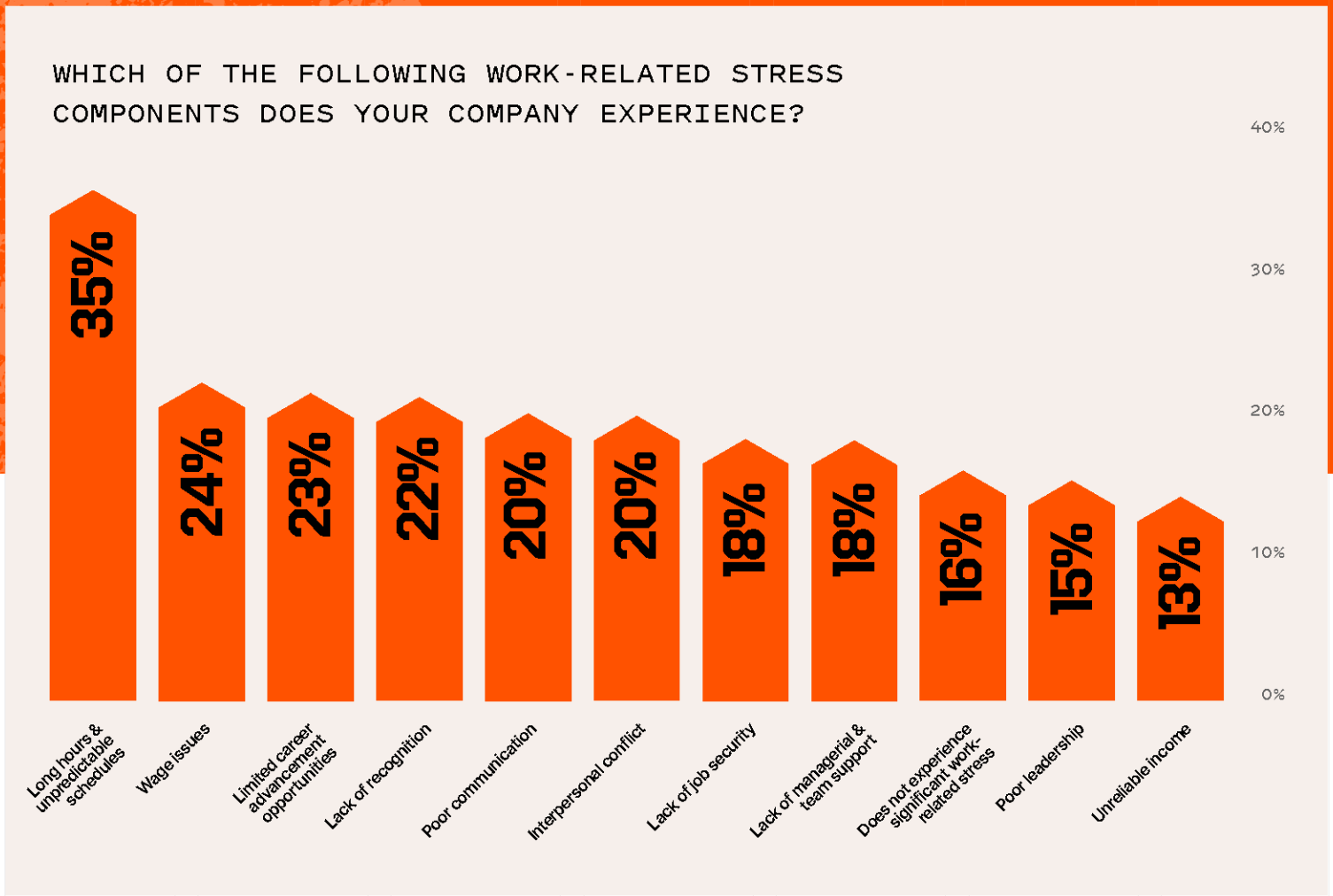
As the workforce changes, company culture becomes a moving target. Enabling the workforce with career growth opportunities will be the key to retaining workers.

WHAT DO YOU SEE AS THE BIGGEST CHALLENGES FACING THE CONSTRUCTION INDUSTRY IN YOUR COUNTRY IN THE NEXT 2 YEARS?



WHAT MOTIVATES YOU TO CONTINUE WORKING IN THE CONSTRUCTION INDUSTRY?





Positive culture changes will create a path to a healthier workforce.

The workforce of the future will empower workers by focusing on the root causes of burnout and mental health challenges. According to the survey, common work-related experiences include factors like long hours and unpredictable schedules (35%), wage issues (24%), and limited career advancement opportunities (23%),[13] which can contribute to burnout and/or mental health challenges.

The good news is that staff well-being is already of great importance to construction organizations. According to the How We Build Now report, 48% of respondents have a wellness and mental health policy in place to reduce the likelihood of burnout[14] and 57% of companies offer mental health benefits.[15] And yet, 45% of survey respondents say that burnout is a primary reason people leave their companies, with that concentration being even higher among medium-sized companies (50-500 employees).[16] Similarly, only 26% of construction workers are likely to seek mental health care.[17]

Advancements in productivity enabling flexible hours and a stronger work-life balance will result in positive culture changes. Approximately half of respondents surveyed said that they would like to see culture improvements focused on work-life balance in the next 2-3 years.

In the future, investments in workforce-empowering technologies and leadership training will make for a more fulfilling place to work.

45%

OF SURVEY RESPONDENTS SAY THAT BURNOUT IS A PRIMARY REASON PEOPLE LEAVE THEIR COMPANIES

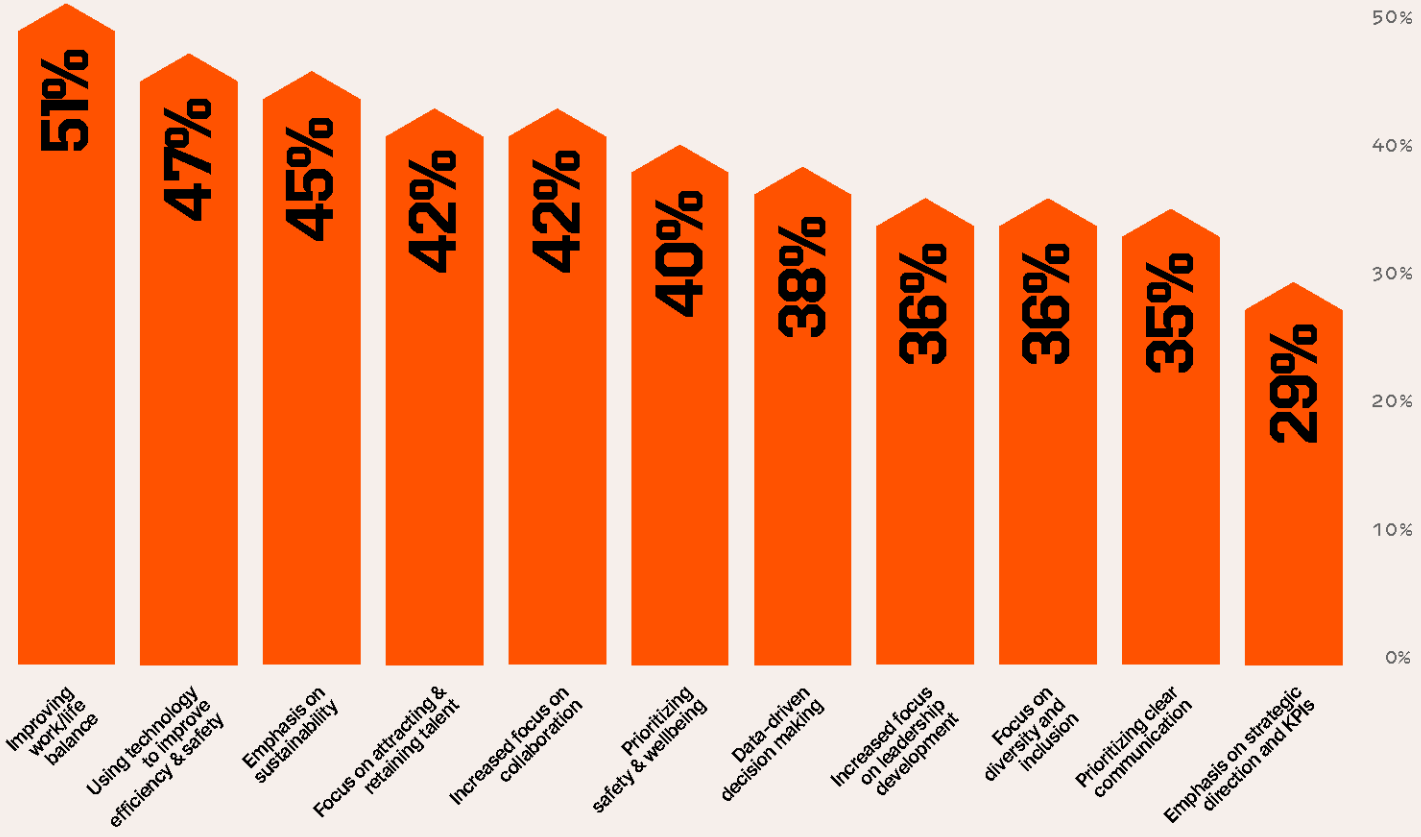
"Wearable tech will be a focus for Studson and helmets happen to be one of the best places to start.

Monitoring live worker health will be very important. We already see development going that way.

We have a lot of requests from the people we work with, specifically about monitoring heat stress, which will probably be one of the first things that we'll see addressed. Then being able to, in real-time, tell that worker or tell management, 'Hey, you need to go on break, you need to eat, you need to drink 16 ounces of water immediately and take a break for a half hour.' This is an area where wearables can be impactful and really help save people out there in the field."

ADAM BOOKWALTER, CHIEF REVENUE OFFICER AT STUDSON

WHAT CHANGES WOULD YOU LIKE TO SEE IN THE CULTURE OF THE CONSTRUCTION INDUSTRY IN THE NEXT 2-3 YEARS?



State of construction research, Procore

Two-way knowledge transfer will empower the next generation.

The construction industry is facing a ticking clock: **53% of the workforce is expected to retire by 2036.**[18] And, according to the Bureau of Labor Statistics, the average age of a construction worker increased over the past 7 years from 40 to 42, double the national average for other industries.[19]

This mass exodus will result in the loss of knowledge and expertise. 30% of construction leaders say some of their most experienced people will retire within the next few years, taking valuable knowledge with them, according to the How We Build Now report.[20] This reality will create a knowledge gap that leaders should be solving for now.

Maximizing knowledge transfer not just downward, from senior workers nearing retirement, but upwards, from next-generation workers to those above them, will increase workforce engagement. Those just joining the workforce will learn what they need to know about legacy tools, equipment, and processes, while those same workers will teach the existing workforce how to utilize technology to augment their task flows. This knowledge share and transfer will also help address generational challenges experienced by 96% of construction leaders surveyed.[21]

Intentional knowledge transfer will help lead to a culture that is more welcoming to the next generation and more enriching for those further along in their career journeys — resulting in career longevity and increased engagement.

96%

OF CONSTRUCTION LEADERS EXPERIENCED GENERATIONAL CHALLENGES

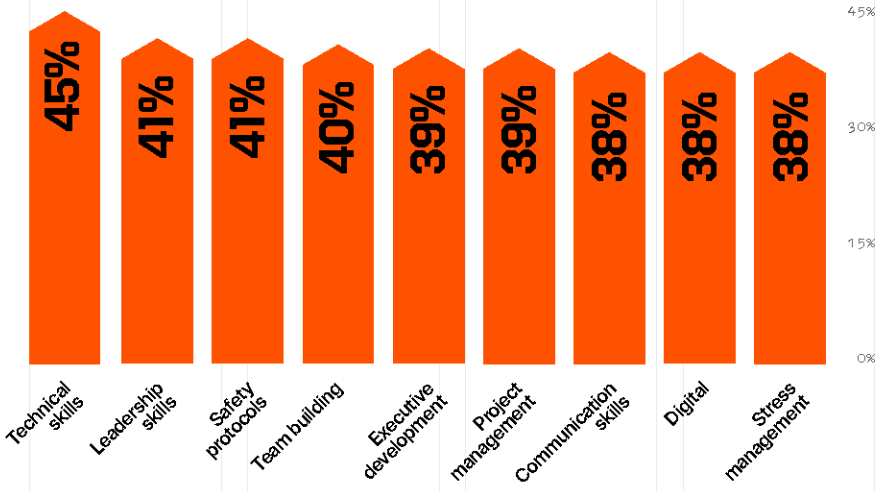
The impact of technology will depend on the people behind it.

Any innovation that technology offers the construction industry can't be fully realized without a workforce able to use it. With so many people retiring over the next decade, up-leveling the current workforce through training is critical to maximizing technology effectiveness. According to the How We Build Now report, 47% of respondents already have training programs in place for upskilling and reskilling, while 41% plan to implement them in the next 12 months.[22]

Training and upskilling workers will maximize technology's impact on construction while also creating the career growth opportunities workers crave.

47% OF RESPONDENTS SAY THAT THEY CURRENTLY HAVE EMPLOYEE TRAINING PROGRAMS FOR UP-SKILLING AND RESKILLING IN PLACE, WHILE 41% ARE PLANNING TO IMPLEMENT ONE IN THE NEXT 12 MONTHS

WHICH OF THE FOLLOWING SKILLS OR AREAS DOES YOUR COMPANY NEED TO FOCUS ON GOING FORWARD?



Leadership development will shape culture and drive performance.

New leadership styles will emerge as the construction workforce evolves. Beyond technical skills, leaders will be challenged to deepen their self-awareness and people management skills. Soft skills will become increasingly important. Additionally, increasing communication and promoting openness and transparency was stated as the single most important thing to improve culture by 28% of respondents.[23]

According to our survey, 41% of respondents want their company to focus on leadership skills.[24] Respondents also reported that they wanted a focus on executive development

By investing in leadership development, companies will create well-rounded leaders who have both the technical skills and the people skills to support a healthy culture, employee well-being, and high-performing teams.

41%

OF RESPONDENTS WANT THEIR COMPANY TO FOCUS ON LEADERSHIP SKILLS, AND REPORTED A DESIRE TO FOCUS ON EXECUTIVE DEVELOPMENT

Engaging employees at all stages of the employee lifecycle will be critical.

Companies will need to define and understand their unique value proposition in order to recruit the next generation of construction workers. It must be technology-forward and focused on every stage of the employee lifecycle.

An effective and supportive onboarding program presents an ideal opportunity to highlight the organization's dedication to workforce experience and meaningful work. This has a significant impact on the employee journey and tenure.

Additionally, conscious succession planning lets companies proactively and intentionally design their future, ensuring the next generation of leaders can succeed.

"The building trades have traditionally relied on the passing down of knowledge from generation to generation. When experienced workers retire, their expertise leaves with them. Compounding this issue, fewer people are entering the trades.

The key challenge lies in improving recruitment and training practices to inspire new talent.

Advanced technology is key to attracting new talent to the trades. Tools like drones, robotics, 3D modeling, and a more seamlessly connected jobsite will transform planning and execution, appealing to the next generation of workers.

A unique challenge for the building trades is overcoming the stigma. Technology is the key to doing that, and will play a critical role in meeting construction demands, improving recruitment, and enhancing project execution. Technology lays the foundation for new generations to transform and evolve the industry for years to come."

- ANDY LAMBERT, VICE PRESIDENT - DIGITAL PRODUCTS AT MILWAUKEE TOOL

CASE STUDY

Rogers-O'Brien uses automation to create a safer, more fulfilling workplace and promote purposeful work.

Rogers-O'Brien (RO), a Dallas-based construction company, aims to "build a better Texas." The RO team has built everything from residential housing to houses of worship. To accomplish its ambitious goals, RO relies on a culture of innovation.

That means better tools, more efficient processes, and a tech-savvy workforce. The RO leadership believes that construction isn't just a vocation — it's a way to find fulfillment in life.

RO also has more practical ways to bring young, enthusiastic workers onto construction sites. The workforce of the future can expect safer working conditions, a greater focus on mental health, and less drudgework.

"Part of changing the image of construction is getting people to understand how much meaningful and purposeful work can be done. It's not just a job or a career in construction. For me, this is a calling. And I can't think of a greater responsibility than to be able to shape the geometry for everyone who lives on this little blue marble", says Todd Wynne, Chief Innovation Officer, Rogers-O'Brien.

"You can see the writing on the wall of how big of a challenge we're going to have ahead of us. What we're also trying to do is lean into automation and augmentation, and leveraging technology. I'm very bullish on robotics and AI. We're going to have to automate the three Ds. If it's dull, dirty, or dangerous, let's automate it."[25]

CASE STUDY

Peninsulators promotes work-life balance in a highly connected world.

At Peninsulators, a window covering installation company in San Jose, California, the staff knows when to work hard and when to take it easy.

In an era of smartphones and cloud computing, workers often feel the need to be on-call 24/7. Instead of driving employees to exhaustion, Peninsulators uses remote work technology to help their crew maintain a healthy work-life balance.

Modern productivity software can streamline simple administrative tasks, allowing employees to be more productive during the workday. Databases organize projects automatically, meaning employees don't have to sift through huge, unsorted binders. VR and AR software let crews work from their own homes and neighborhoods rather than living out of hotels and airports. On-site robots using sophisticated AI can perform quality checks with minimal human oversight. Workers can do their jobs more efficiently, then disconnect and live their lives at the end of the day.

"It's important to focus on the new generation entering the workforce and the rapid technological advancements occurring globally. We have reached a point where we can establish new standards and integrate technology more effectively," says Courtney Daniels, Chief Executive Officer, Peninsulators.

"As a result, we can thoughtfully evaluate workplace policies, particularly those concerning employee work hours and overall well-being."[26]

Key takeaways:

1. **Culture has a direct impact** on attracting and retaining talent.

2. **Two-way knowledge transfer** will reduce the impact of retirements while increasing career longevity.

3. **Upskilling and training across all levels** is necessary to engage employees and realize the value of technology investments.

CHAPTER 3

The Future of Decision-Making

THE FUTURE OF DECISION-MAKING IS DATA-DRIVEN

Digital transformation has led to a world where data can be accumulated in real time, stored digitally, and retrieved at the push of a button. Bringing together multiple data sources into a single source of truth will be a game changer, eliminating fragmentation and misalignment across project stakeholders, and ensuring that teams work from real-time, consistent, and verified information. It will also allow decision-making to happen closer to the work itself — on-site, where problems arise — rather than at a distance, reducing the lag between problem identification and resolution.

Complex decision-making will shift from human-only to hybrid.

Rather than rely on error-prone, static spreadsheets or people's gut instinct, future decision-making will leverage meaningful data-driven insights. AI, predictive analytics, and automation will shift decision-making from a human-only process to a hybrid one, **where technology assists in making better-informed decisions based on a huge range of data.**

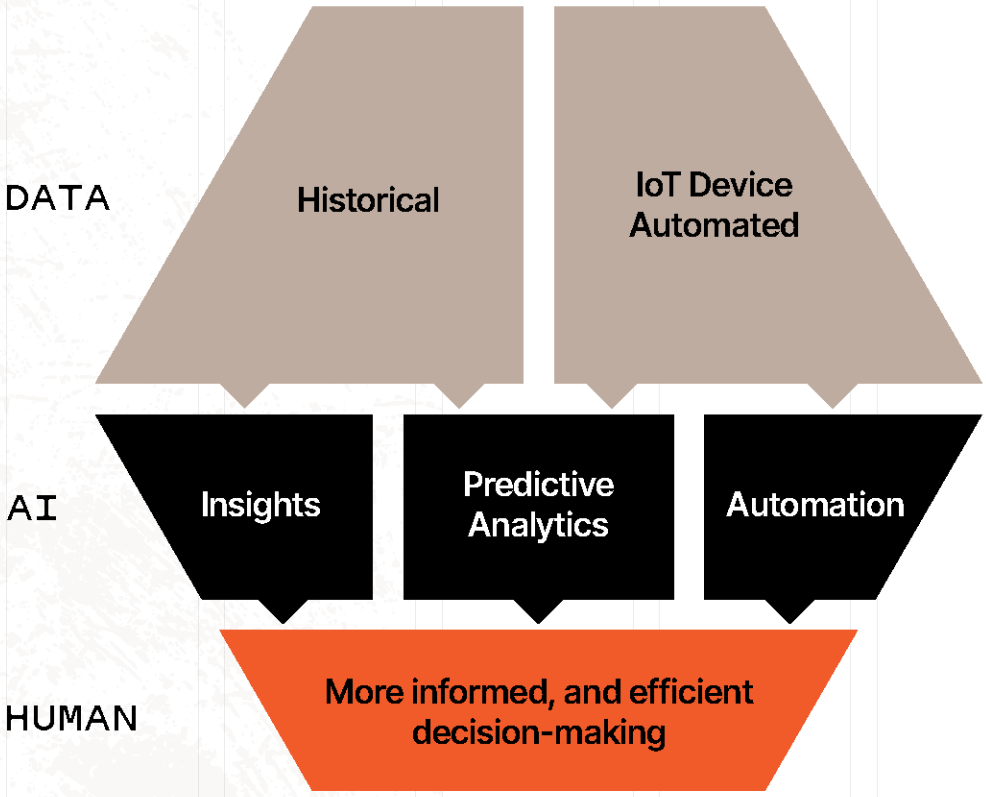
More than 80% of survey respondents agreed or strongly agreed that access to historical data is critical to current and future projects, connected data across teams is imperative for project success, and accurate historical data helps reduce financial risks.[27] But while construction leaders realize that data is the foundation of decision-making, 76% of civil and infrastructure builders say they are not realizing the full potential of their data.[28]

80%

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

Hybrid Model Decision-making



AI will surface insights and recommendations, but experienced professionals will still validate and apply judgment to those insights. Leaders will lean into guiding decision frameworks, managing risk, to make better business calls faster, as they rely on AI for contextualized data and predictive analytics.

Ordering and scheduling will become streamlined as AI assistants collate past models to anticipate future needs. The more data they collect, the better they will get at hitting the sweet spot between running short and oversupplying, minimizing wait times and waste.

"The industry doesn't have a decision-making problem. It's filled with experienced people who can make the right decision in a split second. What we have is an information problem.

They need the right information to make the right decision, so they can prove those hunches if needed.

We've all talked to that veteran superintendent with 20 years of experience who can walk next to a project and just sense that something is off. Now, that super can start with their hunch and say, 'OK, let's check the data.' They can point out exactly what the problem is to their supply chain and move forward."

AMIR BERMAN, VICE PRESIDENT OF INDUSTRY TRANSFORMATION AT BUILDOTS

Data will be integrated, providing key insights into project delivery.

Internet of Things (IoT) devices and sensors, which include smartphones, smart tools, and automated sensors placed on construction equipment, **will automate data collection to provide key insights we haven't been able to leverage in the past.**

Data will also drive simulations, such as digital twins, which provide visibility into what will be required to build and how the end product will function. This data-based simulation enables teams to test decisions and their outcomes, before moving people and property to the project.

By analyzing all this data, we can begin to predict when supplies will need to be reordered, where and when to assign workers to specific areas of the jobsite, and how to better assess the team's performance. Everyone will be capturing data, but those who ask the best questions of the data will thrive.

"Without a collaborative project delivery platform, I would need one or two extra full-time equivalents to produce the actual charts, the reporting structure, the report outs, and the continuous updating. Each full-time equivalent, depending on what they cost, adds up really quickly. A project that has 150 people, will have 40 or 50 people sitting in a meeting to get this information. Think about the efficiency you could gain if you saved those 30 minutes meeting every week.

These projects go on for two years in preconstruction; you're now talking about hundreds of thousands of dollars saved."

JASON BRENNER, HEAD OF INDUSTRY STRATEGY AT JOIN

CASE STUDY

ARCO/Murray uses data to unlock personal connections.

Impersonal decisions are a common criticism of data-backed decision-making, but ARCO/Murray is using data to go the opposite direction.

The design-build contractor's process for subcontractor selection formerly involved hours of meetings to determine who had worked with whom and when, and what the outcome was. This was necessary to ensure the best selections were made for each project, but it was time-consuming and had to be repeated for each project.

Then, ARCO/Murray used their construction management platform's API to implement a simple rating system for subcontractors. Each project in the system now comes with a handy drop-down menu where employees can rate the subcontractors they worked with. Ratings are tied to individual employee accounts, which makes it easy to break experiences out by department and find the best person to talk to for context.

Now, when ARCO/Murray is looking at an earthwork subcontractor, it can instantly see who has collaborated with that group before and what kind of experience they had. Setting up further conversations to get relevant details takes minutes rather than hours, and all this valuable information is instantly available for projects down the line. This context enables ARCO/Murray to make smarter decisions about who it hires, faster.[29]

Key takeaways:

1. **Tech and people** will be partners in complex decision-making.

2. **Integrated data models** will provide new and critical information on jobsites.

3. **AI models, automation, and predictive analytics** will synthesize historical and real-time data, unlocking actionable insights and recommendations.

CHAPTER 4

The Future of Design

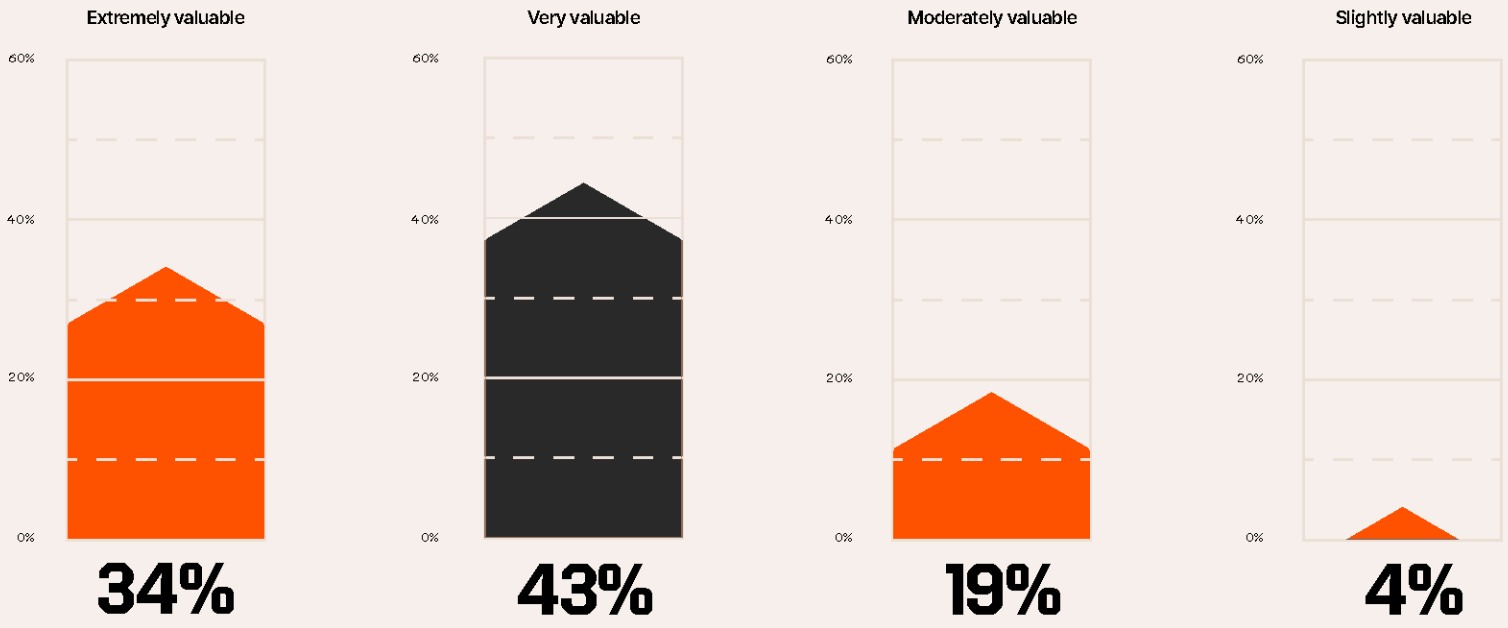
THE FUTURE OF DESIGN WILL TRANSFER TO BUILDERS

The designers of tomorrow will be builders themselves, or they will be designers using AI and emerging technologies. Design tools will become more automated, rolling code compliance, cost, and constructibility into the process of design from the start. These tools will also become more intuitive, democratizing the process and allowing builders and designers to collaborate in real-time.

Data will elevate the approach to design.

77% of construction leaders surveyed agreed that building information modeling (BIM) is very or extremely valuable to improving project outcomes.[30] As advanced data capture evolves, designers will have increased access to contractors' insights on constructible and non-constructible elements, further strengthening this design approach. But this isn't just about collecting data, **it's about building intelligence that compounds with every project.** Based on historical data, cost information will be automatically tallied in the design phase. AI tools will optimize designs, not just for code compliance and structural soundness, but also to help ensure they're candidates for automated construction.

HOW VALUABLE DO YOU THINK BIM IS FOR IMPROVING PROJECT OUTCOMES?



ORGANIZATIONS WITH EFFECTIVE PRECONSTRUCTION STRUGGLE WITH REWORK 65% LESS OFTEN THAN BELOW-AVERAGE ORGANIZATIONS

Preconstruction will also inform the design phase. Effective preconstruction is universally recognized as critical for reducing delays, improving profitability, and enhancing client satisfaction. In fact, the FMI State of Global Preconstruction report found that organizations with effective preconstruction struggle with rework 65% less often than those with below-average preconstruction practices.[31] Early involvement of stakeholders and standardized processes are key differentiators between successful and struggling organizations.

Digital twins will enable designers and builders to work in tandem and witness the impact of design decisions on construction and vice versa before a tool is even lifted. And they will make buildings more adaptable throughout their lifecycle, evolving with real-time data.

While tomorrow's design solutions might look very different from today's tools, **what won't change is the value of field experience.** It will, in fact, be multiplied through coordination systems and data capture. This real-world insight from builders — who best understand what works in the field — is the data that will drive future design automation. Every RFI, every field modification, and every constructability issue will be data to influence future design.

> IN THE FUTURE OF DESIGN, THE VALUE OF FIELD EXPERIENCE WILL NOT DECREASE; IT WILL BE MULTIPLIED

AI and machine learning will enable upfront engineering.

In the current construction process, engineering happens after the design. Plans are drawn up by designers, and then engineers and builders assess those plans for constructibility and efficiency, often redrawing them in the process. **Rework costs alone amount to 19% of total project costs,** according to the FMI State of Global Preconstruction Report.[32]

With AI, engineering decision-making can be incorporated into the initial design process and drive quality and compliance checks. Equipping AI with decisions from past projects, manuals, guidelines, and building codes can allow it to check designs against that data, automating what could take designers hours of tedious work.

Machine learning (ML) can also add value through generative design, performance prediction, BIM integration, and resource optimization. The industry is optimistic about the impact ML will have on design, as 49% of construction professionals surveyed anticipate increased use of BIM for design collaboration and clash detection.[33]

49%

OF CONSTRUCTION PROFESSIONALS SURVEYED ANTICIPATE INCREASED USE OF BIM FOR DESIGN COLLABORATION AND CLASH DETECTION

"Buildings are the most expensive, most complicated, and hardest-to-create things that mankind endeavors to build. They are harder to build than airplanes. Boeing designs seven airplanes and builds them for 65 years. We design an individual building. We design one at a time, using disparate kinds of labor. All different kinds of consultants come together to build these things. And it's hard for me to think that there is anyone out there — architect or designer — who can keep their mind completely wrapped around the design problem the entire time.

AI is going to enable us to see a lot more clearly the complexity that goes into buildings.

We might be able to design processes, systems, and physical spaces better."

CLIFTON HARNESS, CO-FOUNDER AND CEO AT TESTFIT

"A lot of rework happens because, if architects want to change something in the architectural drawing, they don't always know how those changes impact engineering solutions. We run architecture drawings through a generative AI algorithm that we built, which allows engineers to explore thousands of different layout options.

Generative design means we're able to generate most of the drawings in minutes.

We're doing the same structural analysis an engineer would have done manually, but we do it much faster at a bigger scale. This empowers engineers to react much more quickly."

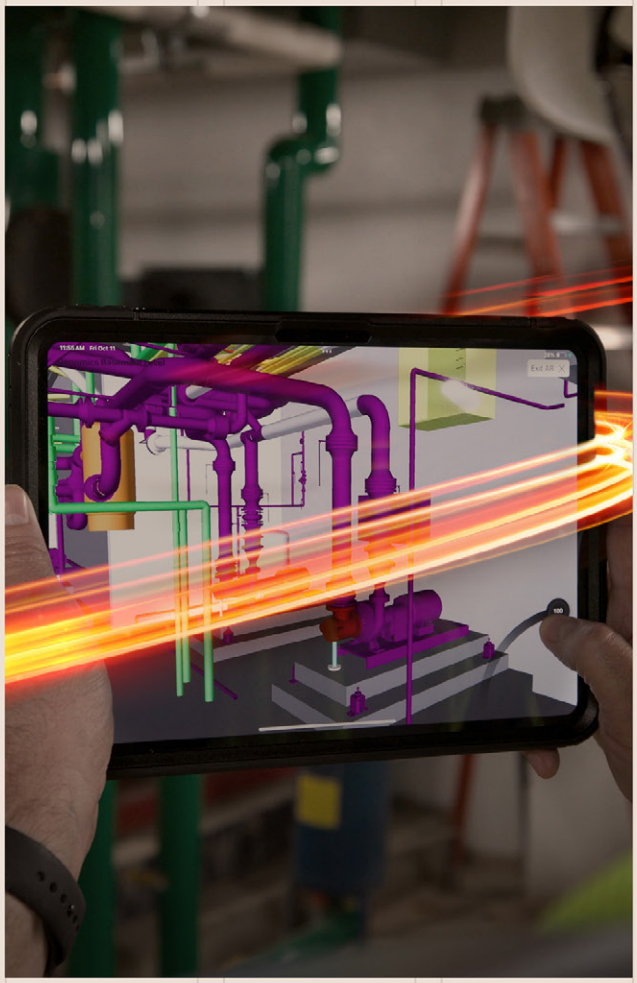
ZHIHAO ZHAO, CO-FOUNDER AND CEO, GENIA

Design will be more efficient.

As design tools advance, they will become more intuitive and accessible, allowing broader team participation in the design process. Parametric design tools will allow dynamic updates and faster designs. Algorithmic design tools can take this concept even further, using advanced algorithms to automate the design process. Designers will be able to create complex structures that would be too tedious or complicated to design by hand, incorporating various sources of data and performance criteria when creating a structure.

All of the design technologies described will be combined in a project coordination system to capture the reason behind every design decision. That data leads to coordinated decision-making and more efficient designs that impact every aspect of construction.

Key takeaways:



1. **Designers of tomorrow will be builders themselves.**

2. **AI and ML will reduce rework, waste, and frustration.**

3. **Easy-to-use tools will allow teams to contribute to the design process regardless of their experience.**

Conclusion

Although technology, platforms and data will play a crucial part in shaping the future of construction over the next 8 to 10 years, its success will ultimately depend on people — the general contractors, specialty contractors and owners who are building that future. Technology will reveal new solutions to longstanding challenges and introduce sweeping changes to the industry, but without you, it is simply a tool.

The four pillars of construction outlined here, Productivity, Workforce, Decision-Making, and Design, will power new ways of collaborating, communicating, and constructing. In many ways, that future is now. How we adapt to and harness those technologies and how we enable our people will determine how effective we are at achieving this future state.

What's next? Use this report to inform action — what will you do to prepare for the future of construction?

Methodology

This report includes data based on research that took place between May and November 2024 that included the following countries: USA, Canada, UK, Ireland, Kingdom of Saudi Arabia, United Arab Emirates, Australia, and New Zealand.

The research began with 40 in-depth interviews with current executives, future executives, industry association leaders and Procore leadership team to capture the current state of the construction industry.

We then conducted a comprehensive construction landscape review using secondary research to understand industry and economic headwinds in key geographies around the globe.

Additionally, as a part of research into the state of construction, we conducted a quantitative research phase with 1,200 C-suite and senior construction executives, including building owners, general contractors, and specialty contractors. This included a series of three surveys addressing three different audiences that asked questions about construction trends, the culture of construction companies, and the impact of digital transformation. This is reflected in references to "state of construction research" throughout the report.

Procore was not revealed as the research sponsor.

Statistics from the following reports were also included:

Top Civil & Infrastructure Trends, Procore 2023

Construction Playbook: Overcoming Industry Challenges With Technology, Procore 2023

The State of Global Preconstruction, FMI in partnership with Procore, 2022

How We Build Now, Procore 2023

Center for Workplace Mental Health

National Center for Construction Education and Research (NCCER)

Bureau of Labor Statistics

About Procore

Procore Technologies, Inc. (NYSE: PCOR) creates software for people who build the world. With a focus on providing timely and accurate data for all, Procore transforms the construction industry one project at a time - from hospitals and skyscrapers to airports and stadiums. Beyond its connected, innovative technology, Procore empowers the industry and its communities through Procore.org. For more information, visit www.procore.com.

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