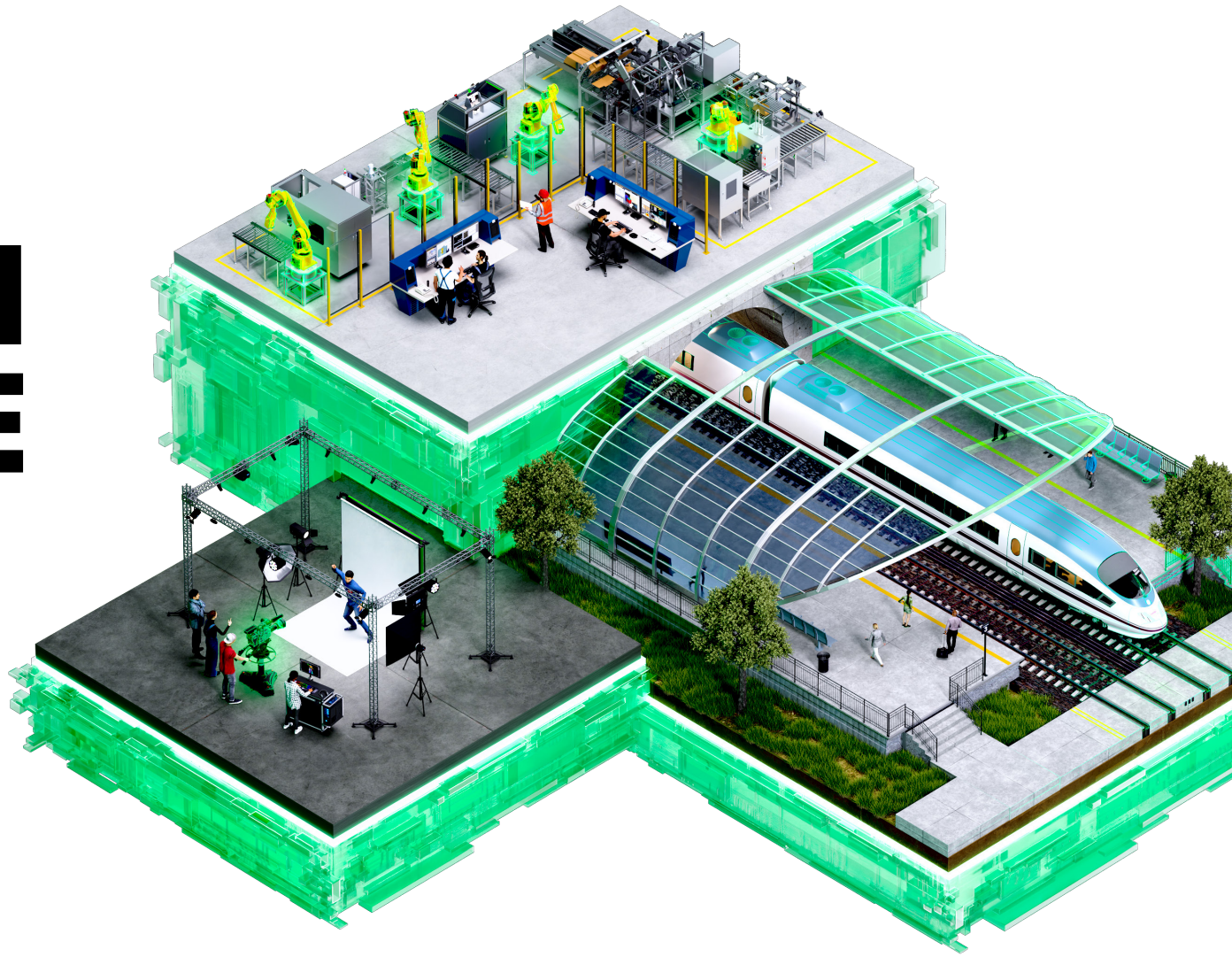


2024 STATE OF DESIGN & MAKE

Insights from industry leaders on how digital transformation is driving business resilience, sustainability, and talent management



 **AUTODESK**

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About the study

The *State of Design & Make* report is a global, annual study for leaders who design and make places, objects, and experiences. It identifies the most pressing issues shaping today's businesses and helps leaders make informed, strategic decisions about how to prioritize and invest in the future.

The industries that design and make represent a unique category that connects the digital to the physical. Architecture, engineering, construction, built asset operations, product design, manufacturing, game development, and filmmaking all require complex human collaboration throughout a digital design process and delivery of a physical result. Executives in these industries share their approaches and points of view on the challenges unique to their organizations and the opportunities they are identifying.

Key areas of focus for this research include: a macro view of the industries; staying resilient and relevant in an ever-changing world; attracting, training, and retaining a skilled workforce; and achieving sustainable outcomes.

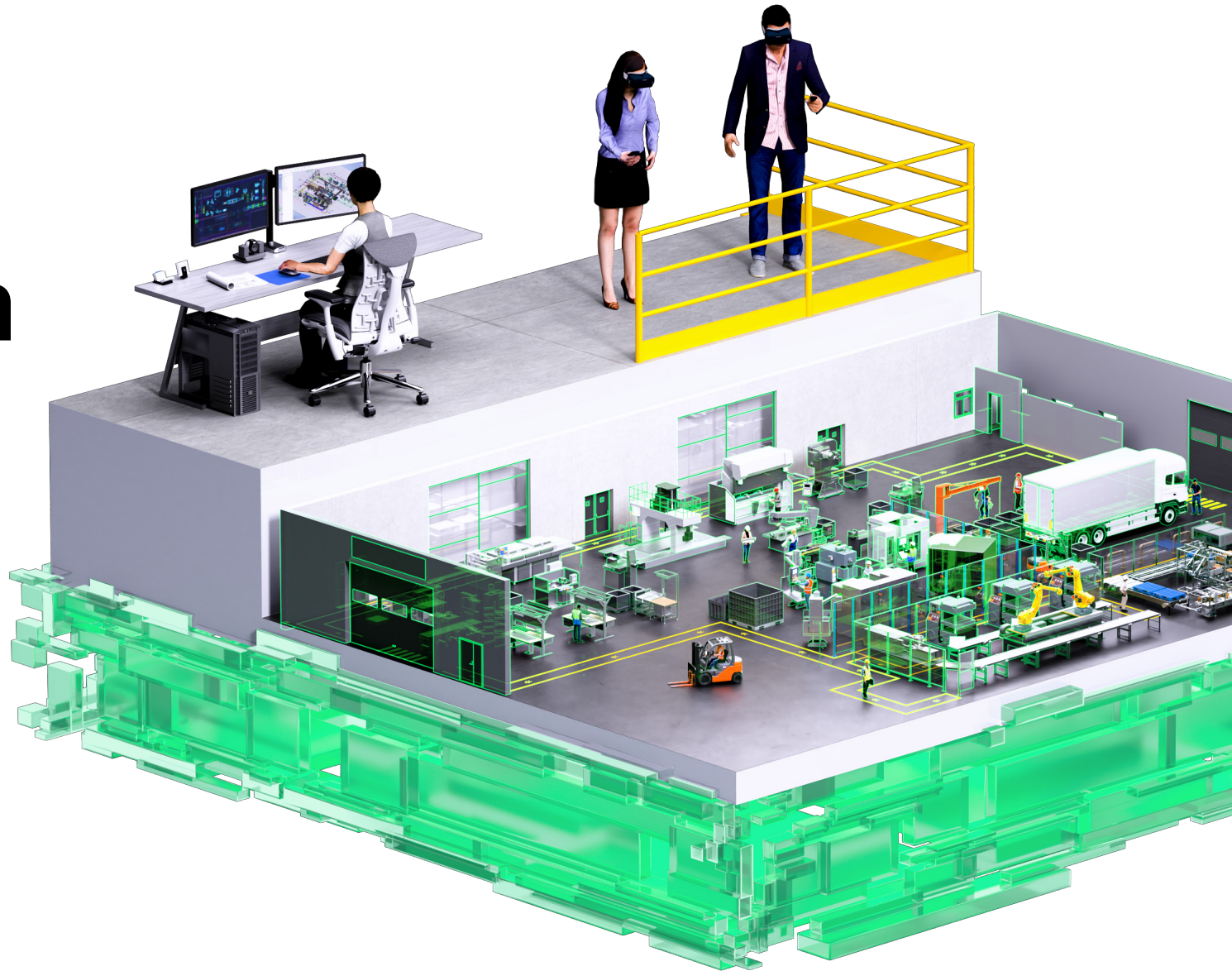
Autodesk surveyed and interviewed 5,399 industry leaders, futurists, and experts from the following industries: architecture, engineering, construction, and operations (AECO); design and manufacturing (D&M); and media and entertainment (M&E). Survey data has been broken down by

global region: Asia-Pacific (APAC), which includes responses from Australia, China, India, Japan, and South Korea; Europe, Middle East, and Africa (EMEA), with responses from France, Germany, Italy, the Middle East, the Netherlands, the Nordics, Spain, Turkey, and the United Kingdom; and the Americas (AMER), with responses from Brazil, Canada, Mexico, and the United States. This report contains key findings from this research, including details at the sector and regional level.

The quantitative data (n= 5,368) was collected between July and September 2023, through a 20-minute online survey. In addition, 31 qualitative interviews with business leaders and futurists were conducted in October and November 2023. In some instances, Autodesk references analysis of its own aggregated and anonymized product data.

Introduction

Key themes and top insights





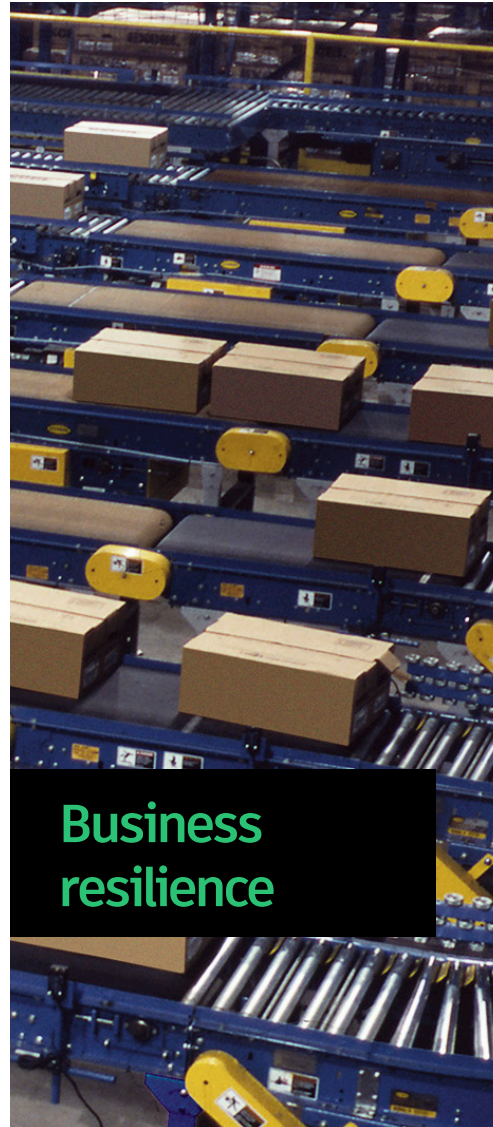
Leaders and experts in the design and make industries report a seismic shift in sentiment from last year to this year, causing big changes in the findings from Autodesk's *2023 State of Design & Make* report. The group is far more optimistic about the global landscape, as well as their companies' resilience, preparedness, performance, investment, and level of digital transformation. In qualitative interviews they said that the economy's seemingly soft landing after years of recession fears inspired much of their confidence, but with that confidence came a new concern—cost control, which pushed talent acquisition and retention down from first place to second on their list of top challenges.

Although talent is now second to cost control, it remains daunting and difficult to address. Even with increased recognition of the need for upskilling programs, most leaders say they don't have the internal

resources to meet that need. Leaders are tackling the issue via multiple avenues that may yield dividends by the time we field next year's survey.

Also new this year was the understanding that artificial intelligence (AI) is a current tool rather than a futuristic pipe dream, and with that understanding, a surprising degree of trust. As one leader remarked, that trust may come from the fact that AI has not caused harm to businesses quite yet. Nonetheless, leaders find productivity gains to be a promising effect of AI and are pushing their teams to pilot use cases in hopes of converting opportunities early. One benefit of this urgency is improved sustainability. AI has risen to the top spot in terms of technologies leaders are using to make their businesses better able to meet sustainability goals. Read on to discover how leaders and experts are rising to meet this year's top business challenges in design and make.

Key themes



Business
resilience



Talent



Sustainability

Top insights

Business resilience



1. **Optimism is returning:**

Leaders feel their companies are far more resilient than last year



2. **Cost control** has risen above talent as the top challenge for businesses



3. **Digitally mature companies** are reporting even greater success



4. Companies are already making meaningful progress on their **AI adoption journeys**

Talent



5. **Upskilling** is essential but out of reach for many



6. Companies are taking a multipronged approach to solving the **talent problem**

Sustainability



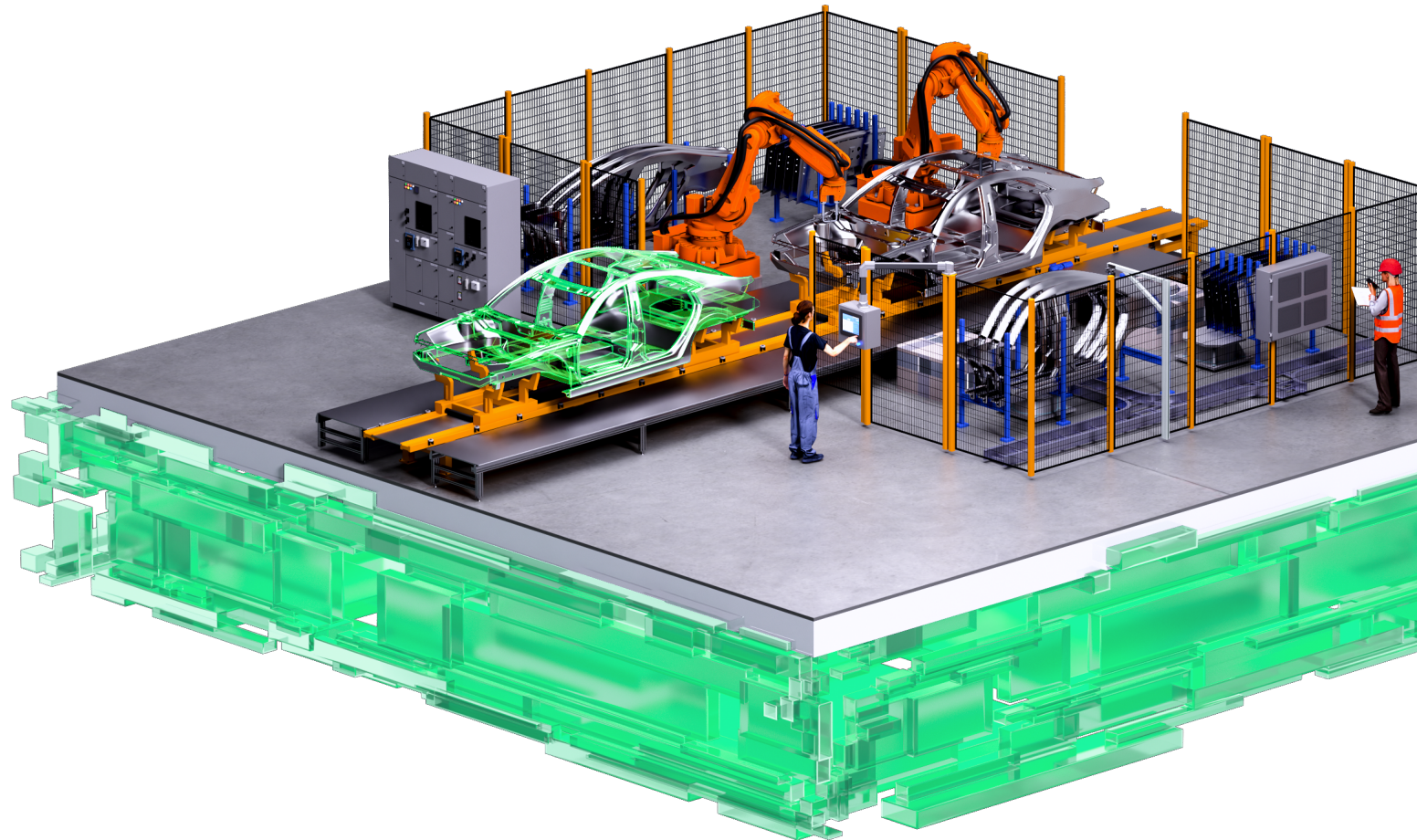
7. Sustainability has become a **key priority**



8. Sustainability is improving both **short-term and long-term business health**

Business resilience

Digitization boosts business resilience amid continued challenges



BUSINESS RESILIENCE

A positive outlook, a new top challenge, and the value of digital tools

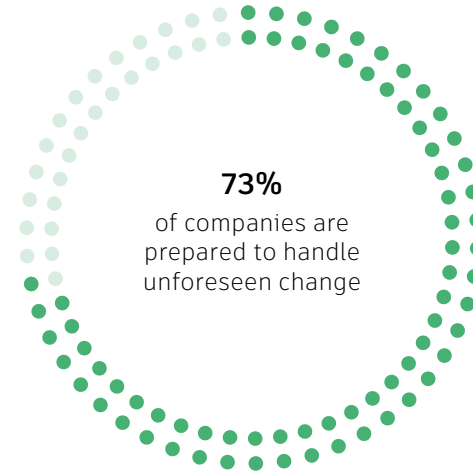
In a word, business leaders and experts this year are optimistic.

While they continue to face significant challenges, the past few years have proven how resilient their organizations are. As a result, they feel far more confident than they did last year in their companies' ability to tackle challenges effectively.

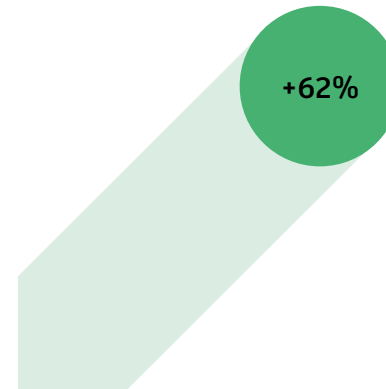
Talent took the top spot last year among business challenges, with organizations struggling with both talent acquisition

and retention. This year, cost control outweighs labor concerns, followed by product and service innovation and environmental sustainability.

Keeping up with the rapid pace of technological change—including artificial intelligence—is another important challenge, but one that presents significant opportunity for companies able to make strategic investments. Professionals report an array of benefits from digital investments, but they also say that costs, a lack of time, and skills gaps all present barriers to their digital transformation efforts.



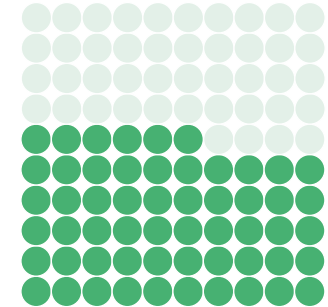
Digital transformation has improved productivity



Concern about access to skilled talent is down from last year



56%
of companies are approaching or have achieved their goal of incorporating AI



INSIGHT 1

Optimism is returning

Companies are more prepared than reported in 2023 to face an uncertain future.

Last year, survey respondents emphasized the sense of uncertainty brought about by the global pandemic, geopolitical turmoil, and economic instability in many markets, with many businesses struggling to attract and retain the talent they needed to grow.

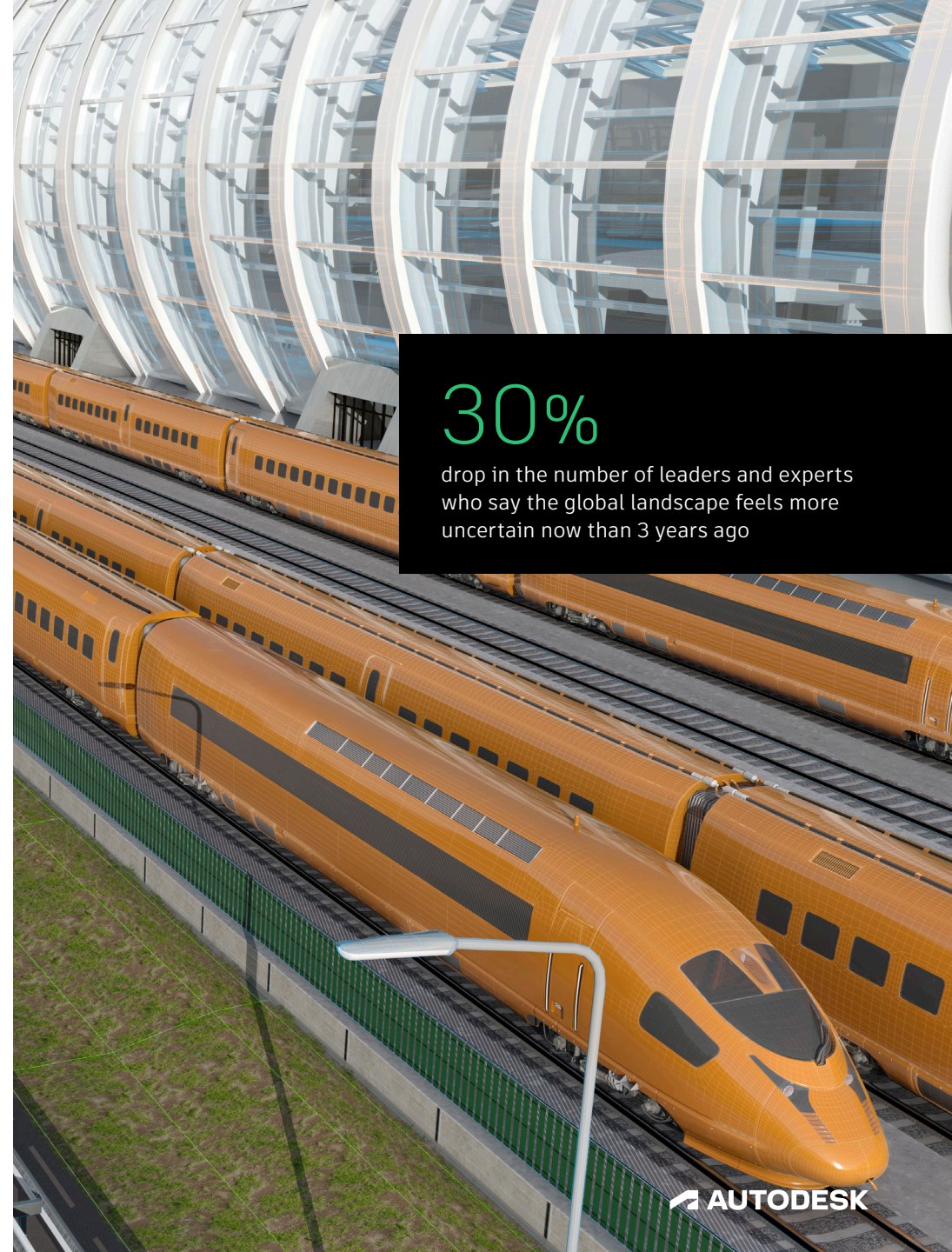
This year, business leaders and experts are much more confident. Seventy-three percent say their companies are prepared to handle unforeseen economic or geopolitical changes, up by 14 points from last year.

This confidence is due in part to the fact that businesses have successfully navigated a series of unprecedented challenges over the past several years. “Coming out of COVID, people are a lot more optimistic,” says Richard Matchett, digital lead at Zutari, an infrastructure engineering

and advisory practice. “We’ve had a year now to figure out which way is up.”

Companies are also proactively improving their positions, taking steps such as planning new offerings, entering new markets, increasing agility, and diversifying supply chains. The more of these steps that a company takes to boost resilience, the more confident leaders feel about the future (see chart on page 12: “The connection between resilience and preparedness”).

Businesses are also performing better and keeping pace with their competition. Seventy-two percent of leaders and experts say their companies outperformed expectations last year, representing a 14-point jump from the year before. And just 7% say that their company is not keeping up with the rate of change in their industry this year, down from 11% a year ago.

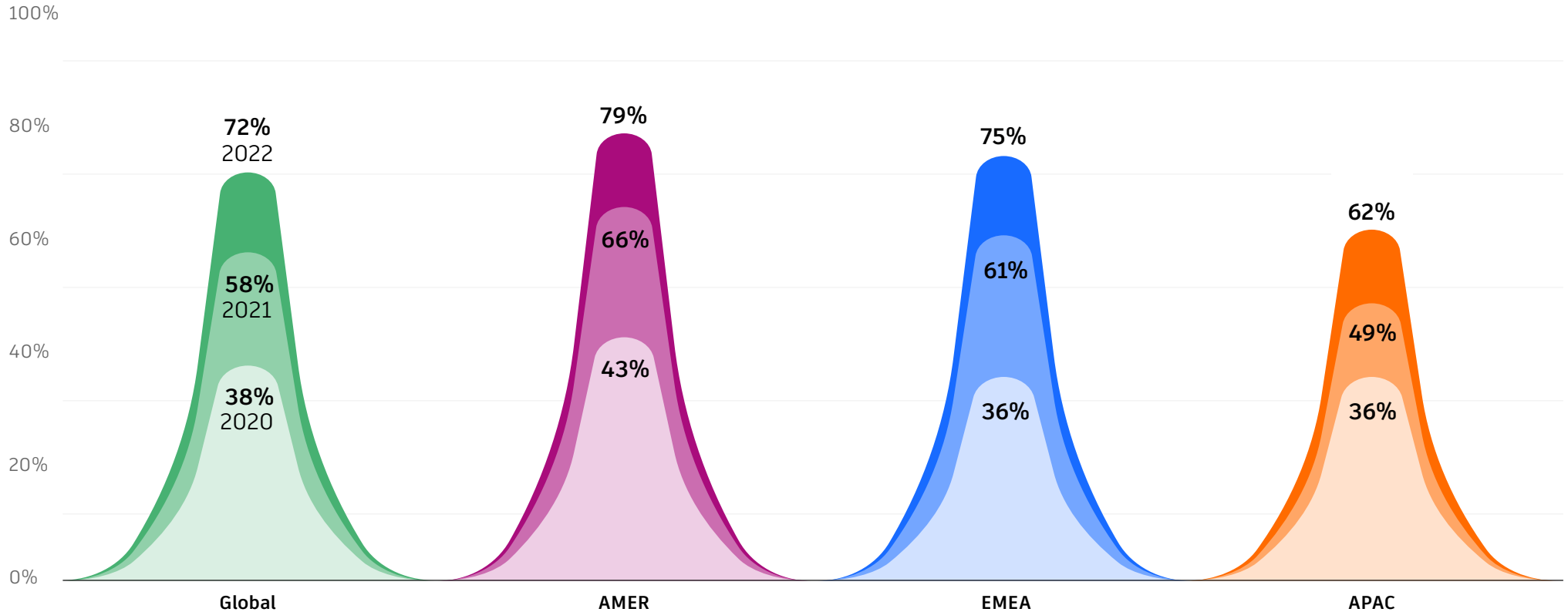


30%

drop in the number of leaders and experts who say the global landscape feels more uncertain now than 3 years ago

Company performance is improving

Percentage of businesses that outperformed corporate expectations



Survey question: How has your company or organization performed compared to corporate expectations in each of the last 3 years? In 2020, in 2021, in 2022. 5-point scale. Top two = above average performance.

INSIGHT 1 – GLOBAL

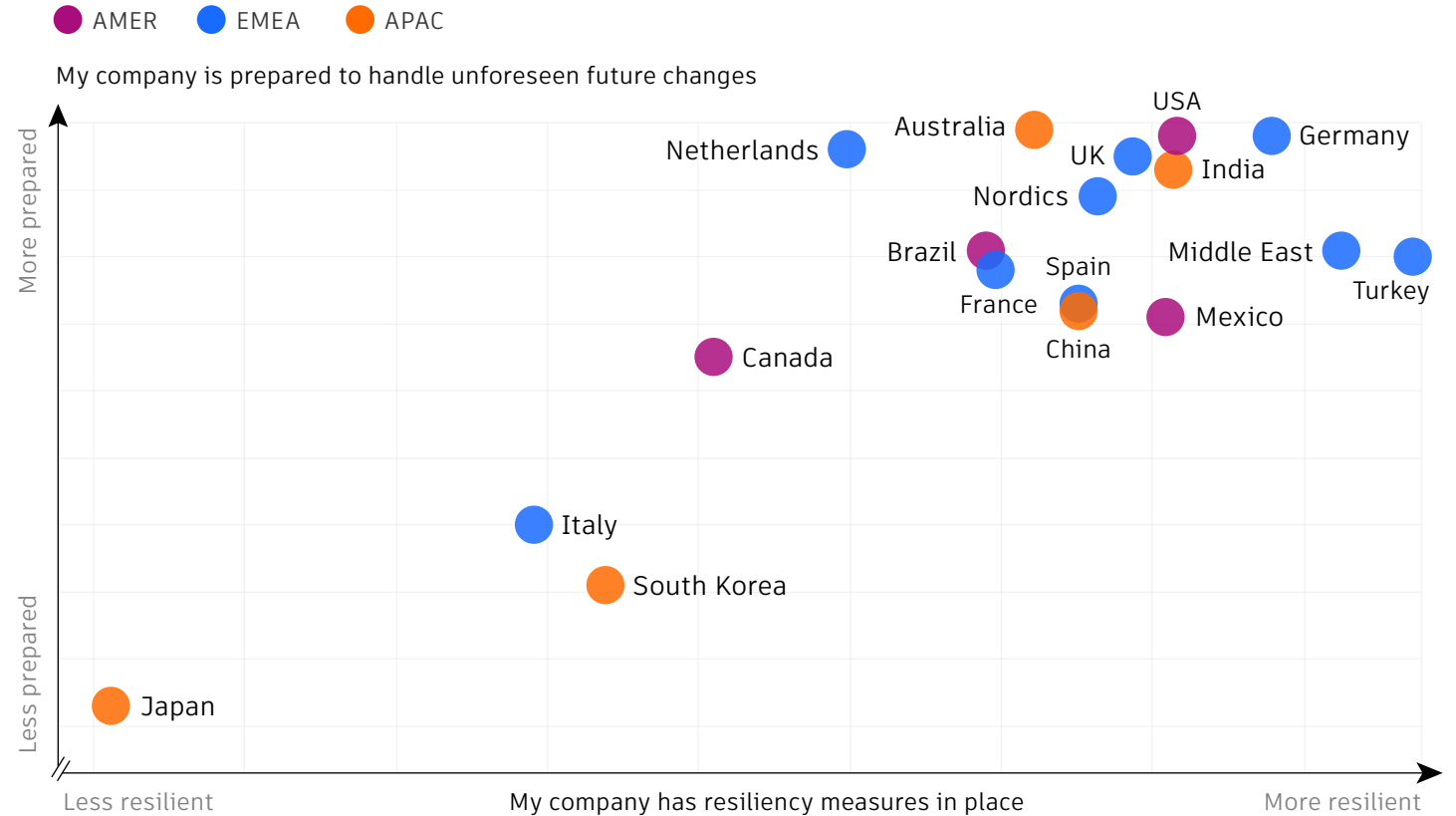
Resiliency measures are tied to confidence

At companies that take more steps to boost resilience, leaders and experts are more confident about the future.

This year's survey asked about companies' efforts to plan new offerings, enter new markets, increase agility, and diversify their supply chains. At companies where leaders agree that their companies are taking these measures, respondents feel much more equipped to face down future uncertainty.

The connection between preparedness and resilience

With plans in place, leaders are more confident about navigating change



Survey question: My company is well prepared to handle unforeseen future macroeconomic and geopolitical changes. x Resiliency is the average score of the survey question: To what extent do you agree or disagree that your company or organization is doing the following to be more resilient? Planning new offerings, entering new markets, increasing agility, and diversifying supply chain. 5-point scale.

INSIGHT 1 – AECO

“Having experienced the global challenges in the last few years, we’ve now **established ways to hedge risks more effectively**, such as pricing quotations based on an understanding of price fluctuations and avoiding risky areas in the supply chain.”

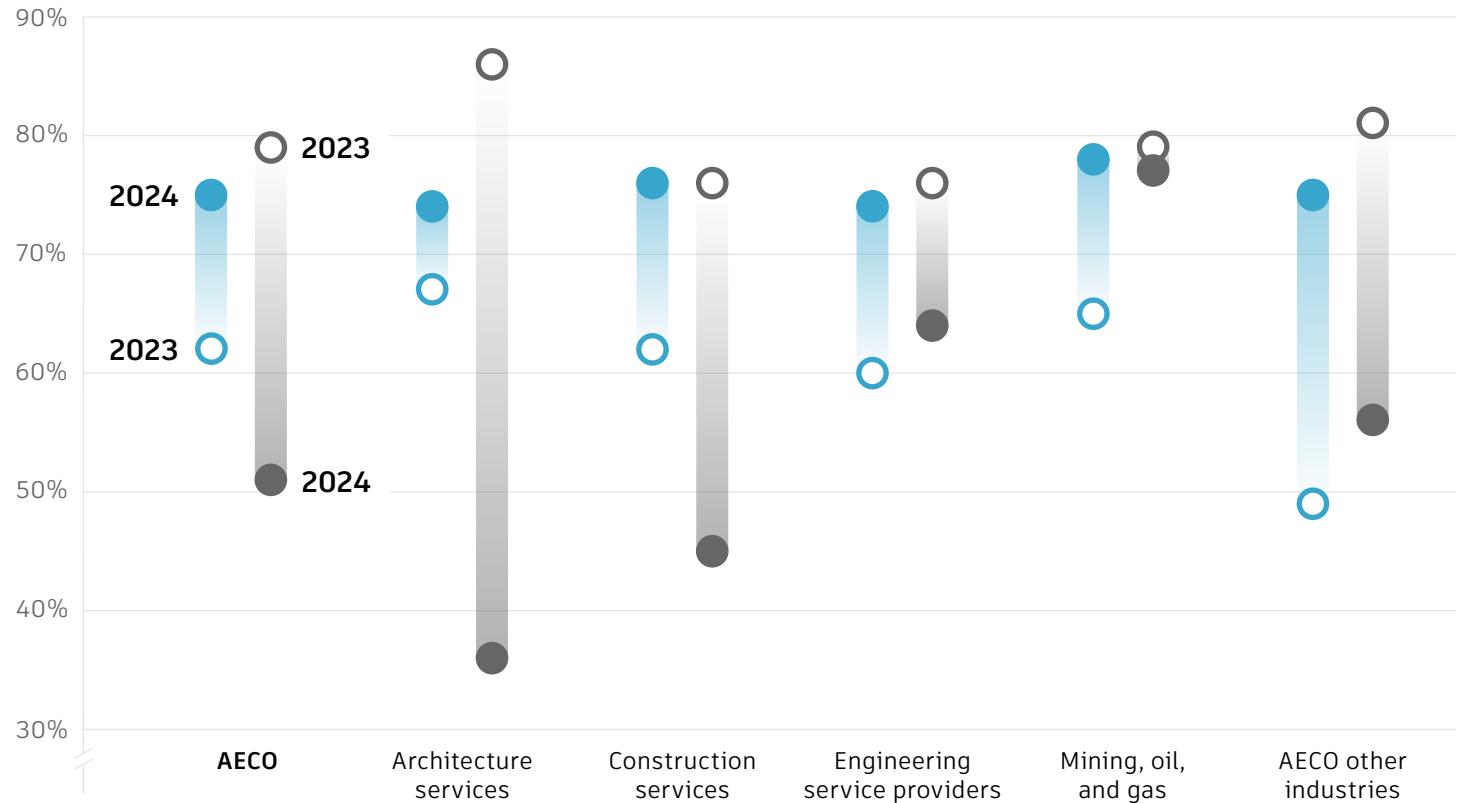
—Eiichiro Okano, Managing Executive Officer, Digital Transformation Division, Obayashi Corporation, a construction and general contracting firm

“I wouldn’t say optimism returned, because I don’t know that it ever left us. We’ve been very optimistic the last two years, and our team is definitely resilient. **The pandemic created different ways for people to think.**”

—Vince DiPofi, PE CEO, SSOE Group, an architecture and engineering firm

Architecture services firms are especially confident about the future

- My company is prepared to handle unforeseen future changes
- The future global landscape feels more uncertain now than 3 years ago



Percentage of respondents who agree with statements: 1. My company is well prepared to handle unforeseen future macroeconomic and geopolitical changes. 2. The future global landscape feels more uncertain now than 3 years ago. 5-point scale. Top two = agree.

INSIGHT 1 – D&M

“The key to becoming more resilient is navigating the pace of change and making sure the organization has enough agility to **lean in when it’s appropriate, adopt new things quickly, and manage risk** around that.”

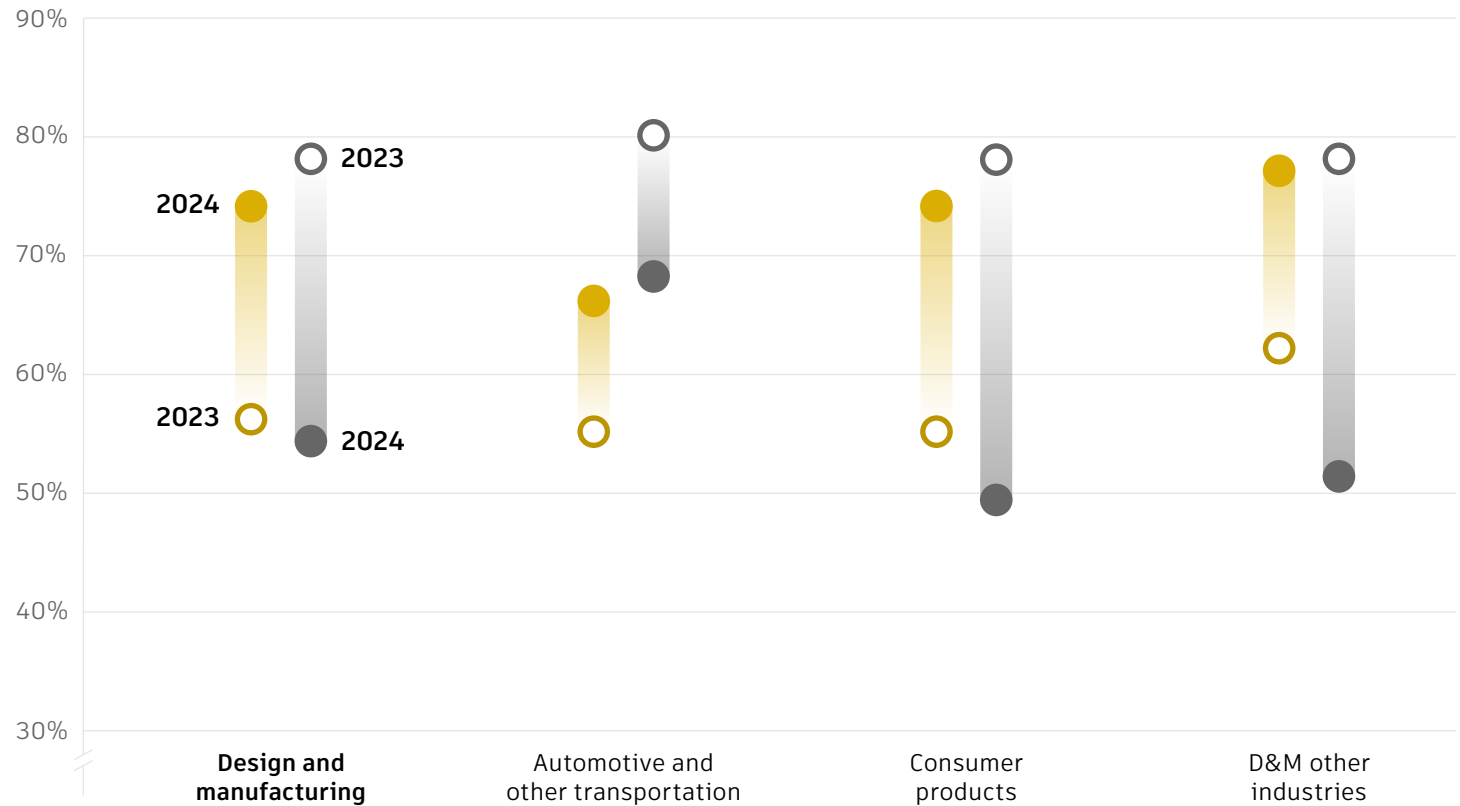
–Dave Mackenzie, Managing Principal for Digital, Aurecon, a design, engineering, and advisory firm

“After the pandemic, we are now actually more accustomed to using digital platforms and collaborating online, and **we have improved our analytical processes.**”

–Cucu Juanda, Division Head of Business Systems and Automation, PT Sanggar Sarana Baja, an industrial machinery company

Not all manufacturing companies are equally ready for the unexpected

- My company is prepared to handle unforeseen future changes
- The future global landscape feels more uncertain now than 3 years ago



Percentage of respondents who agree with statements: 1. My company is well prepared to handle unforeseen future macroeconomic and geopolitical changes. 2. The future global landscape feels more uncertain now than 3 years ago. 5-point scale. Top two = agree. Note: Automotive sample size in 2023 is small.

INSIGHT 1 – M&E

“**We’re optimistic.** For a time, there was a narrative that everything was going to streaming, and people weren’t going to the theaters anymore. But we’ve seen the industry respond with quality products. **This is a creative business. It was not built on an algorithm.**”

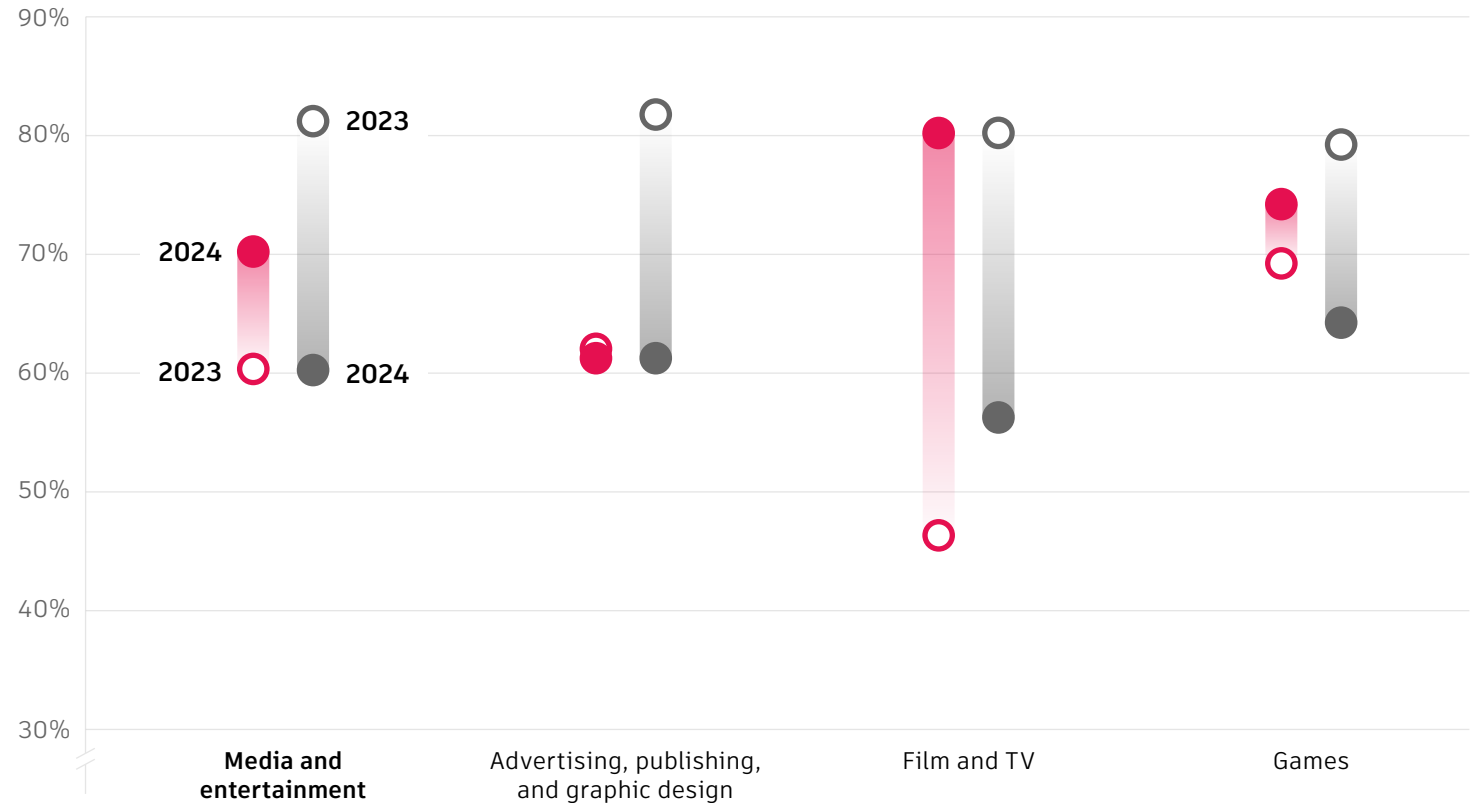
—Hansjeet Duggal, Head of VFX, Artists Equity, a film and television production studio

“**Things have improved significantly when you compare last year and this year.** But there is a certain level of skepticism at the same time about how long this trend will continue. We need to enhance and diversify our capabilities to respond to changes and trends in the market—for example, by incorporating immersive content platforms.”

—Jong-Hyun Jin, Director of VFX, Dexter Studios, a VFX post-production and film production company

Film and TV companies are far better prepared to handle changes

- My company is prepared to handle unforeseen future changes
- The future global landscape feels more uncertain now than 3 years ago



Percentage of respondents who agree with statements: 1. My company is well prepared to handle unforeseen future macroeconomic and geopolitical changes. 2. The future global landscape feels more uncertain now than 3 years ago. 5-point scale. Top two = agree.

INSIGHT 2

Cost control has risen above talent as the top challenge for businesses

Talent remains a critical factor in company success, but it is no longer the top challenge many businesses are facing.

Instead, cost control and management has taken the top spot, with 33% of respondents citing it as their biggest challenge. Professionals at struggling companies are, understandably, even more concerned with costs. At organizations that experienced poor or below-average performance over the past 12 months, 44% of respondents cite cost control and management as a top challenge.

Cost challenges are forcing companies to become leaner and find ways to optimize performance, even on a tighter budget.

“The need to control costs is motivating companies to try anything to become more efficient,” says Richard Matchett of Zutari, an infrastructure engineering and advisory practice. “So while cost control is a major challenge, it is also driving innovation.”

Although talent fell below cost management this year, it still ranks second on respondents' list of top challenges. Attracting, training, and retaining talent is a top-three challenge for 29% of business leaders and experts, down significantly from 48% a year ago. Forty-three percent say that access to skilled talent is a barrier to their company's growth, but that number is down from 64% last year.

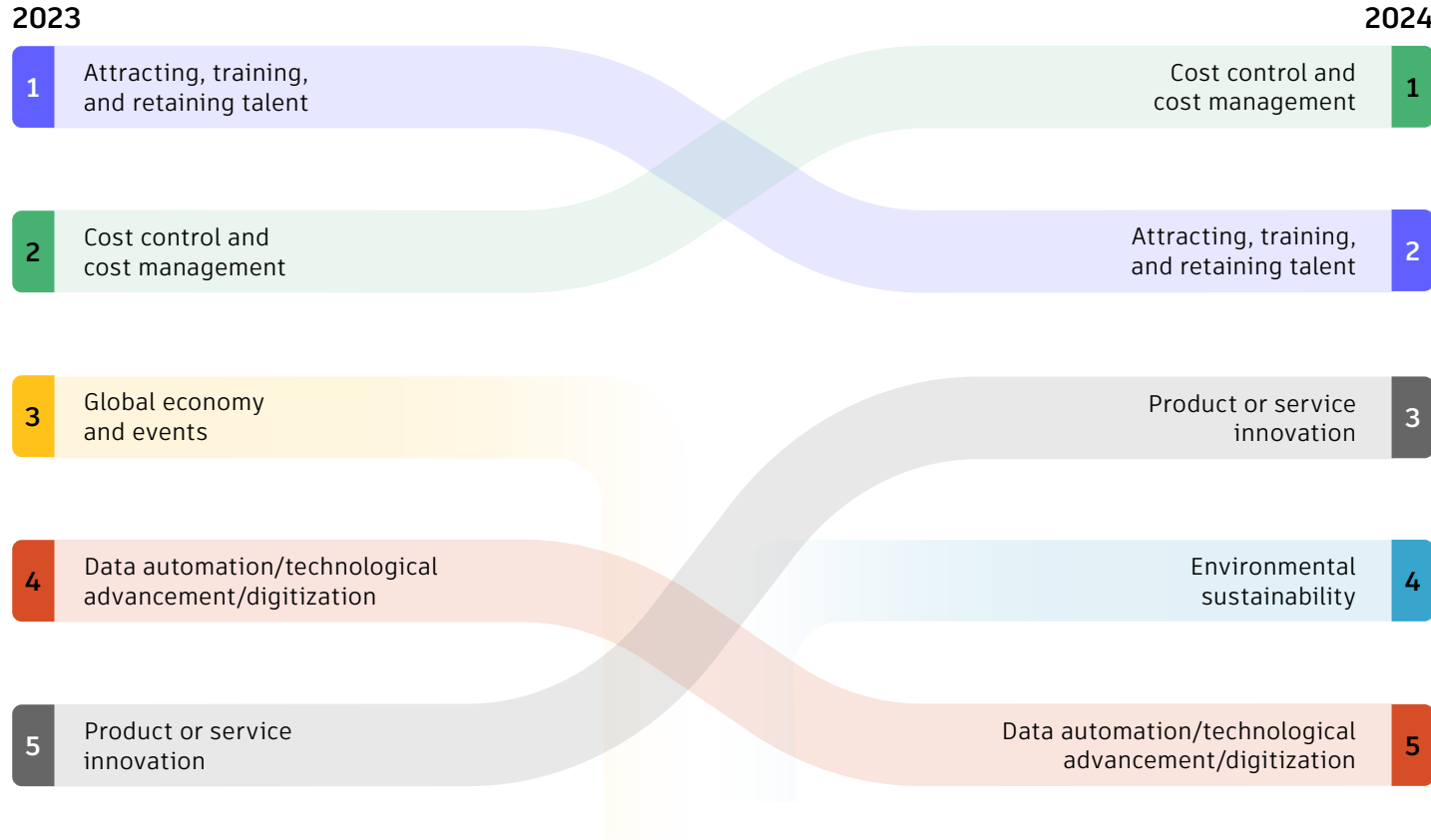
“It's a balance between cost control and talent,” says David Spilsbury, chief technology officer for Axis Studios, an animation and VFX studio. “How do you grow talent to meet demand, without growing too much—which creates the risk of needing to downsize later? Technology can help companies hit that sweet spot in the middle.”

Product and service innovation ranks third on the list of top challenges, followed by environmental sustainability, data automation, technological advancement, and digitization.



Cost control emerges as the top business challenge

Top 5 challenges showing year-over-year change



Industry ranking of challenges			
	AECO	D&M	M&E
1.	●	●	●
2.	●	●	●
3.	●	●	●
4.	●	●	●
5.	●	●	●

Survey question: What are the top 3 challenges your company or organization faces today? Select up to three.

INSIGHT 2

The global economy and events, which ranked as a top-three challenge a year ago, has fallen out of the top five this year. However, it is important to note that survey data was collected before the October 2023 outbreak of conflict in the Middle East. “The supply chain is the biggest worry related to global events,” says Callahan Tufts, design lead at Nexii, a green construction technology company. “Anytime you see a global conflict—first off, it’s horrible for the

people involved. But it can also affect the rest of the world’s economy.”

The challenges facing organizations are not siloed, but rather intersect with one another, forcing decision-makers to weigh competing priorities—for instance, opting for only those sustainability measures that offer a return on investment in the form of energy savings or continuing to make investments in areas that are essential for

the long-term health of their companies, despite cost challenges. “Cost control is undeniably important, but in the game industry, hiring and retaining high-caliber talent is even more important,” says Ji-Woong Hong, executive vice president of BF Production at COM2US, a mobile and online game development company. “Even when it pushes up the cost a little bit, hiring good talent will benefit the organization in the long run.”

27%

of organizations have strongly increased their investments in technology to deliver improved project outcomes over the past 3 years—more than double the rate for overall investments

Cutting costs with faster rendering in M&E

One potential opportunity for M&E companies to cut costs is by using new technology to reduce the compute time needed for rendering. For example, lowering the time to render scenes can often lead to a decreased cost of computing. This becomes especially significant in situations where studios rely on cloud computing power. Tests of Autodesk Arnold, a photorealistic rendering program, found that the latest version of the software could render scenes much more quickly than earlier versions due to improved performance in multi-GPU scenarios and a novel sampling technique called Global Light Sampling (GLS). Rendering times were 3.7 times faster for a classic interior scene and 3.1 times faster for an automotive studio scene compared to a year ago.



“Costs are also increasing for talent, infrastructure, and software. The only way to overcome that is to create higher-value products, which gives you a better margin.”

—Milind D. Shinde, Founder and CEO, 88 Pictures, an animation and media company

INSIGHT 2 – GLOBAL

Talent and global events pose less of a challenge

Respondents around the world are less worried this year about talent as well as the global economy and global events. However, this difference is more pronounced in some regions than others. The EMEA region saw a particularly steep drop in the portion of respondents who cite global struggles as a top challenge this year, though it's important to note that survey data was collected before the October 2023 conflict in the Middle

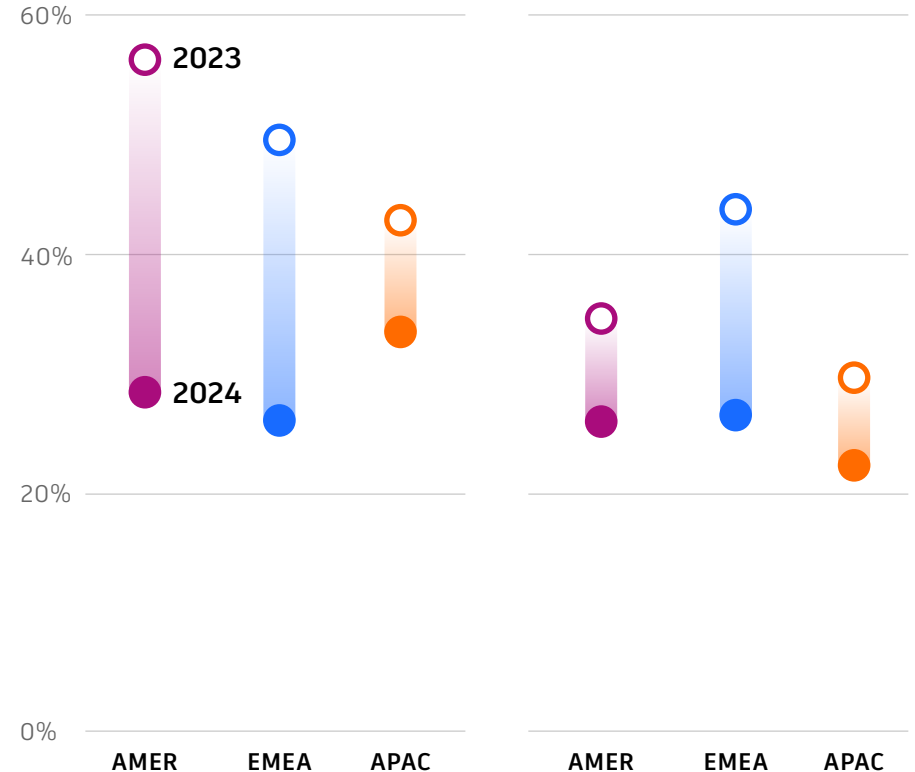
East began. For talent, the steepest drop came in the Americas, with the portion of respondents citing this factor as a top challenge cut in half—from 56% to 28%.

Miro Lin, chief executive officer of tool business group (Taichung) at machine and equipment manufacturing firm Fair Friend Group, offers his view on why business priorities have shifted significantly in the last year. “In the short run, cost control is most important because of the economic slowdown,” Lin says. “But for the mid- and long-term, talent is still the top issue.”

Regional change in talent and global struggles

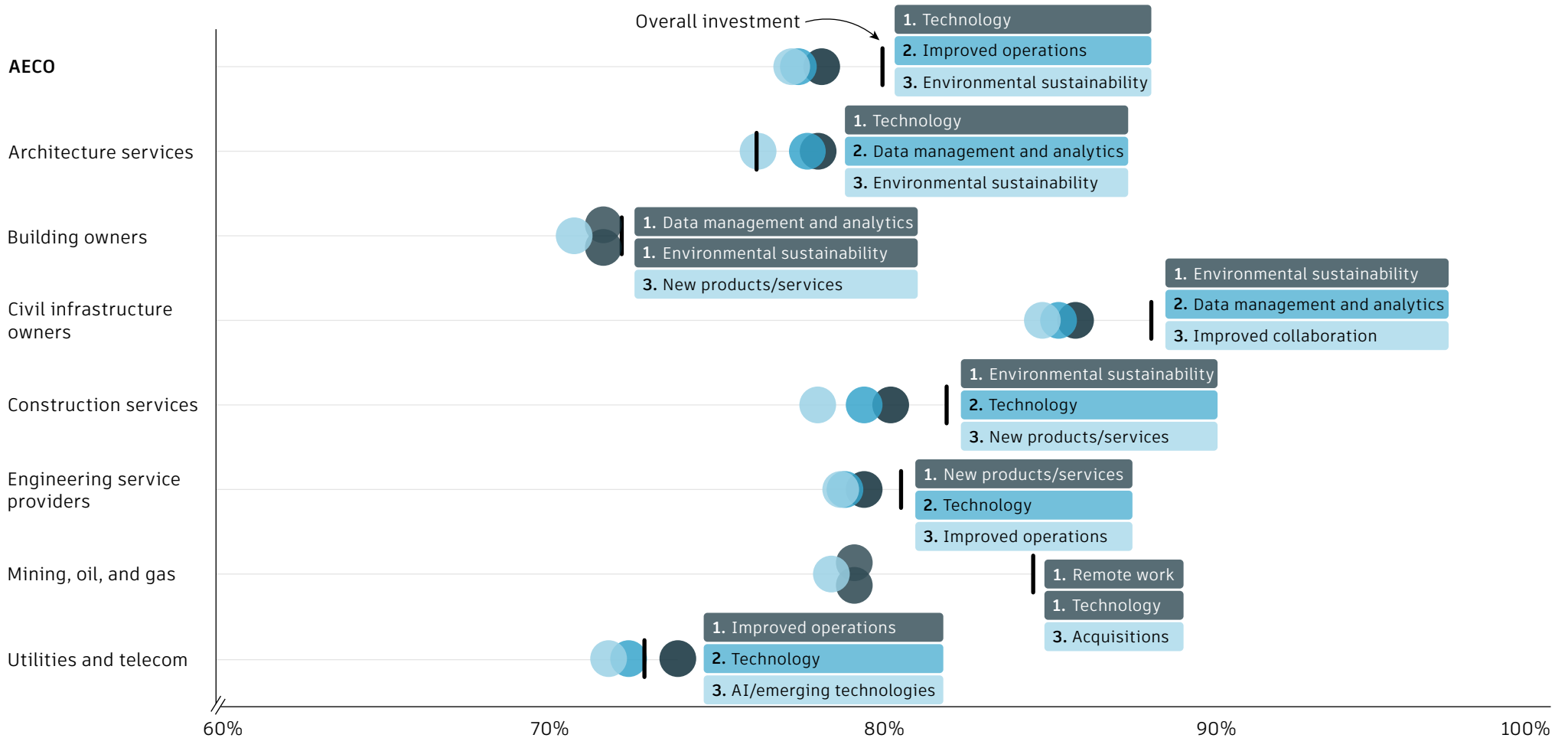
Attracting, training, and retaining talent

Global economy and events



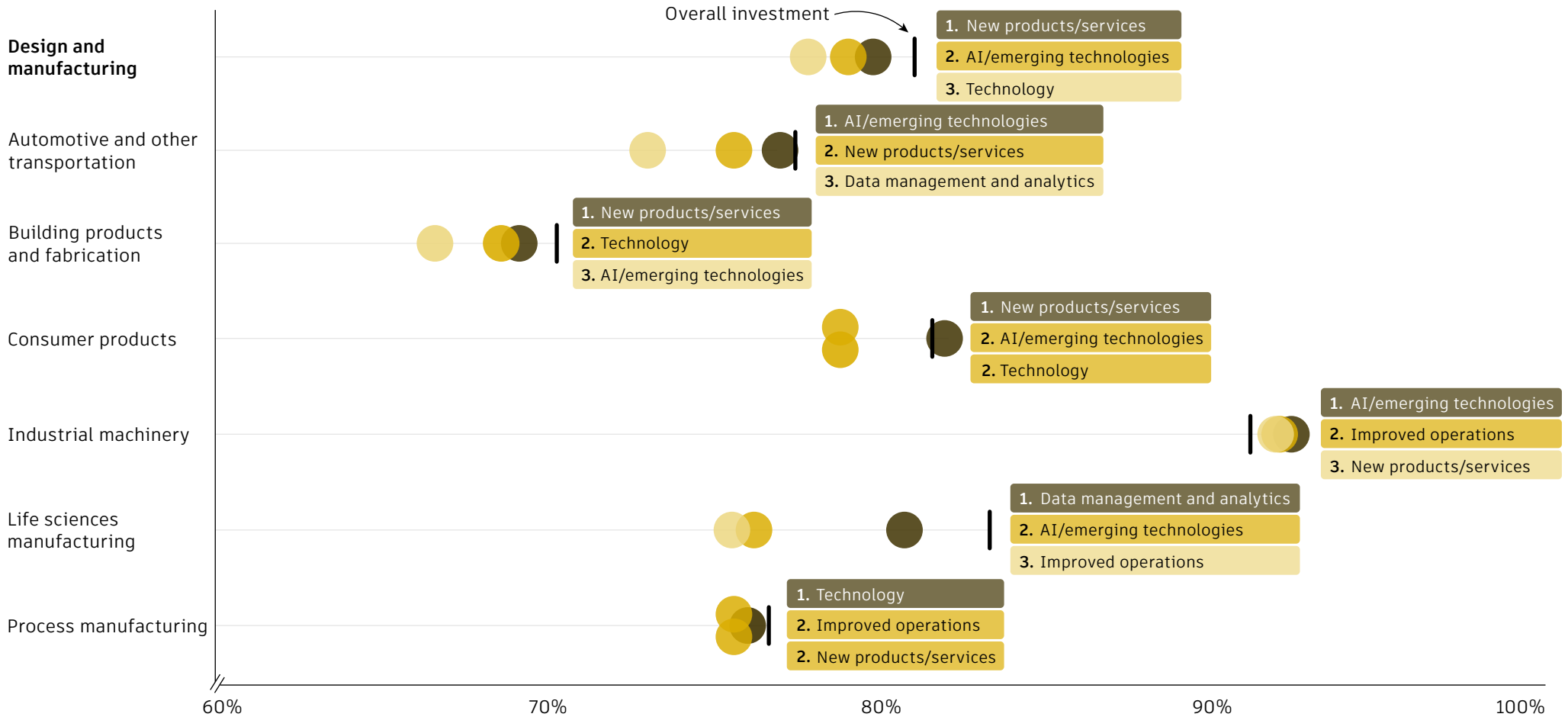
Percentage of respondents who selected “attracting, training, and retaining talent” and “global economy and events (e.g., wars, pandemics, inflation, strikes)” as their top challenge. Survey question: What are the top 3 challenges your company or organization faces today? 12 response options.

Top priorities for future investments differ among AECO segments



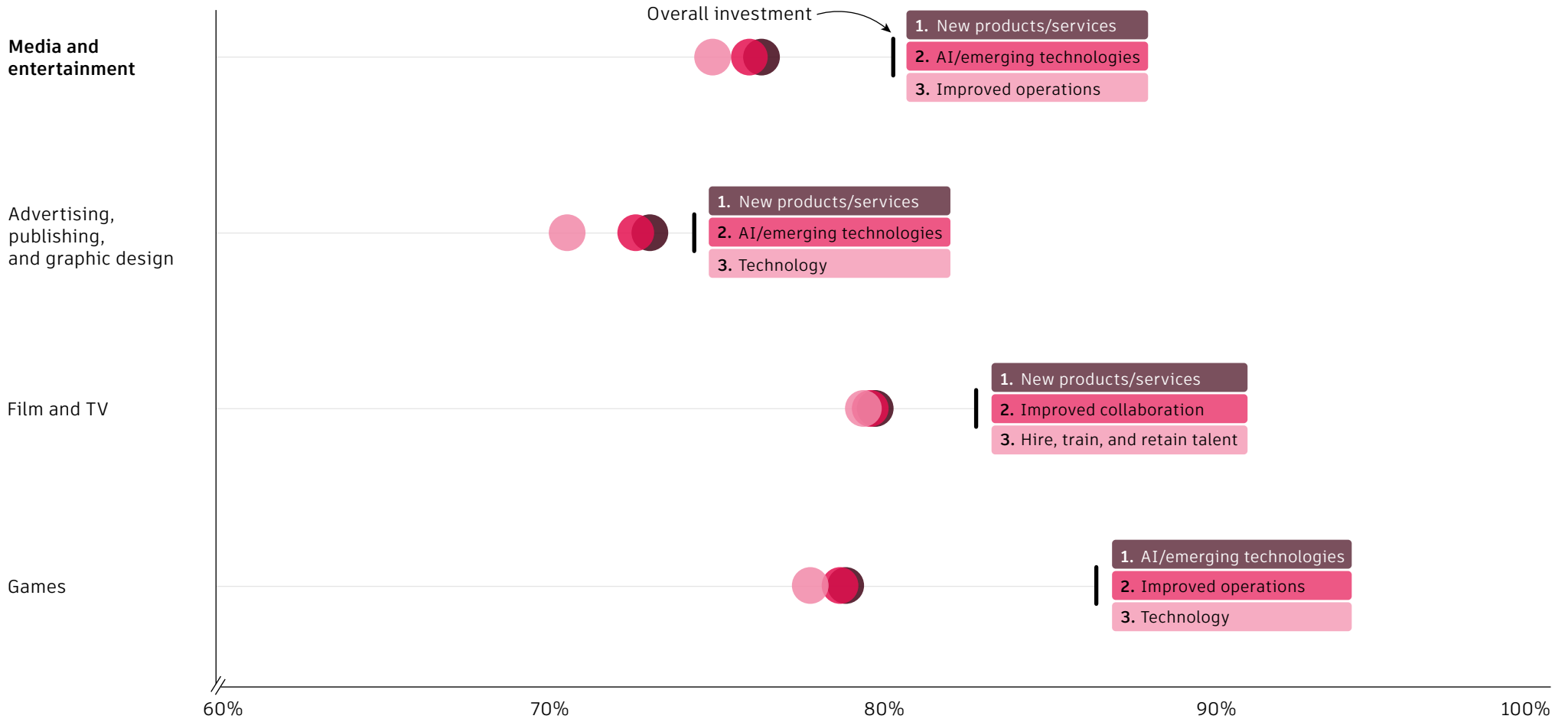
Axis: Percentage of respondents who say investments will increase in each area.
 Survey question: How do you think your company or organization's investment in these areas will shift in the next 3 years? 5-point scale. Top two = increase.

Top priorities for future investments differ among D&M segments



Axis: Percentage of respondents who say investments will increase in each area.
 Survey question: How do you think your company or organization's investment in these areas will shift in the next 3 years? 5-point scale. Top two = increase.

Top priorities for future investments differ among M&E segments



Axis: Percentage of respondents who say investments will increase in each area.
 Survey question: How do you think your company or organization's investment in these areas will shift in the next 3 years? 5-point scale. Top two = increase.

INSIGHT 3

Digitally mature companies see greater business success

Companies that invest in digital transformation are seeing dramatic results. They are more competitive in their industries, their employees are more productive, and they see overall better performance than companies with lower levels of digital investment.

These differences are apparent when comparing companies that invest more or less than 45% of their revenue in technology—and the results create a compelling case that effective digital transformation investments are now essential to business success.

At organizations with higher levels of investment in technology, for instance, 50% of respondents rate their organization's performance as "exceptional," compared to 32% at companies that invest less. And

at companies with higher levels of investment, 34% feel their organizations are keeping up with changes in their industry "very well," compared to 25% at companies that invest less. The productivity gains tied to digital transformation are nothing short of eye-popping. Those who cite productivity as the top benefit of digital transformation say, on average, that digital investments have improved productivity by 62%.

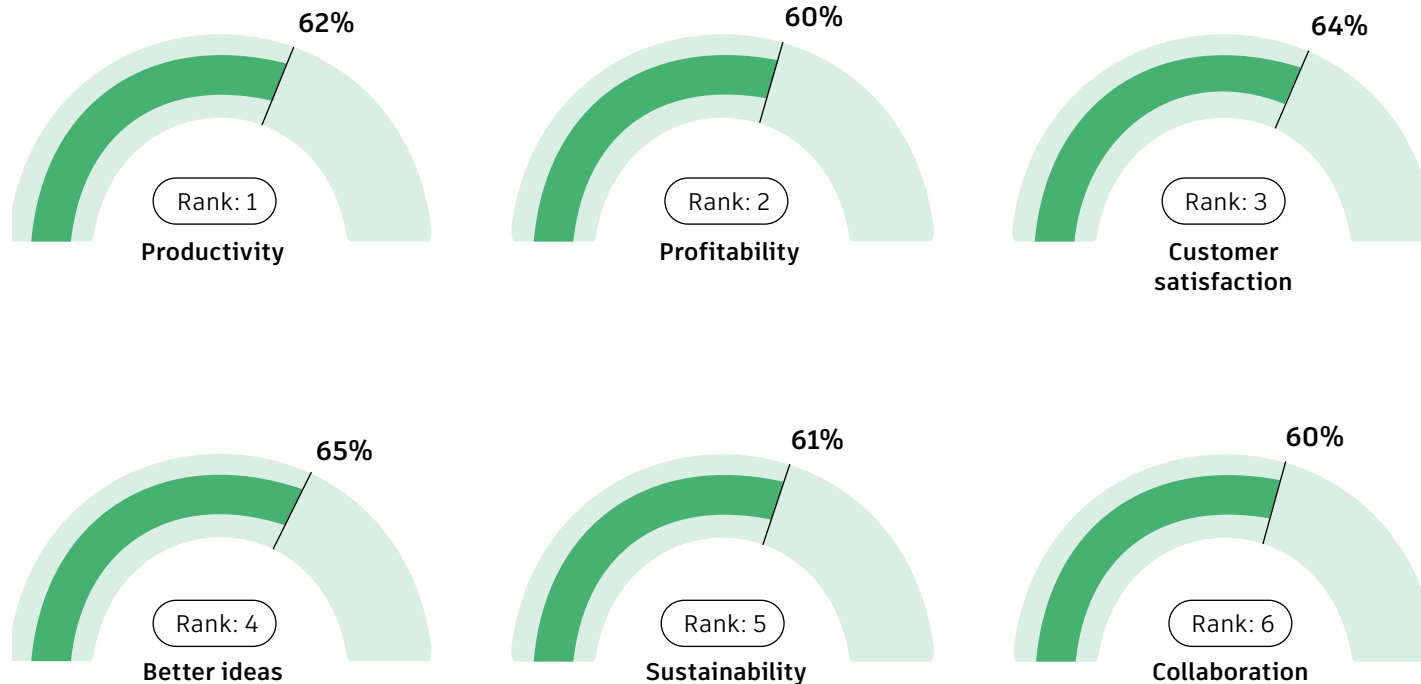
"Our leadership has made digital transformation a top priority," says Jinchun Hu, general manager of the JAC Italy Design Center S.R.L., an automotive and commercial vehicle manufacturer. "Sometimes it is difficult for teams to make decisions simply because they do not all have the same information. If you can use digital tools to address that, your company will be faster and make better decisions."

"We are very focused on digital documentation and information gathering. Whether we're collaborating with contractors or designing a project, **it's all fully digital**. Our suppliers do not send us lists in Excel or emails with attachments. Of course, as much as possible, everything is done through our software, and **there is one source of truth.**"

—Michał Latała, Deputy Director for BIM & GIS, Centralny Port Komunikacyjny, an air, road, and rail transfer hub

Top advantages of digital transformation

The impact of digital transformation on business areas, rated on a scale of 0%–100%



Top-ranked response to survey question: Has your company or organization experienced any of the following benefits of digital transformation?
 Follow-up survey question: On a scale of 0% to 100%, how much has digital transformation impacted your top-ranked benefit?

INSIGHT 3

Barriers to effective digital transformation

In this report, “digitally mature” companies are defined as those that are approaching the goal or have achieved the goal of their digital transformation journey.

Respondents from digitally mature companies are more likely than their peers to report that they ...

... have experienced “above average” or “exceptional” **performance** +34%

... have “increased” or “strongly increased” **investment** in the past 3 years +34%

... have kept up “very well” with **change in the industry** +20%

... “agree” they are **prepared** for the future +26%

... are “very effective” at **leveraging data** +19%



INSIGHT 3

Barriers to effective digital transformation

The benefits of digital transformation are significant, but a number of barriers prevent companies from investing at the levels they would like. Cost is the top barrier, followed by the time needed to invest in new tools and ways of working. A lack of knowledge or technical skills is also holding businesses back.

Leaders and experts note that implementing new tools is not enough to drive effective digital transformation. Rather, these solutions must be accompanied by process improvements and a shift in mindset, both from employees

and leadership. “There is still resistance to digital transformation from people who have been working for a long time,” says Eiichiro Okano of Obayashi Corporation, a construction and general contracting firm. “However, I feel that resistance has been softened rapidly over the past year or two due to the demands from clients and design firms.”

Robert da Silva Bressan, engineer of cultural and transformational change management at oil and gas company Petrobras, notes that data management is another significant hurdle: “Data is a challenge to digital transformation—there is a lot of it, and it has to all be organized and classified.”

INSIGHT 3 – GLOBAL

Digital maturity is now the norm

Perceptions of digital maturity have flipped in just one year.

Overall, 64% of respondents say their companies are digitally mature, compared to last year, when 62% rated their organizations as “less digitally mature.” This suggests that digital transformation has reached something of a tipping point—with businesses seeing the positive impact of their digitization efforts and then continuing to invest to keep up with their peers.

Indeed, effective digital transformation initiatives have now become a necessity

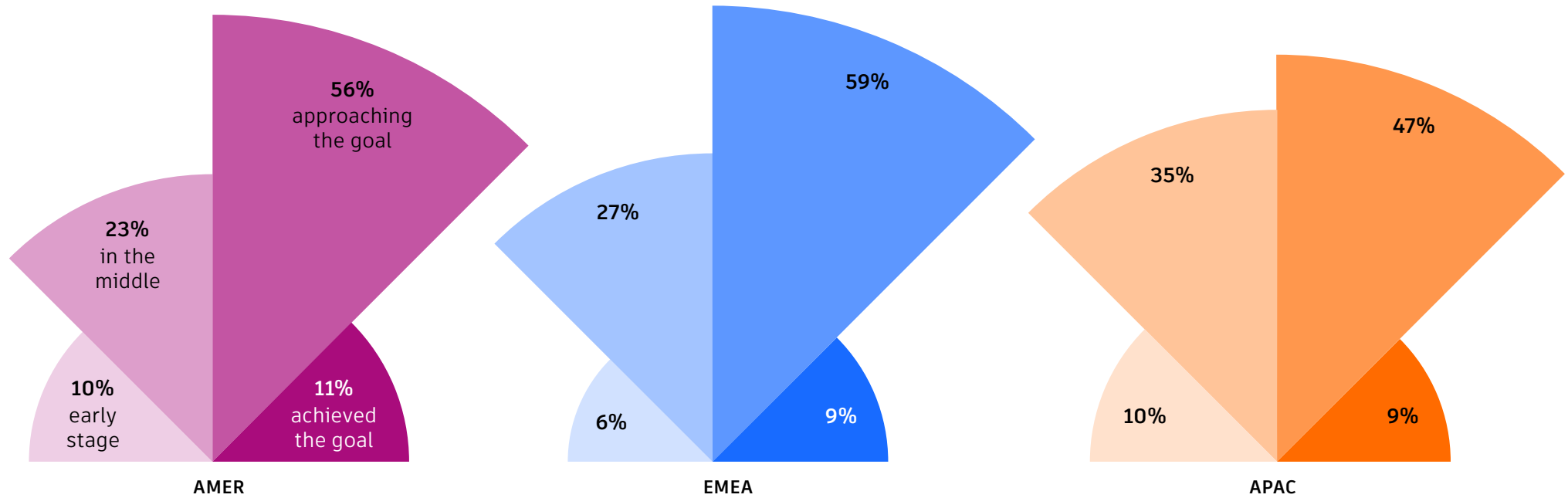
for many organizations to stay competitive. “The mindset of leadership can be one of the biggest barriers to digital transformation,” notes Michał Latała of Centralny Port Komunikacyjny, an air, road, and rail transfer hub. “You need to invest first before seeing results later. Some leaders don’t see that.”

Respondents from the Americas and the EMEA region report their companies are further along in their digital transformation journeys than those in the APAC region. However, most respondents in all three regions report their companies are digitally mature.



Digital transformation is a global priority

Most companies are approaching their digital transformation goals



Survey question: Where is your company or organization in the digital transformation journey? 4-point scale.

INSIGHT 3 – AECO

What does digital maturity mean for AECO companies?

Digitally mature AECO companies are further along than their peers on some of the industry's most important initiatives.

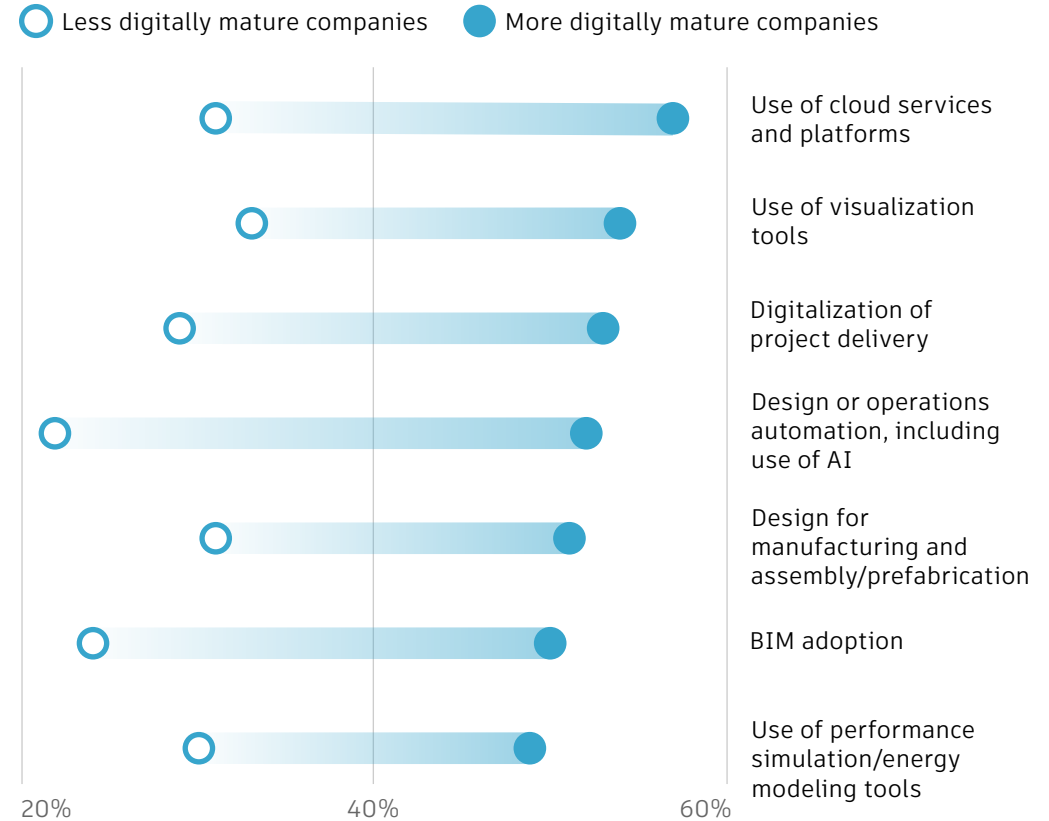
Across the sector, 65% of respondents say their company is digitally mature. These organizations are far ahead of others in the use of cloud services and platforms, digitalization of project delivery, BIM, and other processes that drive success within the sector. Companies that embrace building information modeling (BIM) can improve project visualization and mitigate the risk of errors, cloud platforms can enable centralized storage and management of project data, and digitized project delivery can improve accuracy and quality control, to name just a few benefits of these workflows. Taken together, these benefits of digital transformation can also lead to better tracking and management of costs, helping companies to address pressing challenges.

“Digital tools are key to staying competitive, producing quality work, and improving collaboration between teams,” says Maria Fernanda Olmos, global principal for digital integration at Unispace, a workplace strategy, design, and construction firm. “These days, when most companies have embraced remote working, cloud and AI solutions help ensure that communication goes smoothly, enabling businesses like ours to deliver projects to clients faster and more efficiently than before.”

Mining, oil, and gas leads other AECO segments in the use of digital visualization tools, with 66% of respondents identifying their companies as “very mature” in this area, while civil infrastructure leads in the use of cloud platforms, with 62%.

Utilities and telecommunications companies are relatively weak in BIM, with only 29% of respondents saying their companies are “very mature” in this area.

More digitally mature AECO companies are also more process mature



Percent of respondents who selected “very mature” in each process.
Survey question: In your company or organization, how mature are the following? 5-point scale.
See glossary on p. 78 for the definition of digital maturity.

INSIGHT 3 – D&M

What does digital maturity mean for D&M companies?

Digitally mature D&M companies outpace their peers in a number of important areas.

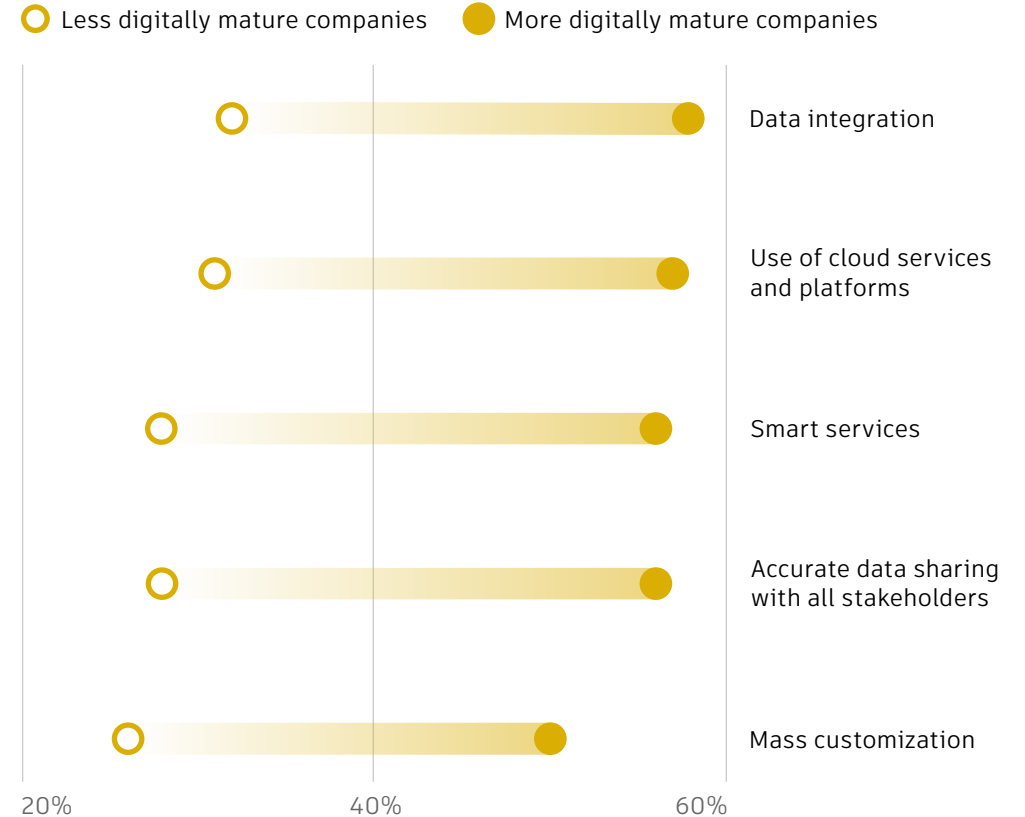
Across the industry, 59% of respondents say their company is digitally mature. These organizations are far ahead of less digitally mature organizations in the use of cloud services and platforms, smart services, and mass customization—processes that can help improve agility, enable predictive maintenance, and optimize supply chains.

In interviews, D&M professionals describe how they have improved a wide array of workflows and systems through digital transformation. For example, leaders at some firms say they have not only embraced automation and digital twins in production, but that they also are also improving supply chain and finance processes through digital transformation.

Dave Mackenzie of Aurecon—a design, engineering, and advisory firm—notes that digital maturity doesn't just mean investing in technology, but also managing these tools effectively to yield positive business outcomes. "We've developed a digital maturity framework with six or seven key specializations that we've identified as important to our business," he says. "Each part of that framework is connected back to client value."

The industrial machinery and aerospace sectors lead others in D&M when it comes to data integration, with 60% and 56% of respondents from these sectors respectively saying their organizations are "very mature" in this area. The building products sector lags in the use of cloud services, with only 34% of respondents saying their companies are "very mature."

More digitally mature D&M companies are also more process mature



Percent of respondents who selected "very mature" in each process.
Survey question: In your company or organization, how mature are the following? 5-point scale.
See glossary on p. 78 for the definition of digital maturity.

INSIGHT 3 – M&E

What does digital maturity mean for M&E companies?

Digitally mature M&E companies are far ahead of their peers when it comes to practices that are key to success in the sector.

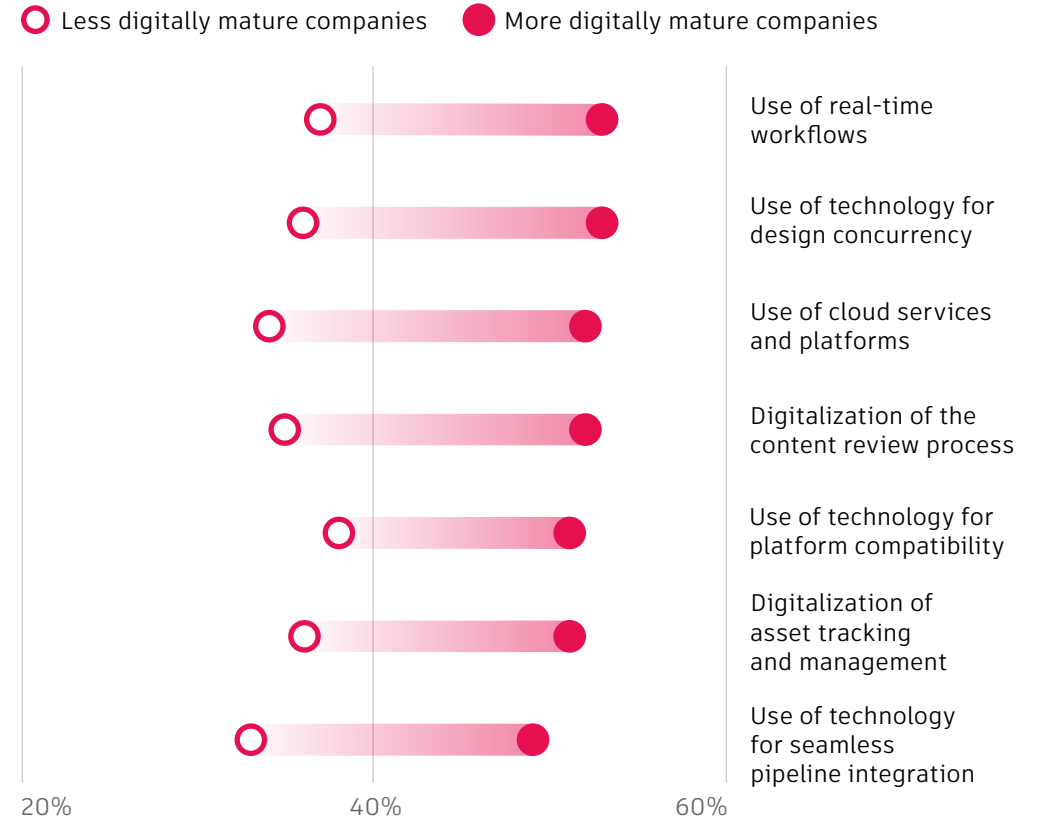
Sixty-six percent of M&E respondents say their company is digitally mature. These companies outpace others in the use of cloud services and platforms, the use of technology for design concurrency, digitalized asset management, and other important processes. These workflows, in turn, drive important outcomes such as more scalable and flexible infrastructure, as well as the monetization and repurposing of existing digital assets.

Embracing digital transformation leads to tangible business benefits that have a real impact on daily productivity and project

outcomes, M&E professionals explain in interviews. Cloud connectivity is helping creative professionals to collaborate like never before, they say, and investments in back-end computing infrastructure are powering advanced work in areas like visual effects.

Marion Guignolle, lead technical design animator for Gearbox Studio Québec, a video game development company, notes that companies must balance the pressure to move quickly with the need to evaluate new tools carefully. “It’s very important to stay up to date with what’s happening in technology because it changes every day and there is always something new,” Guignolle says. “You need to test and try things yourself to form your own opinion about what is going to work in your field and what isn’t. If you stay in your comfort zone, you’re going to get left behind.”

More digitally mature M&E companies are also more process mature



Percent of respondents who selected "very mature" in each process.
Survey question: In your company or organization, how mature are the following? 5-point scale.
See glossary on p. 78 for the definition of digital maturity.

INSIGHT 4

Companies are making meaningful progress in their AI adoption journeys

Business leaders and experts are bullish on artificial intelligence.

Already, their companies are uncovering valuable, industry-specific AI applications—with uses ranging from automated transcription of meeting minutes to assistance laying out factory floors. In the future, leaders and experts predict that generative AI will increasingly help human workers to make crucial design decisions about physical products, buildings, and digital assets.

Fifty-six percent say they are already approaching or have already achieved their goal of incorporating AI into their companies—a perhaps surprising number, given that generative AI is still an emerging technology. An even larger portion say that AI will enhance their

industry and be “essential across the board” within two to three years.

The response to Autodesk’s AI-powered tools indicates a similarly strong level of interest in the technology. The beta version of a Maya automation tool that helps artists manage their scene data saw a 60% increase in the number of users interested in the beta version compared to the average number of beta launch users, over the course of just a few months—a spike that is unprecedented in the history of the company’s beta launches.

While much of the conversation about AI in design and make industries centers on generative design, companies are also exploring use cases that streamline or enhance back-office processes. “There are plenty of use cases for AI, especially

when it comes to contracts, compliance, and risk assessment,” says Robert Gryś, projects management advisor at Public Works Authority of Qatar (Ashghal). “In a construction project you could have AI to review the tender documents whether the scope of work is compliant with your corporate BIM standards. During evaluation stage, you could ask the AI to check whether the proposals are responding to the tender requirements like scope of services or required resources which the contractor needs to provide. Normally, you would need a human to read hundreds of pages of contracts.”

Overall, the top use cases for AI today are increasing productivity and automating mundane, repetitive tasks.

78%

are confident that their company will make the **right decisions** regarding AI

78%

agree AI will **enhance** their industry

79%

agree AI will make the industry more **creative**

66%

agree in 2–3 years, AI will be **essential** across the board



INSIGHT 4

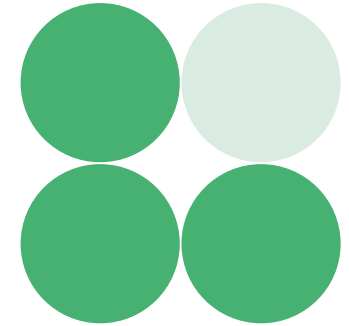
AI as trusted tool vs. AI as threat

Trust in AI is extraordinarily high, with 76% of respondents saying they trust the technology for their industry. However, this statistic is undercut by a vein of cautious skepticism running through interviews with business leaders and experts. Some express doubts that companies are going to be able to trust the technology enough to sign off on critical deliverables, noting that existing AI tools often present errors as facts. Others think that current levels of optimism will dim if bad actors misuse the technology.

“We’ve not yet had cases where AI has done something really bad,” notes Severin Tenim, head of strategic projects & development at ALEC Engineering & Contracting, a leading tier one construction and contracting firm. “Once there are more events of AI impacting society negatively, or malicious use of AI, I think that trust level will come down.”

Respondents are nearly evenly split on whether they see AI as a threat to their industries and companies, with neither side garnering a majority.

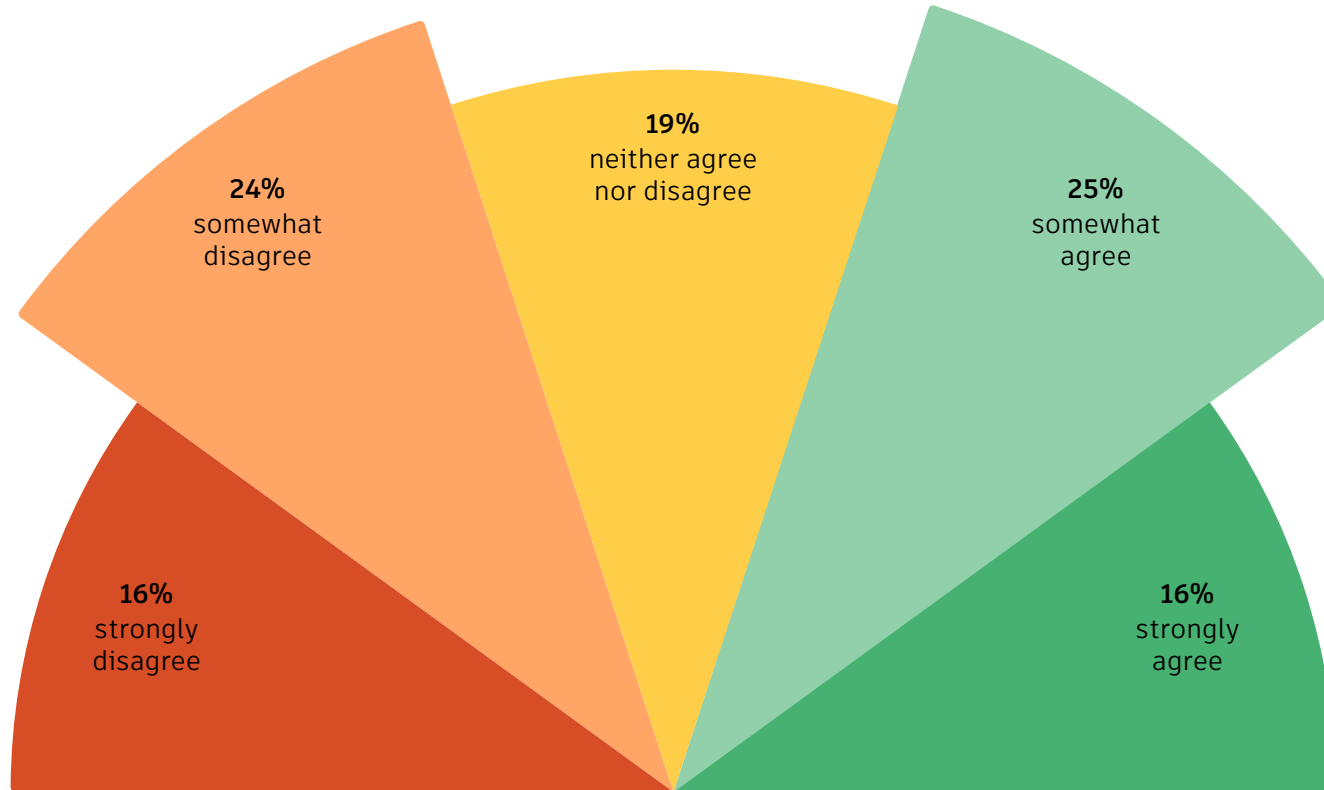
3 out of 4
trust AI technologies
for their industry



INSIGHT 4

Opinions are split on the destabilizing effect of AI

Percentage of respondents who agree that AI is a threat



Survey question: When you think about artificial intelligence (AI) in your industry and company, to what extent do you agree or disagree? AI will destabilize my industry. 5-point scale.

INSIGHT 4 – GLOBAL

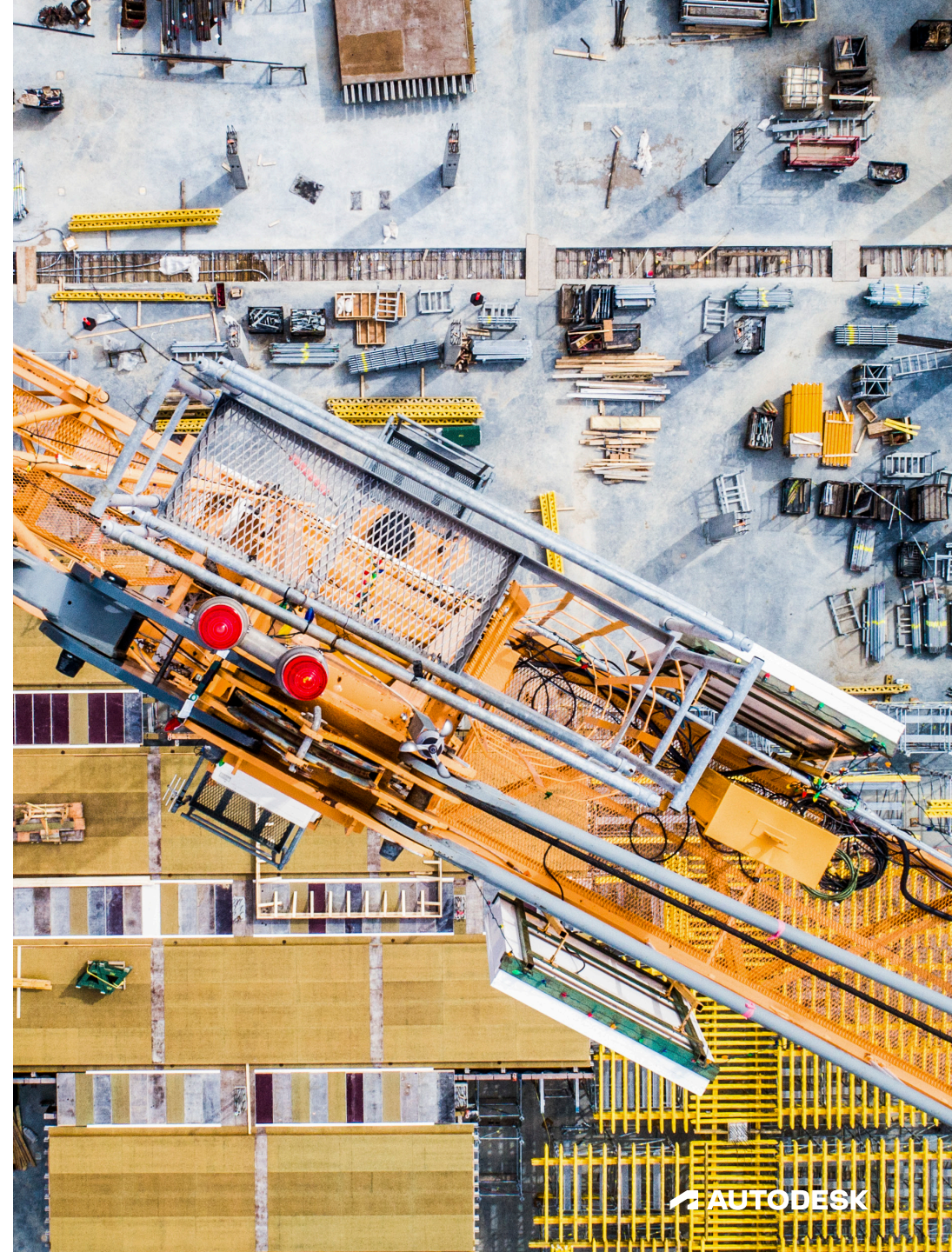
AI adoption by country

Companies are already exploring different ways to use AI. But regulations around the world have a direct impact on the speed of adoption. “You do need guardrails,” says David de Graaf, global director of digital at Royal HaskoningDHV, a consultancy engineering firm providing solutions for the natural and built environment. “The European Union is establishing a new act to regulate AI, including the use of ChatGPT and facial recognition. The US, UK, and China are also rushing to create guidelines. That makes it more difficult for international companies to adopt AI.”

A number of core challenges must also be solved before leaders and experts feel comfortable using AI to its fullest potential. Quansheng Xu, president of the Beijing Institute of Architectural Design,

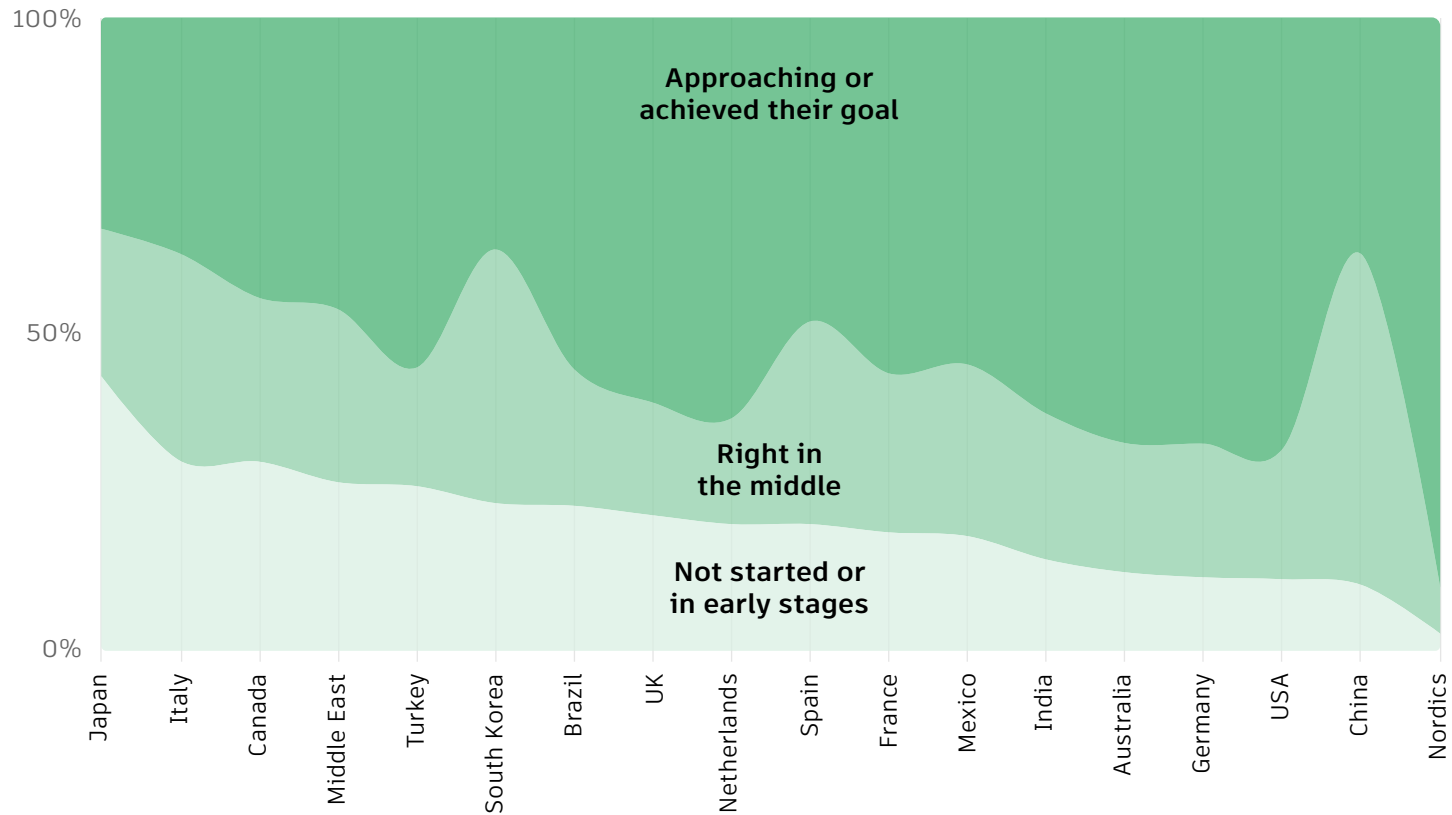
an architectural design and consulting institute, notes: “The outputs produced by AI still need to have a certain level of human-computer interaction to control the quality, at present. Sometimes the text or image generated by AI will contain errors, perhaps because it does not understand the design purpose. Instead of blindly trusting AI, we need to learn and grow with it to prevent these errors.”

Nonetheless, in Autodesk’s cross-industry generative design—and AI-enabled products, user engagement increased by 24% from January 2023 to November 2023 (though this does not take overall subscriber growth into account). APAC led the way with a 55% increase in user engagement, which conforms with survey data showing China, Australia, and India as some of the top AI adopters—though Japan and South Korea are more cautious.



AI adoption varies greatly

Japan, Italy, and Canada are cautious adopters while Germany, the USA, and the Nordics are all-in on AI



Survey question: Where is your company or organization in incorporating artificial intelligence (AI) technology? 5-point scale.

“Generative design is where we see the greatest potential for AI. But even though AI could do the constraints and input for you, the question is, ‘Are we going to be able to trust it in a production environment, and how thoroughly will it have to be checked?’”

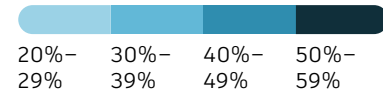
—Todd Rogers, BIM Manager, Walter P Moore, a consulting engineering firm

“AI can automate many tasks and free up creative people to focus on what they do best. Right now, we use AI to codesign interior spaces; our landscape architects have used AI to assist with conceptual drawings; and we can thank AI for winning work, as a matter of fact.”

—Damir Jaksic, CIO, KEO International Consultants, a design and engineering firm

Beyond productivity, AI use cases vary for AECO segments

Percentage of companies that use AI



	AI is ubiquitous and will be adopted in all areas	Automating mundane, repeatable tasks	Billing analysis	Identifying product/asset performance gaps	Increasing productivity	Producing informed design options	Supplementing a skills gap	Workplace safety and risk analysis
AECO	30%	39%	34%	34%	44%	36%	34%	36%
Architecture services	35%	38%	33%	35%	40%	39%	32%	37%
Building owners	37%	47%	34%	38%	44%	39%	29%	40%
Civil infrastructure owners	29%	37%	32%	30%	36%	34%	34%	28%
Construction services	25%	36%	34%	35%	44%	36%	34%	37%
Engineering service providers	32%	38%	35%	35%	48%	34%	35%	39%
Mining, oil, and gas	26%	44%	41%	28%	48%	35%	32%	37%
Utilities and telecom	32%	47%	30%	38%	57%	31%	39%	32%

Survey question: What are the use cases for artificial intelligence (AI) in your company or organization? Select all that apply.

“AI is going to allow robots to be able to adapt dynamically during their missions. For example, a robot could be taking pictures inside a water pipe. It might detect a crack. If that crack is a certain shape and a certain length, the robot would stop and take a closer look. This is just one way AI can proactively help with pipe maintenance while gathering more accurate data.”

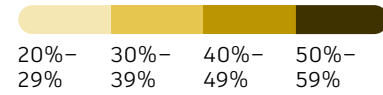
–Jean-Francois Guiderdoni, Director of Business Development and General Manager, ACWA Robotics, a robotics solutions for water management company

“There are challenges but also opportunities. The best opportunity is AI. We can do more, even better, with less. For example, using the same resources as before, we can create three or four proposals at the same time instead of only one.”

–Jinchun Hu, general manager of the JAC Italy Design Center S.R.L., an automotive and commercial vehicle manufacturer

Beyond productivity, AI use cases vary for D&M segments

Percentage of companies that use AI



	AI is ubiquitous and will be adopted in all areas	Automating mundane, repeatable tasks	Billing analysis	Identifying product/asset performance gaps	Increasing productivity	Producing informed design options	Supplementing a skills gap	Workplace safety and risk analysis
Design and manufacturing	35%	40%	35%	37%	50%	35%	37%	37%
Automotive and other transportation	35%	37%	32%	34%	48%	31%	37%	36%
Building products and fabrication	37%	37%	33%	38%	51%	41%	40%	37%
Consumer products	33%	46%	35%	37%	55%	32%	37%	36%
Industrial machinery	43%	37%	39%	40%	44%	37%	37%	38%
Life sciences manufacturing	34%	43%	37%	37%	41%	37%	32%	35%
Process manufacturing	26%	41%	34%	38%	59%	38%	36%	41%

Survey question: What are the use cases for artificial intelligence (AI) in your company or organization? Select all that apply.

INSIGHT 4 – M&E

“There are so many aspects to AI. Cybersecurity vendors are building AI into network security. Does that count as a creative company using AI? We’re using it to **protect our systems**. We’re not using it to create images. We’ve already had our clients tell us, ‘You can’t use AI unless you tell us.’”

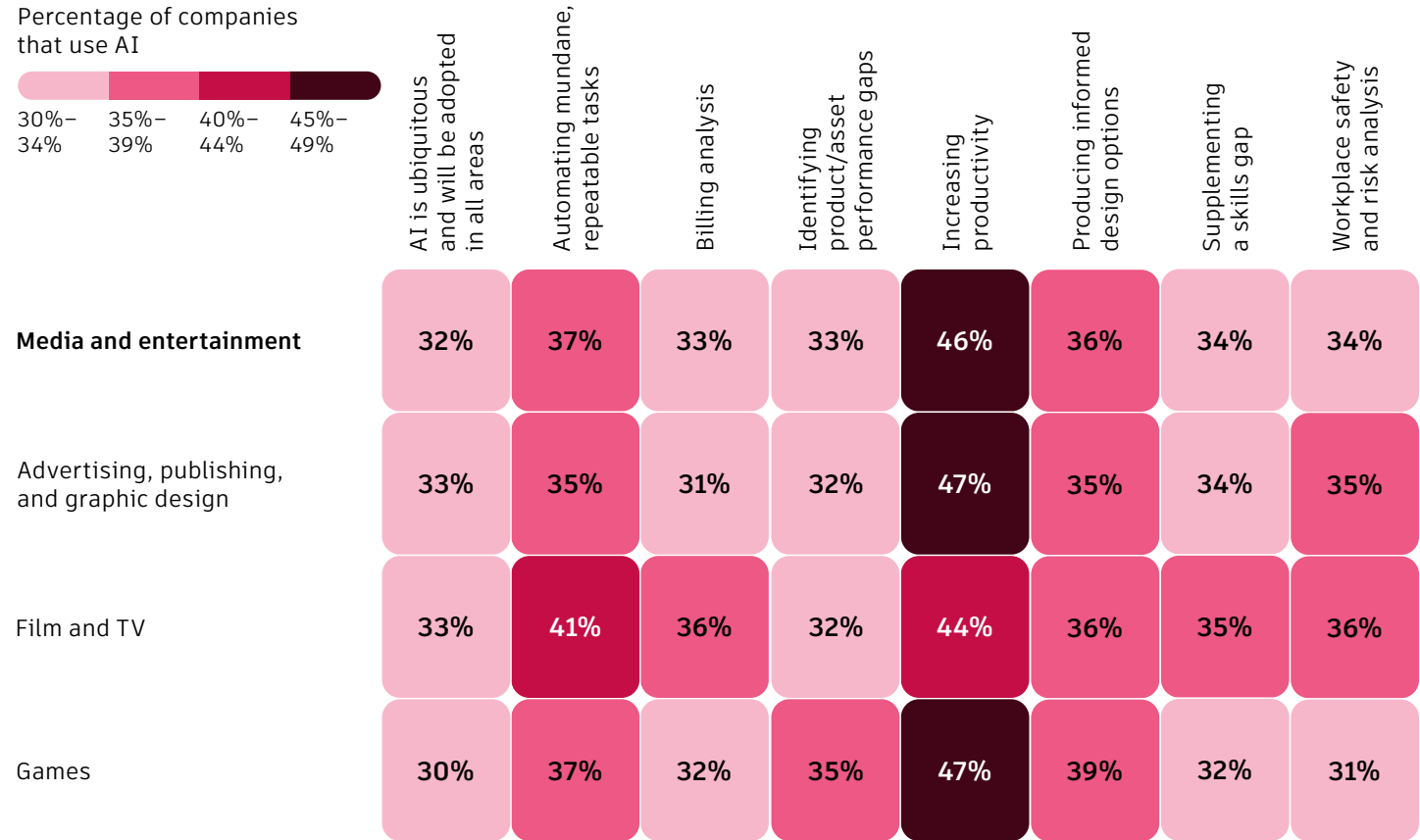
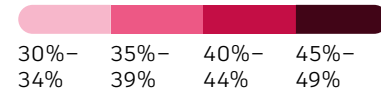
–David Spilsbury, Chief Technology Officer, Axis Studios, an animation and VFX studio

“We are testing different options for AI and [machine learning] ML and applying them to our daily work. For example, AI technologies are used to create concept art and set the direction for new games, with faster results.”

–Ji-Woong Hong, Executive Vice President of BF Production, COM2US, a mobile and online game development company

Beyond productivity, AI use cases vary for M&E segments

Percentage of companies that use AI



Survey question: What are the use cases for artificial intelligence (AI) in your company or organization? Select all that apply.

Talent

Bridging the talent gap





TALENT

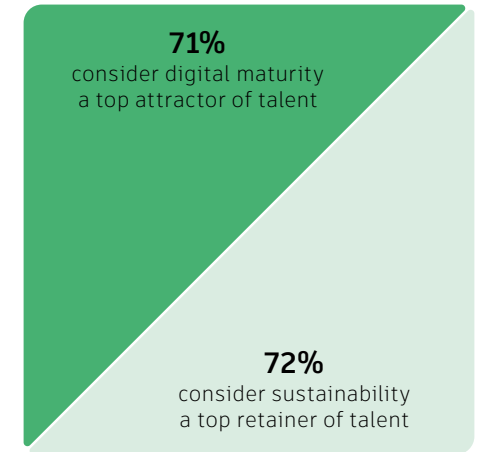
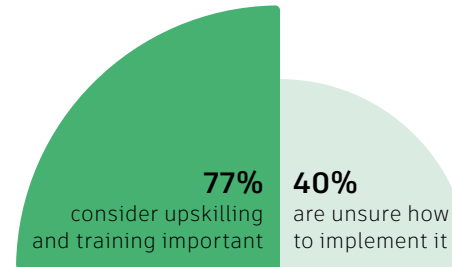
Companies tackle talent challenges with upskilling, digitization, and sustainability initiatives

Competition for top talent is less intense—but it's not over.

Although cost control has dethroned talent as the top business challenge, attracting and retaining skilled employees is still top of mind for most organizations.

The global labor market has shifted in favor of employers, according to the business leaders and experts we surveyed. Still, respondents say their companies are shoring up remaining talent gaps through a mix of training, digitization, and other means.

Companies recognize the importance of developing talent but don't have the resources to do it





INSIGHT 5

Upskilling is essential but out of reach for many

Leaders want to train and upskill their workforces, but not everyone knows how, and many organizations lack the expertise needed to design effective internal training programs.

Seventy-seven percent of survey respondents agree that upskilling is important. However, only 38% say their organizations have the necessary skills and resources to design internal training programs, making it difficult for companies to effectively train employees on systems and processes that are specific to their organization. However, these limitations

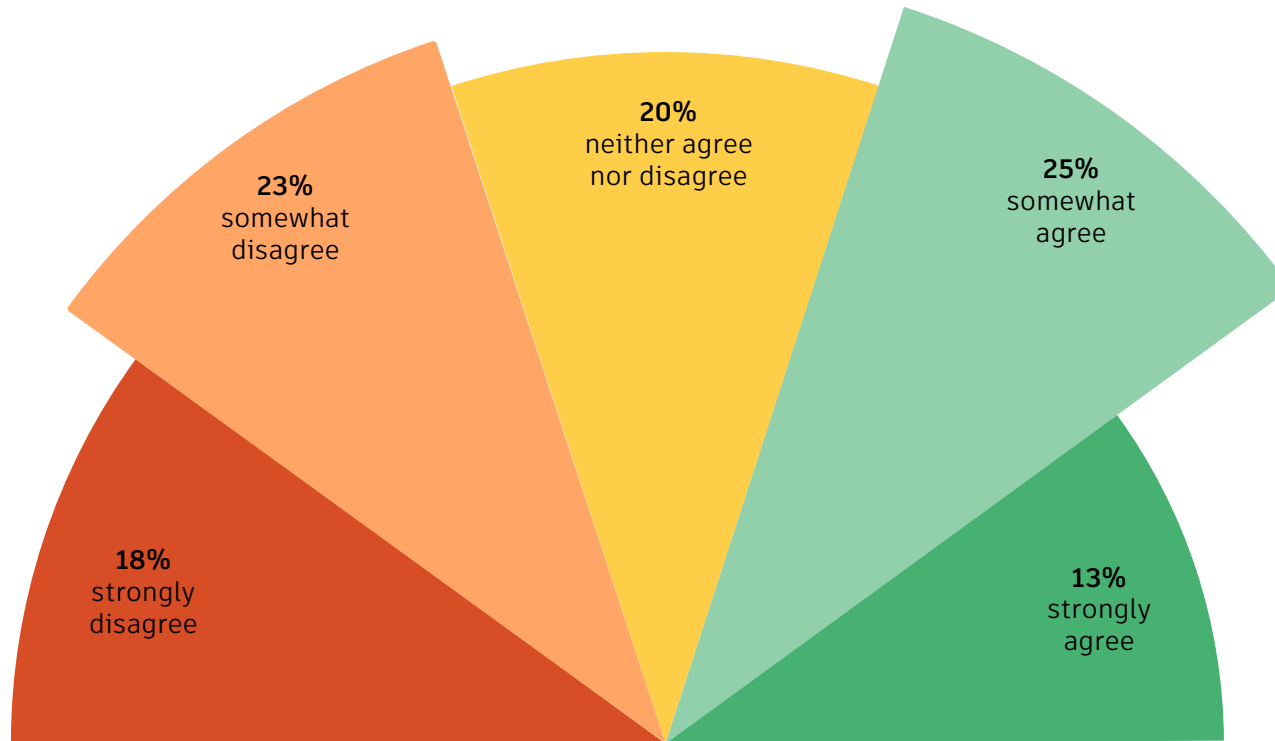
are not stopping companies from offering any training at all. For instance, 71% are implementing continuous learning.

To bridge the training gap, some companies are bringing in outside help in the form of third-party training platforms. “We’ve opted for self-driven training over classroom training,” says Richard Matchett of Zutari, an infrastructure engineering and advisory practice. “We have a very robust training system and structured online courses, and we’ve got open availability to all of this training for our team.”

INSIGHT 5

Companies lack resources or skills for internal training programs

Percentage of respondents who agree they don't have what they need



Survey question: My company doesn't have the skills or the resources to design internal training programs. 5-point scale. Values do not add up to 100% due to rounding.

INSIGHT 5

Other self-directed learning methods include in-product training for learning digital tools, which already show a level of success—and often at a lower cost than formal training programs. For example, Autodesk’s anonymized AutoCAD data shows users are 35% more likely to learn a new command after seeing a personalized insight recommendation.

Maria Fernanda Olmos of Unispace, a workplace strategy, design, and construction firm, points out that training challenges are not always related to a lack of budget or resources. “The challenge internally when running training programs is mostly due to balancing upskilling needs and ongoing project demands,” she says. “Of course, the adoption of new skills and workflows may encounter resistance from some employees, but this is becoming less of a challenge as we consistently demonstrate the efficacy of our systems and processes.”

Among respondents who cite access to skilled talent as a top challenge, 21% say

their company is meeting this challenge with upskilling and development for existing employees by way of technology training, mentorship and coaching, and upskilling and reskilling programs that help employees to meet evolving demands.

Another 11% are addressing talent challenges by training new hires and offering internships and apprenticeships.

Lei Yuan, chief engineer of iron and steel company China Baowu Design Institute/Baosteel Engineering & Technology Group Co., Ltd, stresses the importance of not only training employees but also tracking and incentivizing these upskilling initiatives. “We have digital training for our designers and exams to measure the results of the training program—both their theoretical competence and also their practical competence,” Yuan says. “This is all part of our HR system, and the promotion and compensation of employees are closely linked with their digital performance.”



INSIGHT 5

Digital skills in demand

The ability to work with AI has emerged as the top digital skill that organizations are looking for—followed by digital design and software development/programming.

Industry professionals say that these skills are essential to unlocking the digital transformation benefits discussed above. For instance, Michal Latata of Centralny Port Komunikacyjny—an air, road, and rail transfer hub—notes that firms that lack digital expertise may find themselves at a disadvantage—especially when competing against companies that have made proactive investments in employees

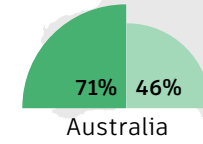
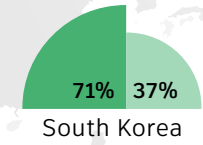
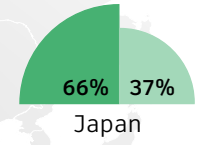
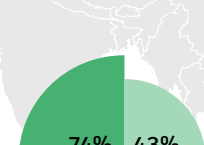
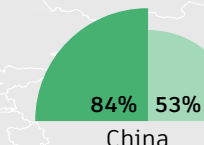
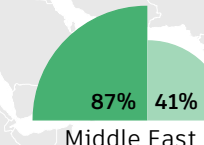
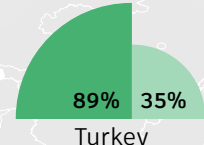
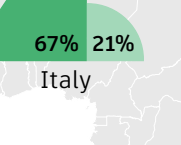
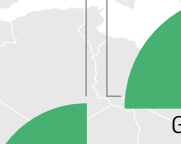
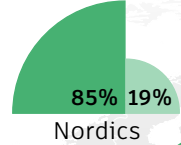
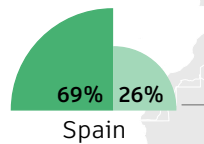
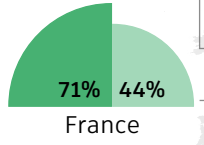
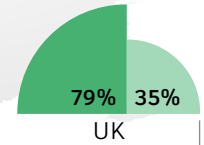
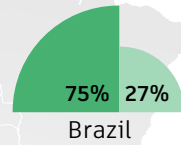
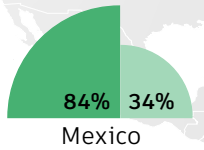
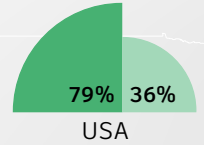
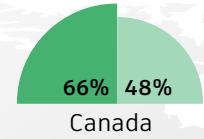
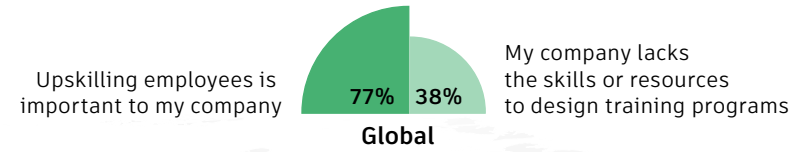
with advanced digital skills. “If you are not hiring digital experts, you will not be selected for certain projects, because there are other companies that are ready,” he says.

Maria Fernanda Olmos of Unispace says that companies in her industry need skills directly related to integrating technology with business processes. Such roles include AI strategists, data scientists, and BIM specialists. “It’s super important to have people who can look at the entire technology portfolio in a business and understand how it can be integrated and utilized,” she says.



The upskilling gap

Companies value training but lack resources



Percentage of respondents who agree to statements: 1. Upskilling employees is important to my company. 2. My company doesn't have the skills or the resources to design internal training programs. 5-point scale. Top two= agree.

INSIGHT 5 – AECO

AECO skills of the future

With the rapid evolution of technology in the AECO space, organizations are prioritizing digital skills for future hires. Cybersecurity, digital design, and AI will all be in high demand as companies try to gain a competitive edge through emerging technology—and the talent that wields it.

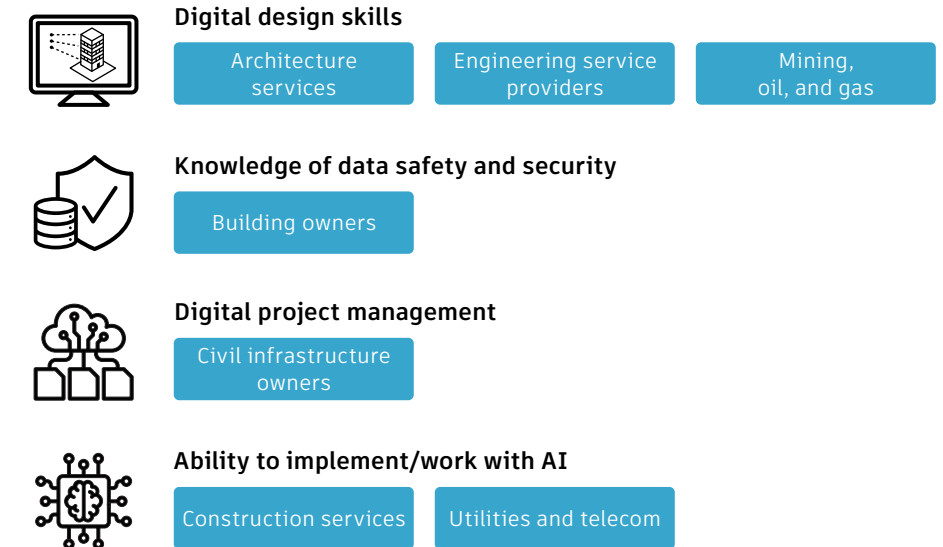
Trends in professional certifications reflect respondents' opinions, as well. For Autodesk's AECO certifications portfolio, there was a 71% increase in certifications from 2021 to the end of 2023.

In interviews, AECO business leaders and experts cite specific job roles that will become more important in the future, such as AI strategists who can help companies to maximize the potential of the technology and data librarians who can help organizations to organize and better leverage the vast quantities of information they store. "It's not easy to find professionals who have knowledge about digital systems and can link them with engineering development and construction management," says Kleber Moreira of metals and mining company Vale S.A. "That's the new reality of the market, and that's why we need to develop people."

Top 3 skills of the future



Top industry skills



Survey question: What technical or digital skills do you believe your company or organization will be prioritizing when hiring over the next 3 years? Select all that apply.

INSIGHT 5 – D&M

D&M skills of the future

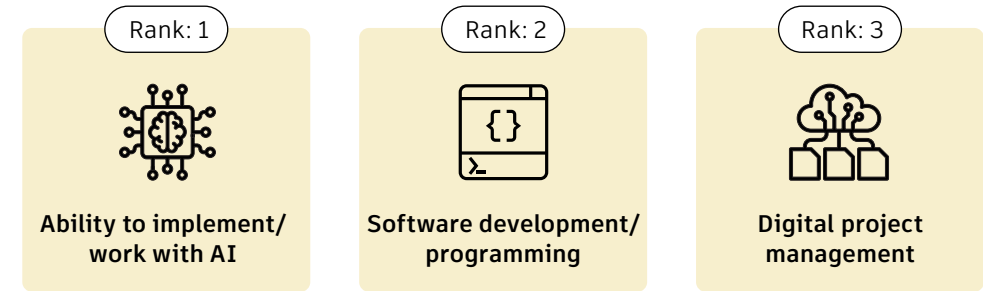
It is not much of a stretch to say that the D&M industry is in a constant state of digital disruption. In just the past several years, the industry has seen a dramatic increase in the use of technologies such as the Internet of Things (IoT), robotics, and digital twins.

Looking ahead, AI is expected to impact virtually all aspects of the industry, through applications such as generative design, predictive maintenance, and supply chain automation. It is little surprise, then, that leaders and experts in the industry say that companies will increasingly need

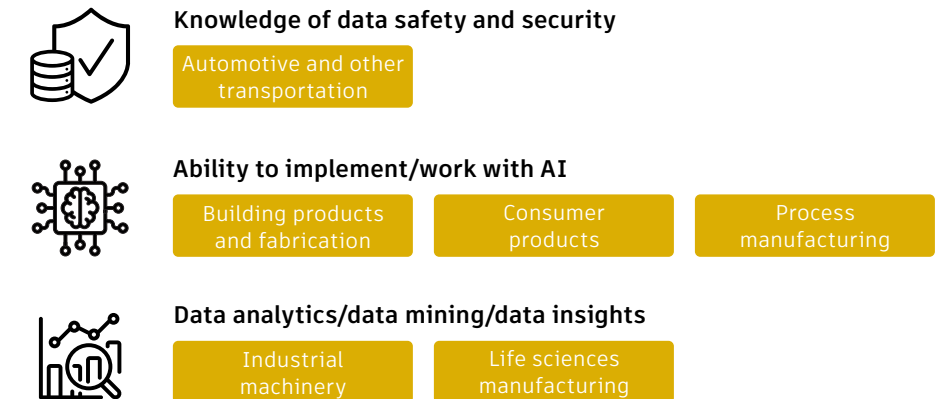
employees with a range of digital skills. Miro Lin of Fair Friend Group, a machine and equipment manufacturing firm, notes: “We need versatile talent with different capabilities—for example, people who are good at not only designing equipment but also programming and using analytical tools,” Lin says.

Industry certification data also shows the growing importance of digital skills in D&M. From 2021 to the end of 2023, there was a 100% increase in Autodesk’s D&M portfolio certifications, reflective of the D&M industry’s rising interest in digital tools.

Top 3 skills of the future



Top industry skills



Survey question: What technical or digital skills do you believe your company or organization will be prioritizing when hiring over the next 3 years? Select all that apply.

INSIGHT 5 – M&E

M&E skills of the future

M&E professionals broadly agree that digital skills and a willingness to participate in self-directed learning will be vital to helping usher their field into the future. “Flexibility is a skill set I always value,” says Gaspard Roche, associate global head of characters at Mikros Animation, a visual effects, post-production, and animation company. “When we needed more artists in one of the other departments, we were able to shift people if they could work in another area. The cool thing about flexibility is you also get to know other aspects of the business and workflows that can make you better in your main skill set.”

Data from Autodesk suggests that M&E workforces are in alignment with these observations, with a 143% increase in Autodesk’s M&E portfolio certifications over the course of three years, from 2021 to

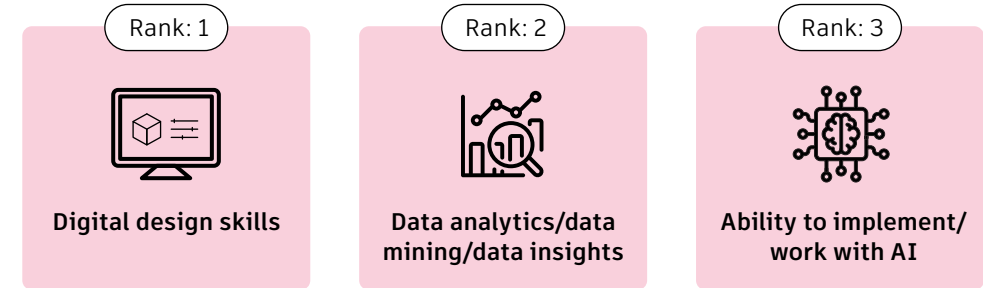
the end of 2023. Based on Autodesk data, the top three training topics are model texturing, real-time character rigging, and creating architectural visualization scenes.

Some in the industry have expressed ambivalence about the role of AI in creative work, and the technology played a central role in recent actors’ and writers’ strikes. Still, respondents across all segments of the industry say that the ability to implement AI tools will be a necessary skill for future employees.

“Being able to work with and harness AI, whether it’s in art, development, or game planning, will be an important skill set in the future,” says Ji-Woong Hong of COM2US, a mobile and online game development company. “Additionally, technical artists and data scientists who can use AI models to predict the viability of different business models will also be valuable.”

Top 3 skills of the future

Film and TV



Games



Advertising, publishing, and graphic design



Survey question: What technical or digital skills do you believe your company or organization will be prioritizing when hiring over the next 3 years? Select all that apply.

INSIGHT 6

Companies are taking a multipronged approach to solving the talent problem

Across the board, companies are facing far fewer challenges when it comes to talent. In fact, the number of respondents citing access to skilled talent as a barrier to growth dropped to 43% this year, down from 64%.

Part of this shift may be due to changes in macroeconomic conditions, with some major companies initiating large rounds of layoffs in the past year, and the number of job openings in the United States shrinking to a post-pandemic low. However, businesses are also taking steps to strengthen their company culture to attract

potential recruits, help existing employees become more productive, and convince workers to stay for longer.

Employees are attracted to organizations that give them the tools to be productive and successful in their jobs, as well as those whose actions align with their own values. Seventy-one percent of respondents say digital maturity helps attract talent, while 72% say sustainability efforts help attract and retain talent, illustrating the far-reaching positive effects of these initiatives beyond their original scope and goals.



“The most difficult thing in a company is hiring people with the right attitude. **Skills, you can teach, but not attitude and mentality.**”

—Dave Amantea,
Chief Design Officer,
Pininfarina, a car
design firm



INSIGHT 6

The most common ways companies are bridging the talent gap is by amping up their talent recruitment efforts and by diversifying their training and upskilling efforts.

These include training programs, online courses, and diverse forms of self-directed learning such as in-product cues, whose success makes them a viable alternative to traditional software courses. For example, anonymized Autodesk data shows that Revit and AutoCAD users are more likely to adopt learning recommendations viewed in-product than through other channels—Revit users had a 123% increase in adoption compared to a 55% when viewing learning recommendations through the account portal. AutoCAD users also saw a 44% increase for adoption with in-product recommendations compared to the 35% increase with the account portal.

Competitive salaries and benefits, a more transparent and efficient hiring process, remote work, and fostering diversity and inclusion are also top tools for attracting a broader range of skilled individuals.

David Spilsbury of animation and VFX studio Axis Studios cites flexible work opportunities as a draw for talent in his field. “You can work remotely full time in our industry, which removes barriers like commute times,” he says. “We’ve supported the hybrid working model and used it as a retention method—not forcing people back into the studio, but allowing them to come back in for screenings, events, and review sessions where it does make sense to be together.”

Others note the importance of having a strategy to address talent leaving the company or industry. “The younger generations have a much higher turnover,” says Lisette Heuer, director of business transformation at Royal HaskoningDHV, a consultancy engineering firm. “That in itself is a change management challenge—we need to have faster onboarding and better knowledge management systems so that when someone leaves, the disruption is not as severe, and work will continue.”

INSIGHT 6

Taking action on talent

Companies are taking diverse steps to tackle their talent challenges.

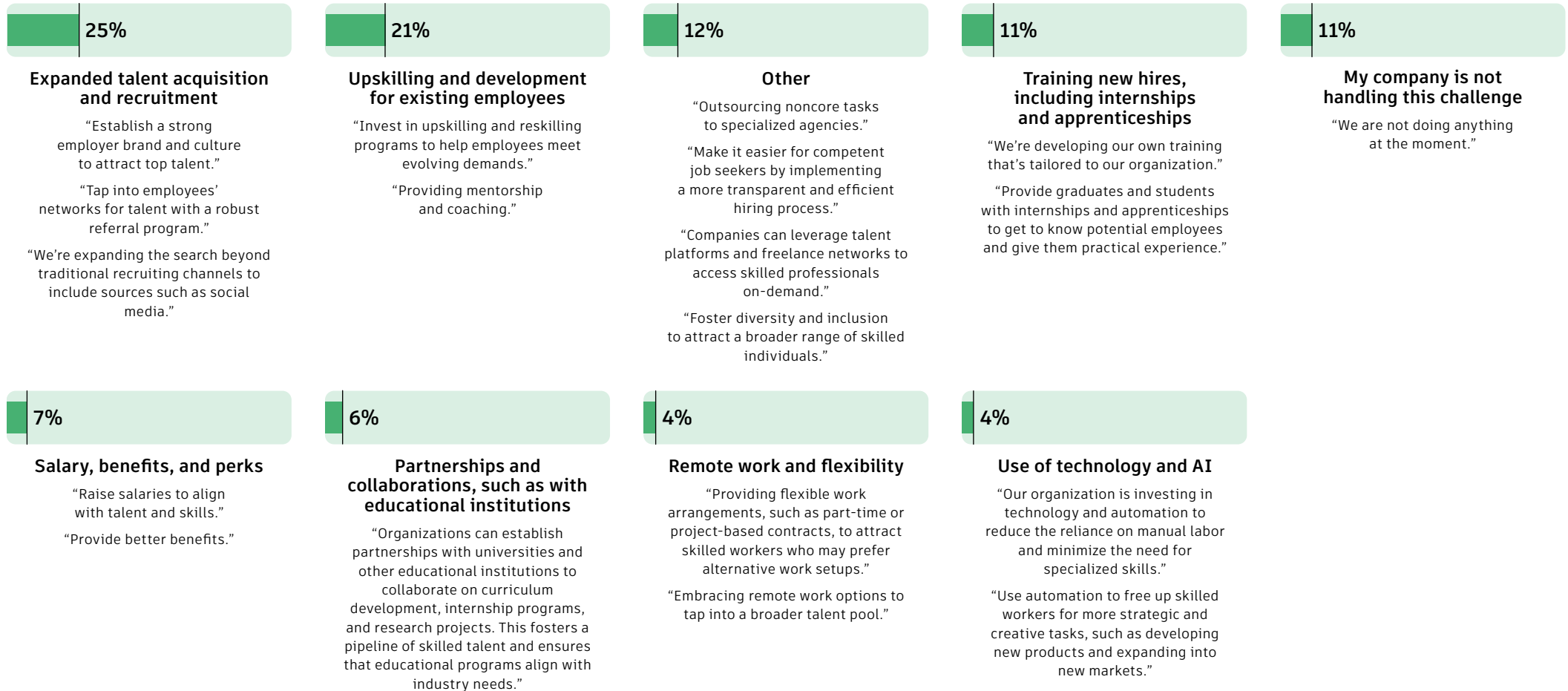
Organizations that struggle to attract skilled workers and those with an aging workforce are largely focusing on expanded recruitment and training. For those with high rates of attrition, the focus tends to be more on providing career advancement and development opportunities, as well as on compensation and benefits. Perhaps surprisingly, only 4% of those struggling with a lack of talent or an aging workforce say their companies are using remote work to tackle these challenges.

Notably, a significant share of respondents who say their companies struggle with talent also say that their companies are not doing anything to solve the problem.



Challenge 1: Lack of access to skilled talent

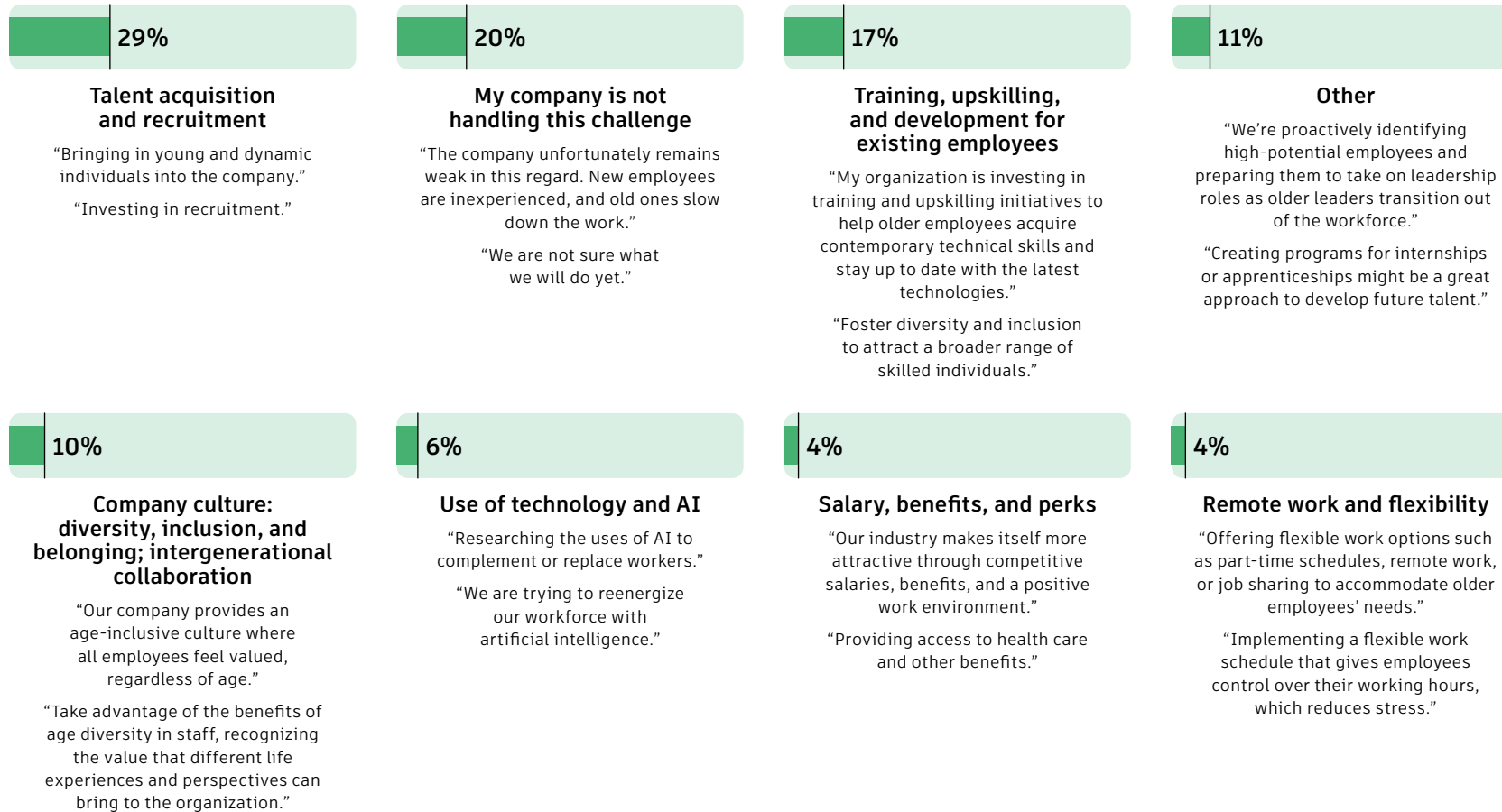
Expanding recruitment and upskilling efforts are top solutions



Percentage of respondents who agree identified "lack of access to skilled talent" as top challenge (43%). Survey question: What is your organization doing to meet the talent challenge? Qualitative open-ended responses.

Challenge 2: Rapidly aging workforce

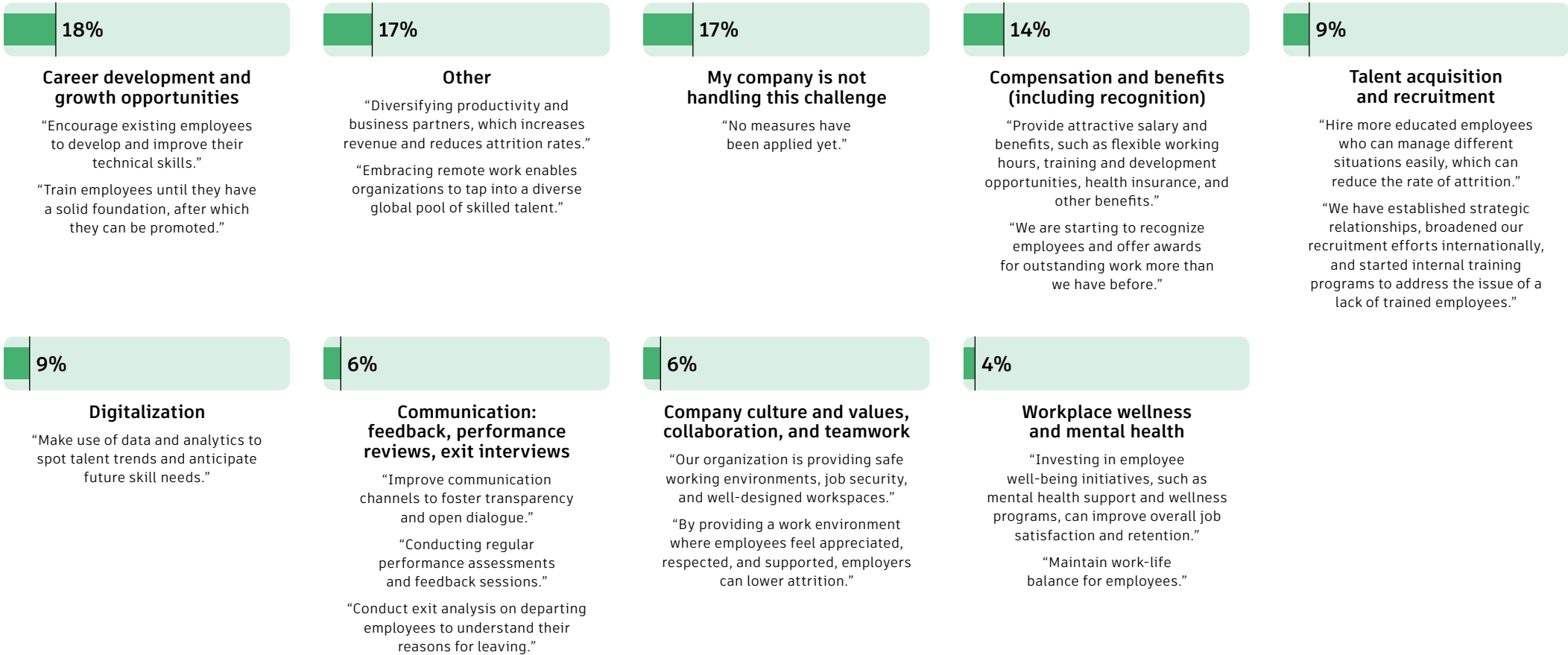
Companies are addressing gaps with increased recruitment and training



Percentage of respondents who agree identified "workforce rapidly aging" as top challenge (42%). Survey question: What is your organization doing to meet the talent challenge? Qualitative open-ended responses.

Challenge 3: Higher rates of attrition in past 3 years

Companies embrace a diverse set of potential solutions



Percentage of respondents who agree identified “faced higher rates of attrition in past 3 years” as top challenge (38%).
Survey question: What is your organization doing to meet the talent challenge? Qualitative open-ended responses.

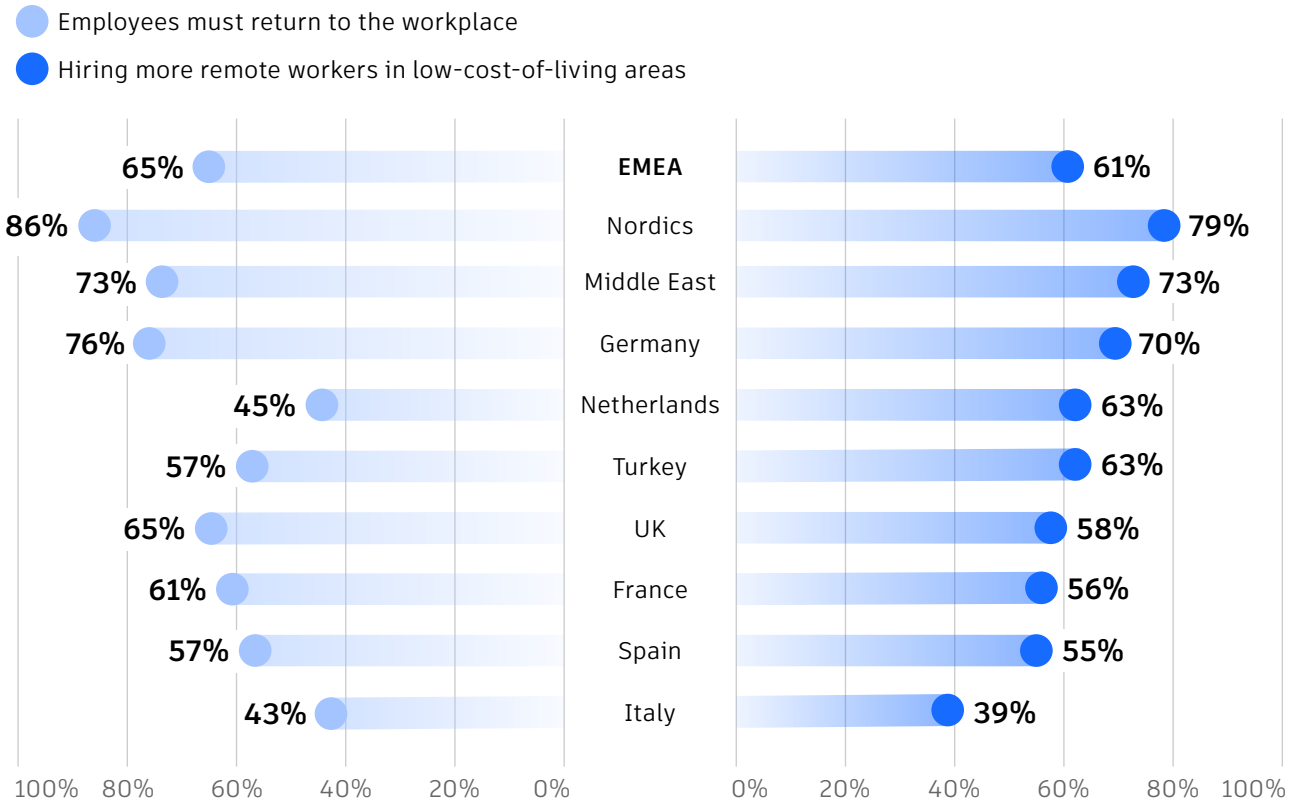
INSIGHT 6 – GLOBAL

Workers return to the office, but remote hiring continues

Survey data shows a mixed picture regarding remote work. Sixty-two percent of respondents say their companies are mandating a return to the workplace, signaling that employers are not yielding to workers' preferences in the race for talent. However, 59% say their companies are seeking remote talent from low cost-of-living areas, a seeming contradiction. Most likely, this suggests that companies are hiring remotely to save on costs while also mandating return for employees who live close to a workplace.

The push and pull of the new normal

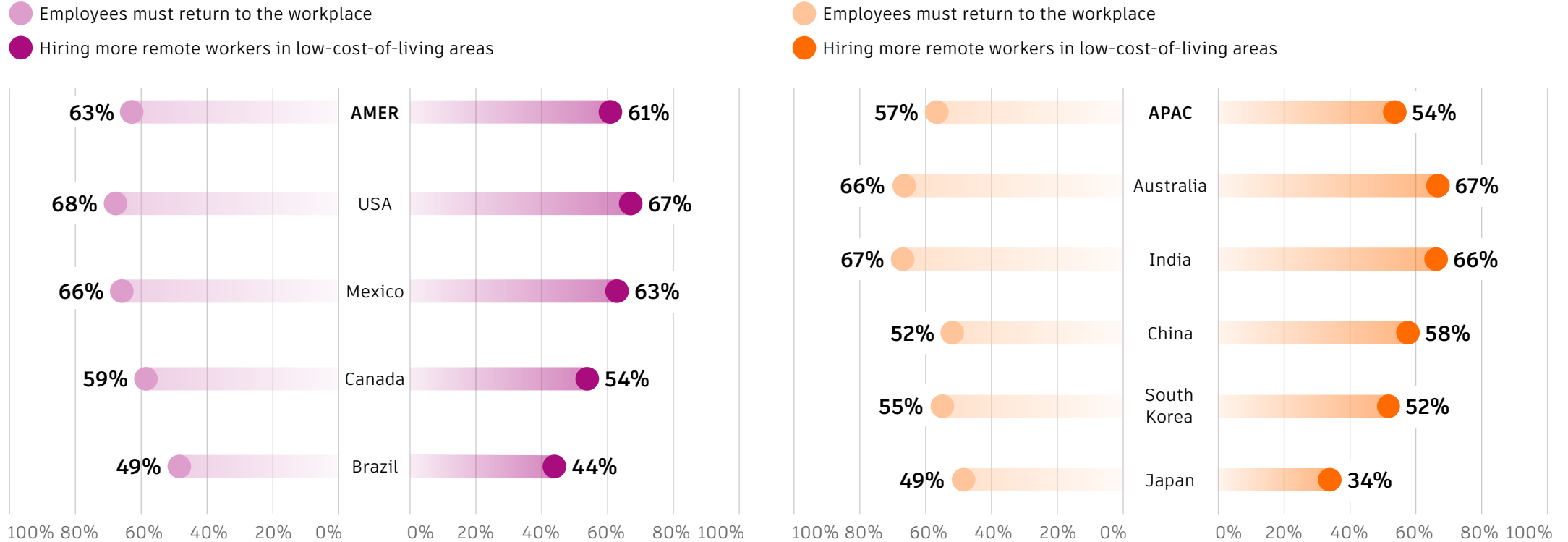
Companies are both hiring remote workers and mandating employees return to the workplace



Percentage of respondents who agree with statements: 1. My company is mandating that employees return to the workplace. 2. My company is looking to hire more remote workers in low-cost-of-living areas. 5-point scale. Top two= agree.

The push and pull of the new normal

Companies are both hiring remote workers and mandating employees return to the workplace



Percentage of respondents who agree with statements: 1. My company is mandating that employees return to the workplace. 2. My company is looking to hire more remote workers in low-cost-of-living areas. 5-point scale. Top two= agree.



INSIGHT 6 – AECO SPOTLIGHT

ALEC Contracting & Engineering

Severin Tenim, head of strategic projects and development at ALEC, says that hiring and retaining engineering talent continues to be a challenge—particularly when it comes to linking digital tools with engineering and construction processes. To solve these challenges, ALEC relies on training programs that help employees develop their skills and advance within the company.

“The challenge is trying to prioritize which training is the most important and when,” Tenim says. “We often ask people what they want to learn, rather than try to

dictate what they should learn. We adjust the curriculum based on their feedback. Alternatively, we focus it toward specific problems where we have to address particular issues that are occurring on multiple projects.”

ALEC’s leadership development programs also help with retention, as they provide employees with the skills they need to advance in the company. “It’s not good having a person in the same role for a very long time,” Tenim says. “You always have to challenge people. I myself went through these programs over the past 10 years, and that’s helped keep me with the organization.”



“We often ask people what they want to learn, rather than try to dictate what they should learn.”

—Severin Tenim, Head of Strategic Projects & Developments,
ALEC Contracting & Engineering

INSIGHT 6 – D&M SPOTLIGHT

Steelcase

Leaders at Steelcase, a furniture manufacturer, spend a great deal of time thinking about how to build a positive workplace culture.

“The work experience is shaped by policies, tools, and all of these things, but it’s also shaped by culture and space,” says Kim Dabbs, global vice president for ESG and social innovation. “We always have our eye towards innovation on the people side, as well.”

Steelcase works with Ashoka, a social entrepreneurship network, to create an inclusive workspace, including an effort

to bring migrant talent on board. Forty-five percent of workers at the company’s factories are underrepresented racial and ethnic minorities. The company has also sponsored leadership training for boys and girls in Romania—a program that eventually grew into an internship pipeline for the company.

“When it comes to skills, we’re partnering with the community to identify skills gaps and find opportunities for training,” Dabbs says. “We really look at not just upskilling and reskilling little by little but also reimagining what nontraditional pathways and pipelines could look like.”



“The work experience is shaped by policies, tools, and all of these things, but it’s also shaped by culture and space.”

—Kim Dabbs, Global VP, ESG and Social Innovation, Steelcase





INSIGHT 6 – M&E SPOTLIGHT

88 Pictures

Milind D. Shinde, founder and CEO at Indian media production company 88 Pictures, cultivated an innovative approach to developing talent in the wake of the COVID-19 pandemic. The firm started a training institute called Gurukul, which offers people from remote areas the opportunity to train for three months.

“I came from a humble beginning from a small town, and I’m the product of opportunities that were available to me, but not everyone gets those opportunities,” Shinde says. “We find students from remote parts of India, where they don’t have a lot of infrastructure, but they do have a lot of curiosity and a lot of innate skills. We bring them to a city like

Mumbai or Bangalore, and we incorporate them into our system.”

Trainees are assigned “buddies” and given simple tasks to start, with project complexity growing as they develop their skills. Shinde says the program is “very successful,” with some students learning the skills they need to work on productions in just six months.

This philosophy of continuous learning extends to the firm’s leaders, as well, Shinde says. “For example, our leadership team has to have good presentation skills that include language skills, so language training is very important,” he notes. “These are all upskilling experiences that help develop all-round talent, rather than just helping somebody become a better modeler.”

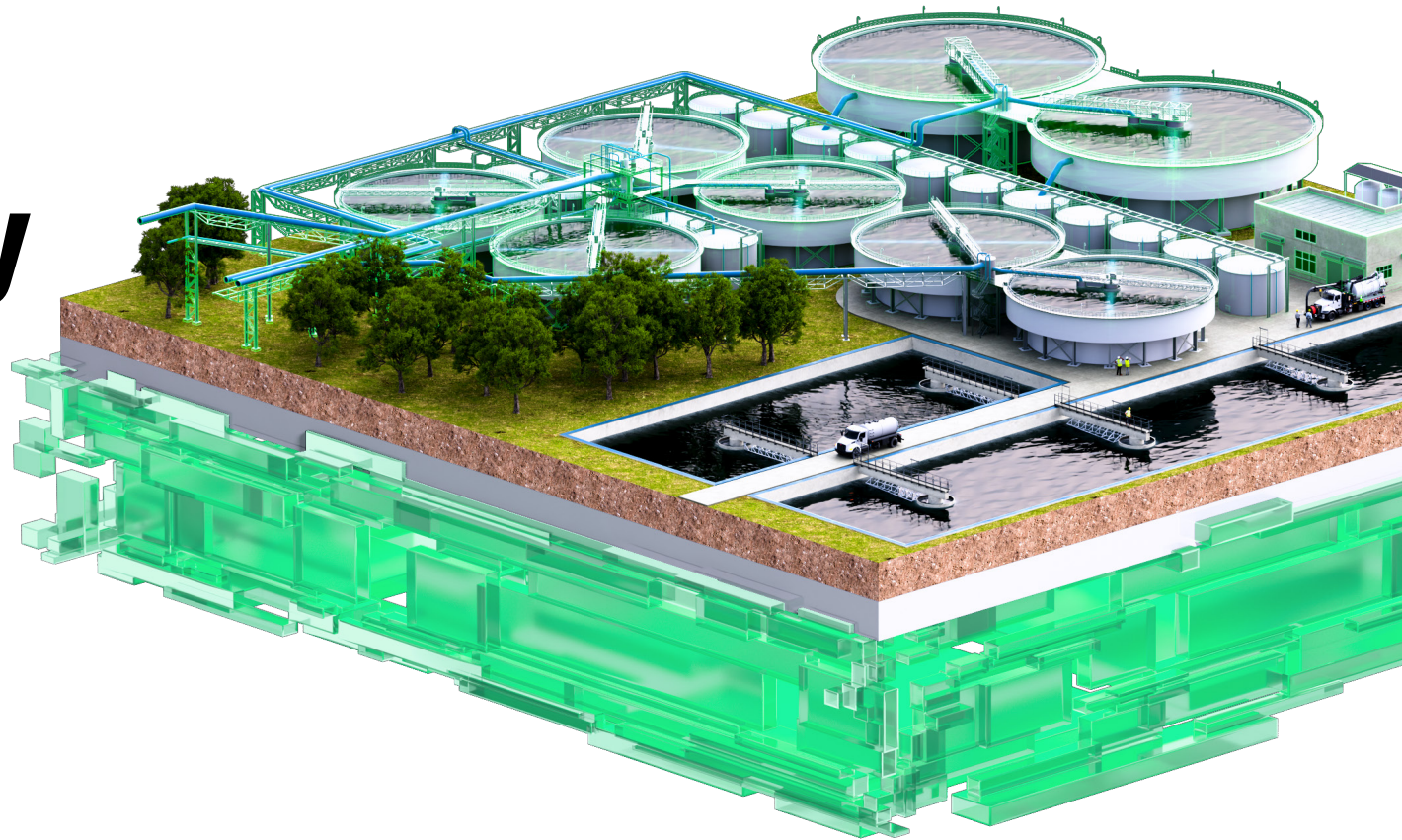


“We find students from remote parts of India, where they don’t have a lot of infrastructure, but they do have a lot of curiosity and a lot of innate skills. We bring them to a city like Mumbai or Bangalore, and we incorporate them into our system.”

–Milind D. Shinde, Founder and CEO, 88 Pictures

Sustainability

Business value drives
sustainability actions





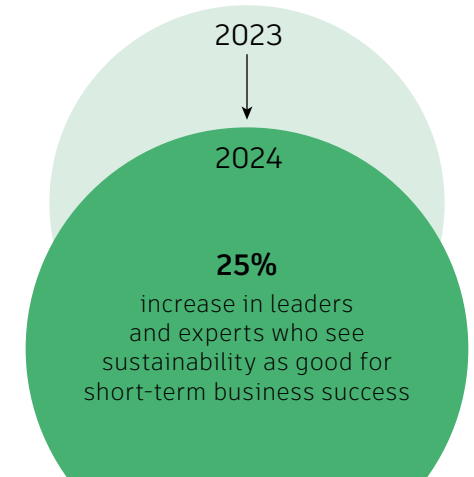
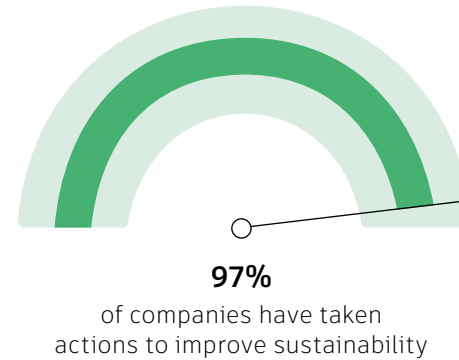
SUSTAINABILITY

Attitude and action

Sustainability is now a key concern for employees, customers, and investors—as well as an important driver of business success.

Shifting attitudes about sustainability are driving action, with companies making investments in energy efficiency, materials reduction, and more sustainable processes that are better for both the environment and the bottom line.

“Climate change is going to impact all of us,” says Dave Mackenzie of Aurecon, a design, engineering, and advisory firm. “The motivation for sustainability goes back to our purpose: bringing ideas to life, leaving a legacy, and improving the communities that we live in.”



INSIGHT 7

Sustainability becomes a key priority

Ninety-seven percent of organizations are taking steps to improve sustainability—a number that represents a five-point increase over last year, as well as a cross-industry consensus on the importance of becoming more sustainable.

Most commonly, companies are using AI to become more sustainable. This makes sense, as the bulk of a project's or product's sustainability impact is determined during the conceptual phase—a part of the process when organizations can use AI tools to optimize their decision-making for specific outcomes, including sustainability. Architects, for instance, are using AI to analyze urban design factors like traffic, noise pollution, and heat before shovels ever go into the ground. In the D&M sector, designers are leveraging AI to help reduce energy consumption and materials waste during production.

Other popular actions include increasing the use of recycled materials and renewable energy, investments in more

energy-efficient processes and equipment, and efforts to reduce waste. Notably, no more than 34% of respondents say their companies are using any one of these methods. This suggests that organizations are only taking actions that will be effective in their specific settings, rather than simply adopting broadly popular tactics.

Car design firm Automobili Pininfarina now sources its leather locally and seeks more sustainable materials to build its cars. “We are buying regionally, which means that there is zero pollution from moving the leather on a boat or on a car before it is finally delivered to our office,” says Dave Amantea, chief design officer at Automobili Pininfarina. “We also try to reduce the usage of plastic in our cars as much as possible, building with carbon fiber, glass, and aluminum instead.”

Damir Jaksic, CIO of design and engineering firm KEO International Consultants, says the firm is upping its use of recycled content and locally sourced

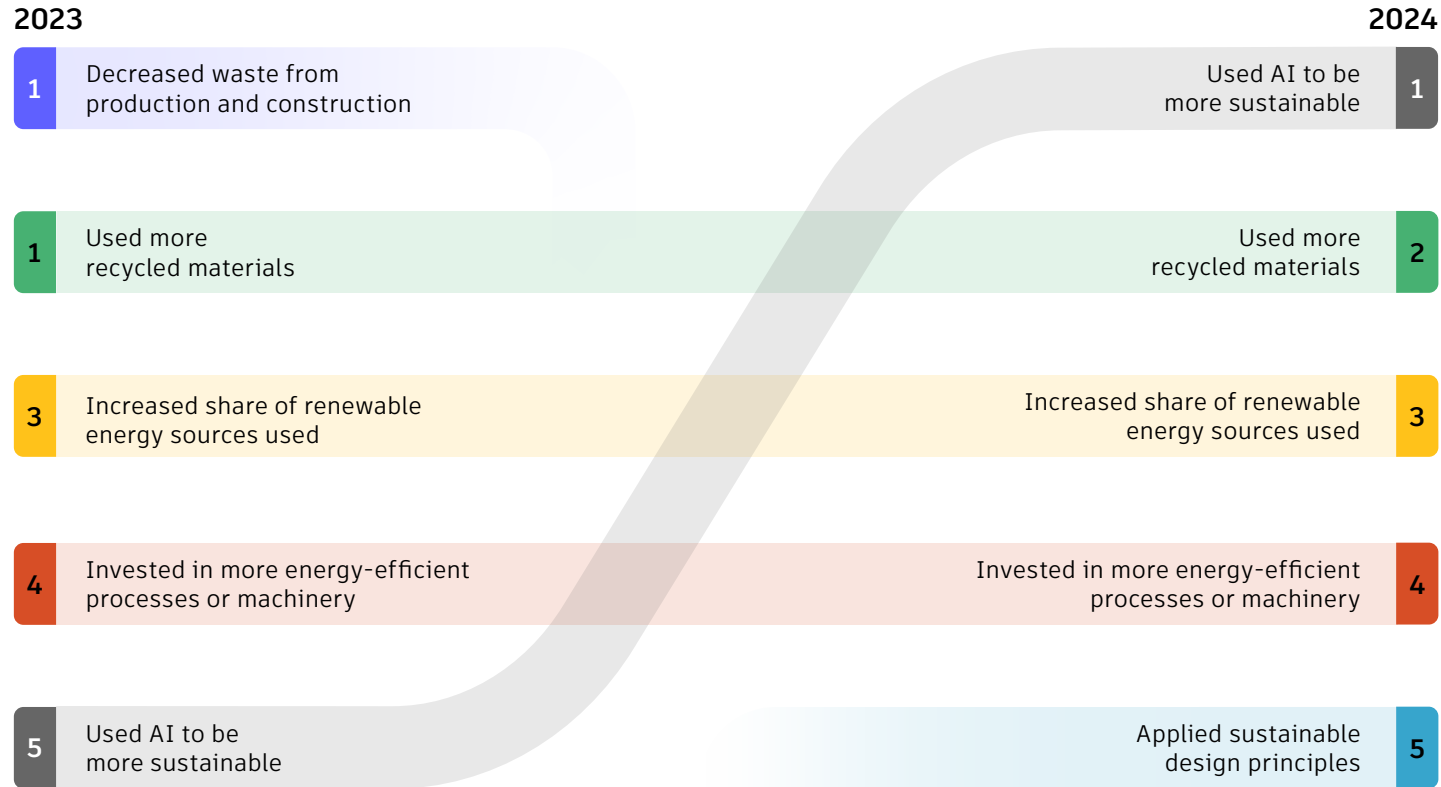
materials. “We are increasingly specifying the use of sustainable materials in our projects, such as recycled content, locally sourced materials, and materials with a low environmental impact,” he says. “We have around 80 sustainability professionals who are on the same floor as the designers, so there are a lot of collaboration opportunities.”

These actions are consistent with Autodesk data showing that user engagement with Autodesk products that enable sustainable outcomes increased by 14% across industries from January 2023 to November 2023 (though this does not take overall subscriber growth into account). This trend was particularly pronounced in the APAC region, where the number of users adopting these products increased by 51%. While more AECO organizations are adopting Autodesk products that drive sustainable outcomes, the growth of users in other industries is also robust.



AI jumps to the top sustainability action

Top 5 actions showing year-over-year change



Industry ranking of actions			
	AECO	D&M	M&E
1.	●	●	●
2.	●	●	●
3.	●	●	●
4.	●	●	●
5.	●	●	●

Survey question: What changes has your company or organization already made to be more sustainable? Select all that apply

INSIGHT 7

Changing sentiment

As organizations take more sustainability-centered actions, leaders and experts report significant changes in how they feel about their companies' efforts.

This year, 78% are proud of their company's sustainability efforts, up from 52%—a full 50% increase over last year. This is a seismic shift in sentiment, and it is reflected in interviews with business leaders and experts, who largely say that their companies' leadership, employees, and customers are united in their desire to improve sustainable outcomes.

“We're doing everything we can around using renewable energy, electrifying our fleet of cars, and minimizing air travel,” says Dave Mackenzie of Aurecon, a design, engineering, and advisory firm. “To help our clients get to net zero, we need to walk the talk. We're not paying lip service; we're driving legitimate change through the business.”



INSIGHT 7

Top motivators

Gone are the days when sustainability was seen primarily as a concern for government regulators. Customers, employees, and investors are all becoming more influential motivators as companies pursue their sustainability goals.

Just over four out of five respondents say they face pressure from each of these groups to be more sustainable, a sentiment that is also reflected in interviews. “Some customers say, ‘We want the greenest building ever,’ and will put an extra \$10 million into the project to install the best sustainability features in that building,” says Michael Dufhues, board member at commercial construction company Bremer SE. “It’s about what the customers want. The market dictates the decision.”

Government regulation trails slightly behind, with three-quarters of respondents saying their companies face government pressure to be more sustainable.

“There are many sources of pressure to be more sustainable—there’s media pressure, corporate pressure, new regulations, and incentives from the European Commission or governments,” says Jean-Francois Guiderdoni of robotics solutions for water management company ACWA Robotics. “Both governments and companies are starting to look beyond just rules and negative financial impact; they’re realizing there’s a lot of economic potential in sustainability. It’s actually creating value and generating a virtuous cycle.”

36%

of experts and leaders say that employees are “very influential” in motivating them to create and meet sustainability goals, up from 23% last year, a 57% increase

Which of these groups is influential in motivating your company to set and meet sustainability goals?

83%
customers

81%
investors

80%
employees

75%
government

The percent of respondents who say each group is influential.

INSIGHT 7 – GLOBAL

Becoming sustainability leaders

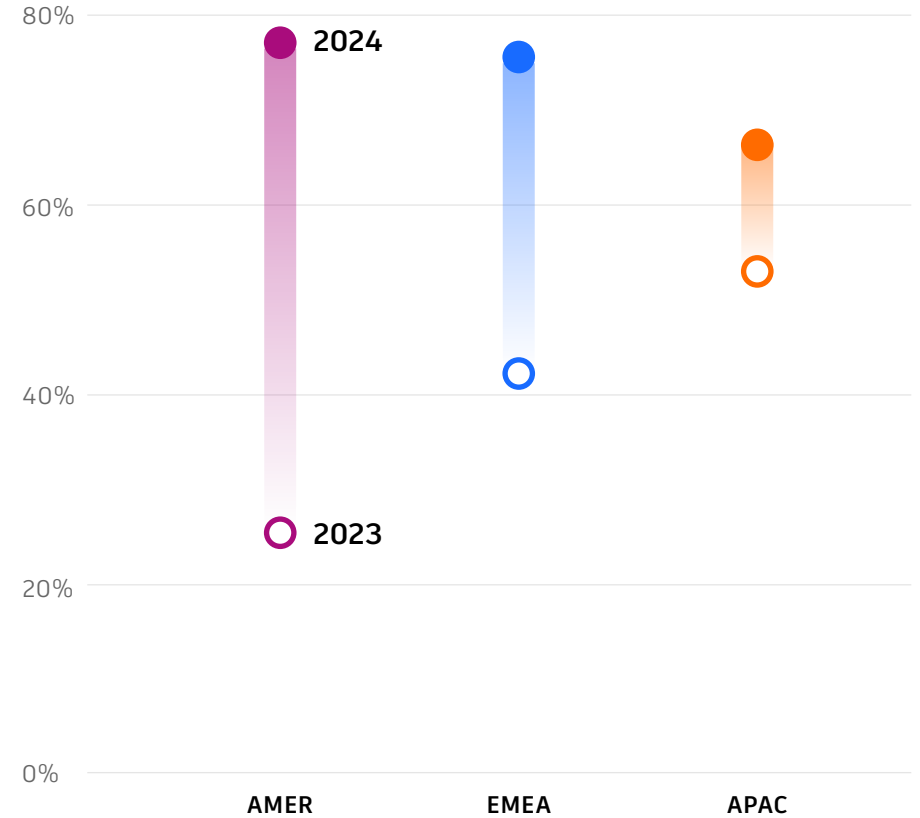
Most leaders and experts now see their companies as leaders in sustainability—a turnaround from last year. The Americas, in particular, saw a dramatic shift, with the portion of self-described leaders more than tripling in one year.

This new viewpoint is reflected in interviews where leaders and experts tend to speak of their organizations' sustainability efforts not as a burden, but rather as a source of pride for employees and a necessary step to stay competitive in the future. "Some of our clients from Europe and the United States started to

remind us to reduce emissions, and sooner or later, we will have to do it," says Miro Lin of Fair Friend Group, a machine and equipment manufacturing firm. "So why not take the initiative to do it in advance?"

Kim Dabbs of furniture manufacturer Steelcase sounds a note of caution about leaders becoming complacent with their companies' sustainability efforts. "The work that we do is forever work," she says. "No matter how much progress we make, there's always going to be more to do, it's great that people are optimistic, but I hope they stay grounded in the science and maintain their commitments without losing that sense of urgency."

Companies increasingly see themselves as sustainability leaders



Survey question: My company is leading the way in this industry when it comes to sustainability initiatives. 5-point scale. Top two = agree.

INSIGHT 7 – AECO

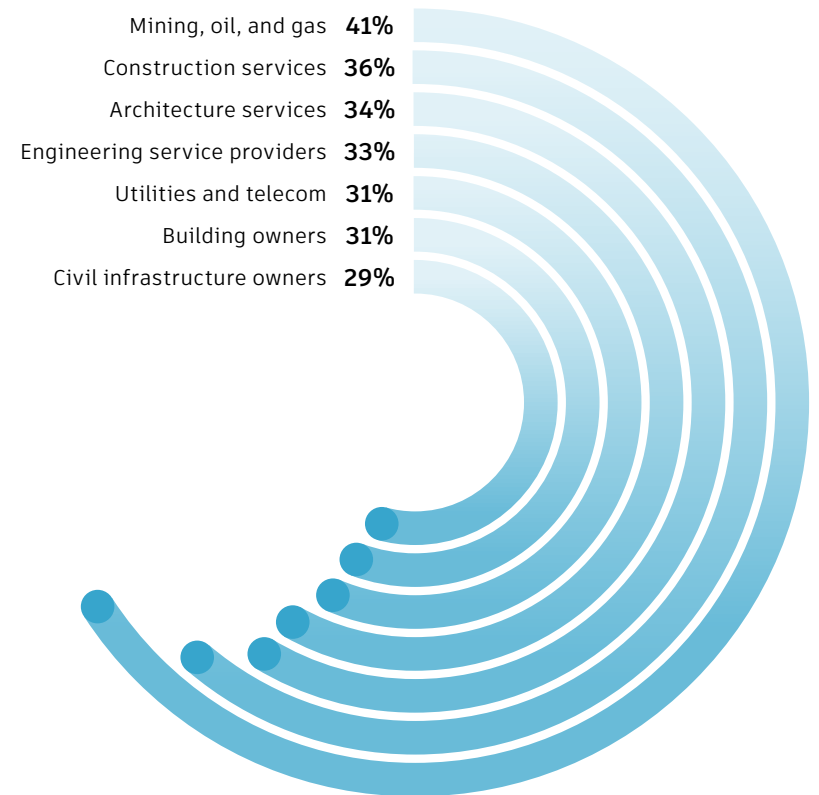
The younger generation's influence on sustainability

Around one-third of AECO respondents say the next generation is “very influential” in motivating their companies to take steps to be more sustainable. Mining, oil, and gas saw the highest number of any AECO sector, with 41% saying the next generation is strongly influencing their sustainability efforts.

“I’ve gotten a lot of feedback from younger employees about how they want to work on sustainable projects,” says Vince DiPofi, PE CEO for SSOE Group, an architecture and engineering firm. “Employees are saying, ‘This is important to me; I want to work at a company that’s focused on sustainability.’ They want to have an impact and know they’re doing the right things for the community and the world. I think that’s great.”

The next generation's influence on sustainability

Percentage of respondents who say the next generation is driving sustainability initiatives



Survey question: How influential is the next generation in pressuring your company or organization to create and meet sustainability goals? 5-point scale. Top option = very influential.

INSIGHT 7 – D&M

The future of D&M is sustainable

The next generation of employees is “very influential” in motivating its companies to become more sustainable in the D&M sector. The rate ranges from 29% in building products and manufacturing to 40% in industrial machinery.

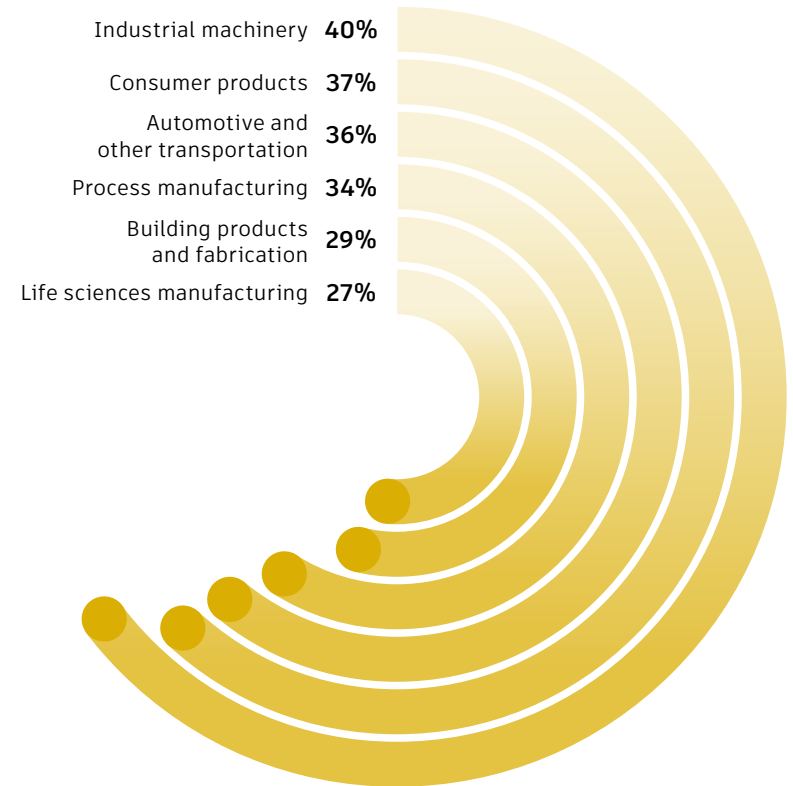
Jean-Francois Guiderdoni of ACWA Robotics, a robotics solutions for water management company, says young

employees are motivated not only by compensation and challenging work but also by the feeling that they’re having a positive impact on the world.

“You have a new generation of people who want to work on sustainability and make an impact,” Guiderdoni says. “The people who join us can be both technologically challenged through their work while seeing the impact of what they’re doing. They know they’re not just a cog in the machine.”

The next generation’s influence on sustainability

Percentage of respondents who say the next generation is driving sustainability initiatives



Survey question: How influential is the next generation in pressuring your company or organization to create and meet sustainability goals? 5-point scale. Top option = very influential.

INSIGHT 7 – M&E

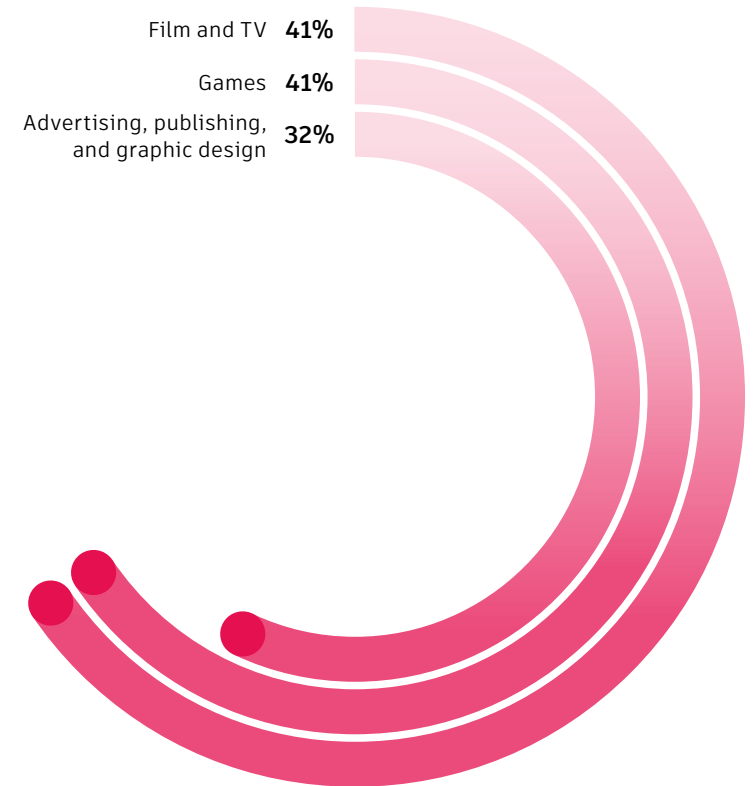
Sustainability in M&E: Younger employees apply pressure

Ji-Woong Hong of COM2US, a mobile and online game development company, notes that the M&E industry has historically had less exposure to sustainability issues than the AECO and D&M industries. However, he says his company has already implemented environmental training and volunteering programs, and he expects that the industry will invest more in sustainability initiatives over time.

A significant portion of M&E leaders and experts say the next generation of employees is “very influential” in motivating their companies’ sustainability initiatives. This is most pronounced in film and TV, as well as in the gaming sector, with 41% in each segment saying that the next generation of workers are very influential to their companies’ sustainability efforts.

The next generation’s influence on sustainability

Percentage of respondents who say the next generation is driving sustainability initiatives



Survey question: How influential is the next generation in pressuring your company or organization to create and meet sustainability goals? 5-point scale. Top option = very influential.

INSIGHT 8

Sustainability is proving its value to both short-term and long-term business health

What was true last year is even more true this year: Sustainability is seen as beneficial to the bottom line.

Sixty-nine percent of leaders and experts say sustainability is good for short-term business success—a 14-point increase from last year. Over the long term, 87% believe sustainability is beneficial for business (a seven-point increase).

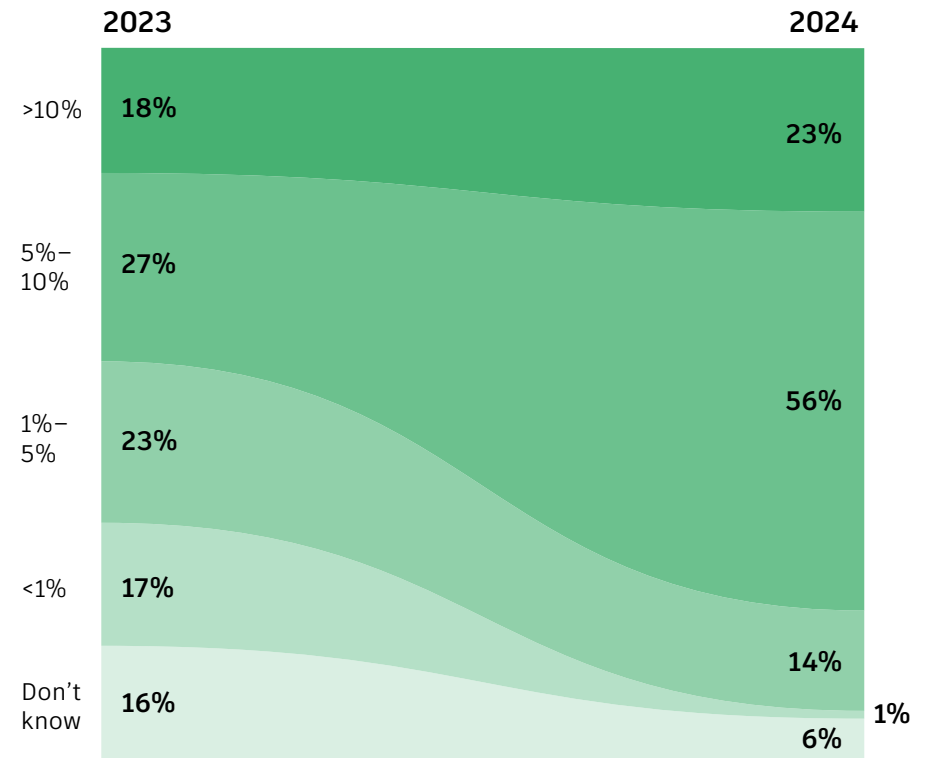
While some of this business value is likely due to an improved reputation with customers and employees, sustainability initiatives also present an opportunity to decrease operating costs through reductions in energy use and materials.

“Sustainability is a no-brainer,” says Severin Tenin of ALEC Engineering & Contracting, a leading tier one construction and contracting firm.

“Companies that think it’s optional are deluded. Sustainability goes beyond the environment. Your business model needs to be sustainable; your staff retention needs to be sustainable; your ability to deliver reliably needs to be sustainable; your pipeline of work needs to be sustainable. Every single business in the world needs to be sustainable.”

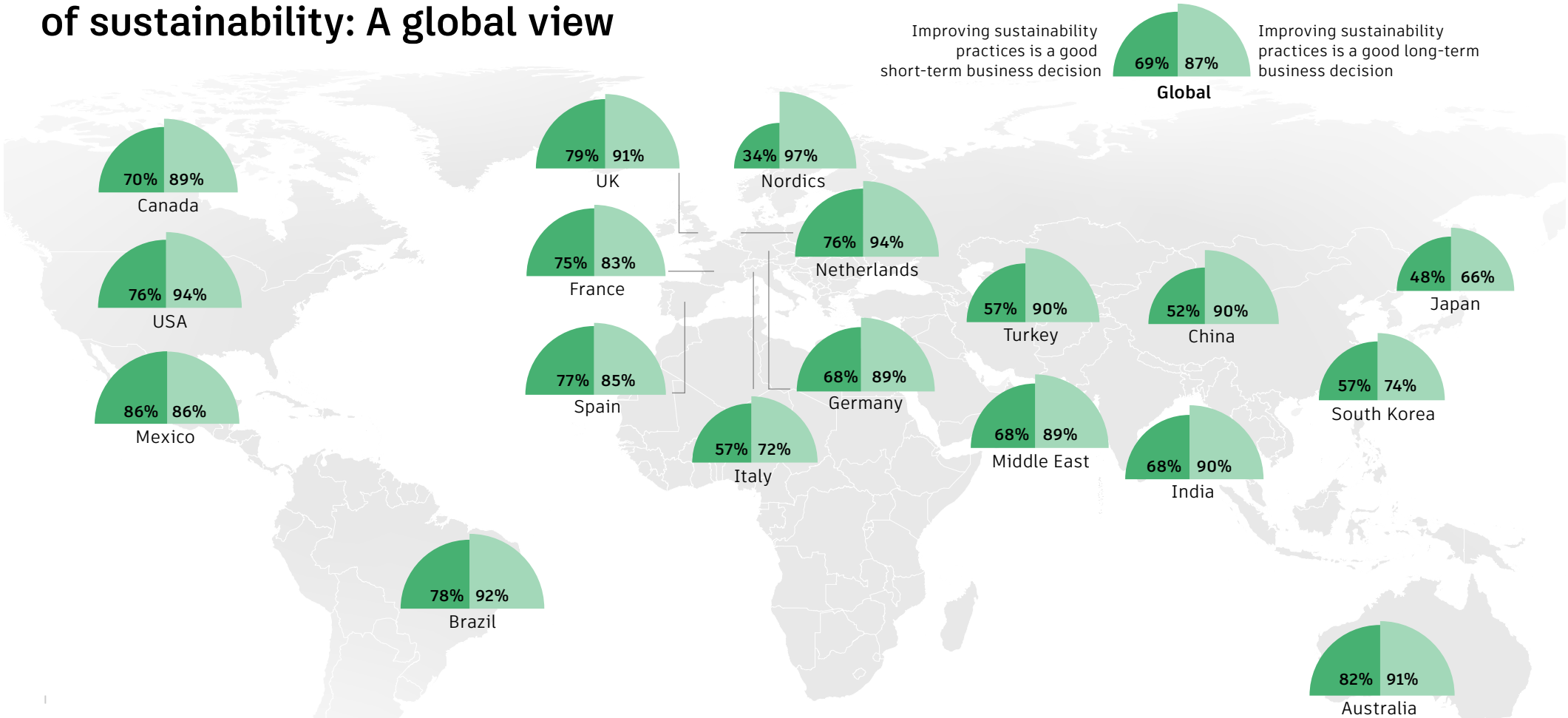
“We’re living in a time where sustainability is not just a nice-to-have,” says Kim Dabbs of furniture maker Steelcase. “You can do business in a way that honors people on the planet and still be profitable. The more that companies understand that these aren’t trade-offs, but rather long-term investments—those are the organizations that are going to come out farther ahead in the next decade. In the long term, they’re going to make money back.”

Sustainability initiatives drive long-term revenue



Survey question: To the best of your knowledge, how much business value (as a % of annual revenue) can sustainability measures generate in the long term for your company? 5-point scale.

Long-term vs. short-term business value of sustainability: A global view



Percentage of respondents who agree to statements: 1. Improving sustainability practices is a good long-term business decision. 2. Improving sustainability practices is a good short-term business decision. 5-point scale. Top two = agree.



INSIGHT 8 – AECO SPOTLIGHT

Nexii

Canadian firm Nexii was the first construction and manufacturing company to achieve the TRUE Zero Waste Gold certification in North America, for its manufacturing plant in Squamish, Vancouver. Callahan Tufts, design lead, explains why the company is committed to sustainability, the challenge of creating environmental product declarations (EPDs), and how this effort helps the firm to win work.

1. The commitment: “When the company was started, sustainability was in our constitution,” Tufts says. “It’s been at the forefront of the company since the get-go, which means that we have a team whose sole role is sustainability. They’re working with all our departments, all the time, on how we can keep sustainability front-of-mind when we’re making decisions.”

2. The challenge: “A big win for us was creating our environmental product disclosures, which were published recently,” Tufts says. “For a composite-type panel system like ours, it’s a difficult task, because you’ve got multiple materials from multiple sources. It’s a very manual process, and the data is fragmented. That’s a big barrier for a lot of people. If it was easy and the information people needed was accessible, more people would be creating EPDs.”

3. The business benefits: “When we do a project, we can provide a CO2 number using the actual data,” Tufts says. “We can break it down and say, ‘Here’s how much is in the walls; here’s how much is in the roof.’ That’s been huge because we can compare our projects to others and show our clients that we can help them hit their goals.”



“It’s been at the forefront of the company since the get-go, which means that we have a team whose sole role is sustainability. They’re working with all our departments, all the time, on how we can keep sustainability front-of-mind when we’re making decisions.”

—Callahan Tufts, Design Lead, Nexii

INSIGHT 8 – D&M SPOTLIGHT

Baosteel Engineering & Technology Group Co., Ltd

Lei Yuan, chief engineer at Chinese iron and steel company China Baowu Design Institute/ Baosteel Engineering & Technology Group Co., Ltd, says the firm has five main areas of focus when it comes to sustainability.

1. Renewable energy: “The first initiative we’ve taken is to reduce the use of fossil fuels and encourage the use of green power,” Yuan says.

2. Recycling: Baosteel is making efforts to recycle materials, including waste and scrap steel.

3. Process improvements: “We are intensifying our research efforts, using digital twins to set up zero-emission factories,” Yuan says.

4. Supply chain: The company has plans to collaborate with suppliers and customers to promote green production. “We are going to increase the strength, lifecycle, and performance of our products,” Yuan says.

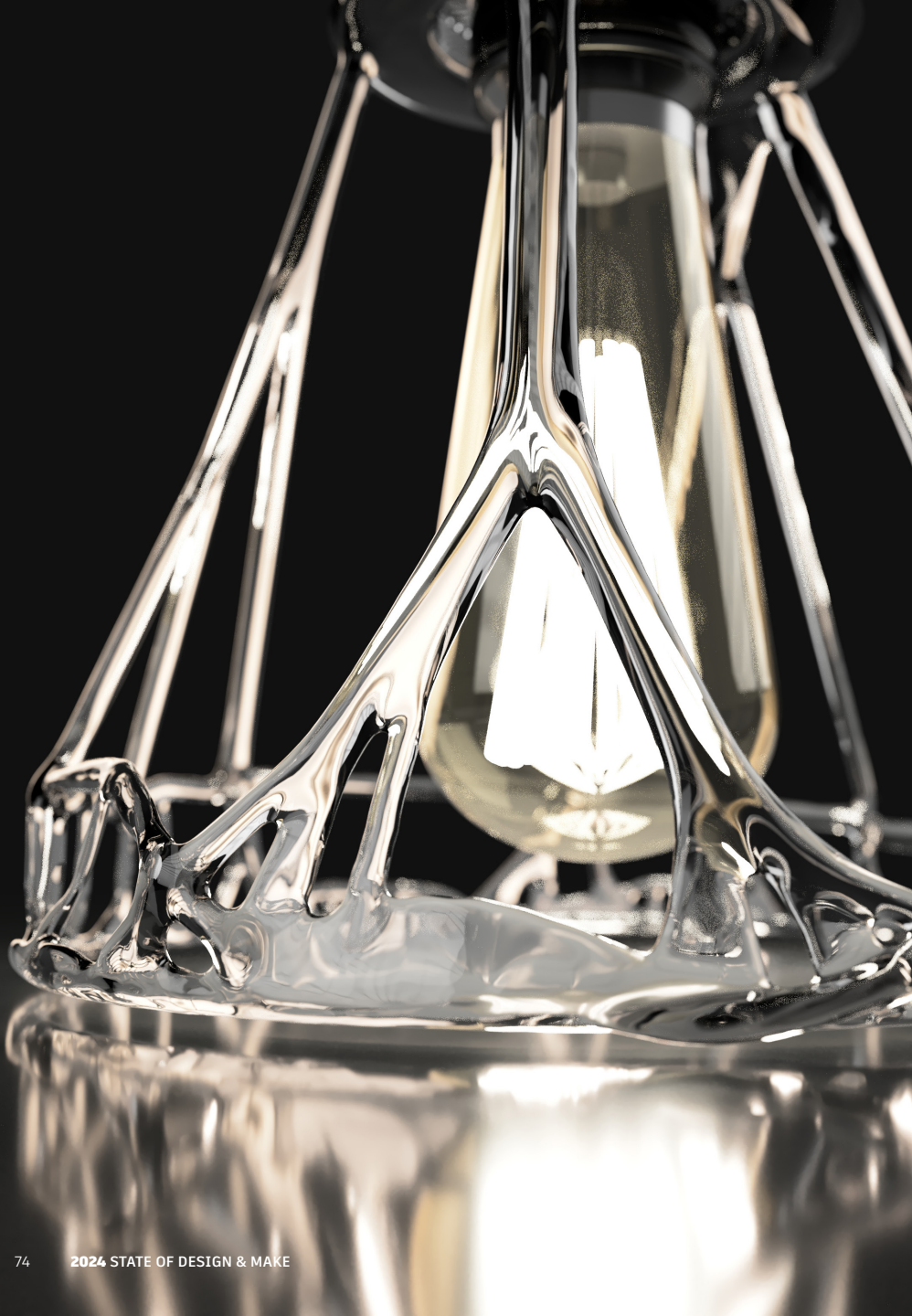
5. Carbon tracking: Baosteel is taking steps to better measure its carbon emissions. “Energy accounts for a huge proportion of the overall costs for our company,” Yuan says. “If we succeed in this area, we will improve our competitiveness and profitability.”



“We are intensifying our research efforts, using digital twins to set up zero-emission factories.”

—Lei Yuan, Chief Engineer, China Baowu Design Institute/
Baosteel Engineering & Technology Group Co., Ltd.





INSIGHT 8 – M&E SPOTLIGHT

Axis Studios

David Spilsbury, chief technology officer for UK-based animation and VFX company Axis Studios, explains why and how M&E firms are improving sustainability.

Q: How can M&E firms become more sustainable?

A: There are a lot of things that we can do. We're moving to a green data center, so all the power we consume will be sustainable. We have free air cooling, so we're reducing our PUE or power usage efficiency. Our PUE, went from 2 to 1.18, and 1.18 is pretty good for a data center. We're halving the amount of power that we need to consume, more or less, to do the same work.

Q: What are the top motivators for pursuing sustainability initiatives?

A: The motivation is about doing the right thing for the planet, but also, a lot of our staff are more aware now of the environmental impact of our industry. Clients are looking at sustainability credentials, as well.

Q: What business benefits do you see arising from sustainability?

A: If you're evaluating everything against being more sustainable, you're going to find efficiencies that can give you a competitive advantage. If you can reuse things and do things more quickly or more cost-effectively, that saves money—and it also gives you a good marketing story. We can't fix things overnight, but we are rethinking everything from a sustainable perspective.



“If you're evaluating everything against being more sustainable, you're going to find efficiencies that can give you a competitive advantage.”

—David Spilsbury, Chief Technology Officer, Axis Studios



Conclusion

Business leaders worldwide continue to face challenges in hiring and cost management, though there is renewed optimism and a greater sense of resilience after enduring—and overcoming—pandemic supply chain disruptions and seeing the global economy avoid a recession.

To address continued hiring challenges, some organizations are investing heavily in training and upskilling their current workforce to help fill the skills gap. Almost universally, organizations are increasing their investments in AI, signaling a high level of trust for emerging technology, although concerns remain.

The volatility of recent years has put many organizations in a reactionary position,

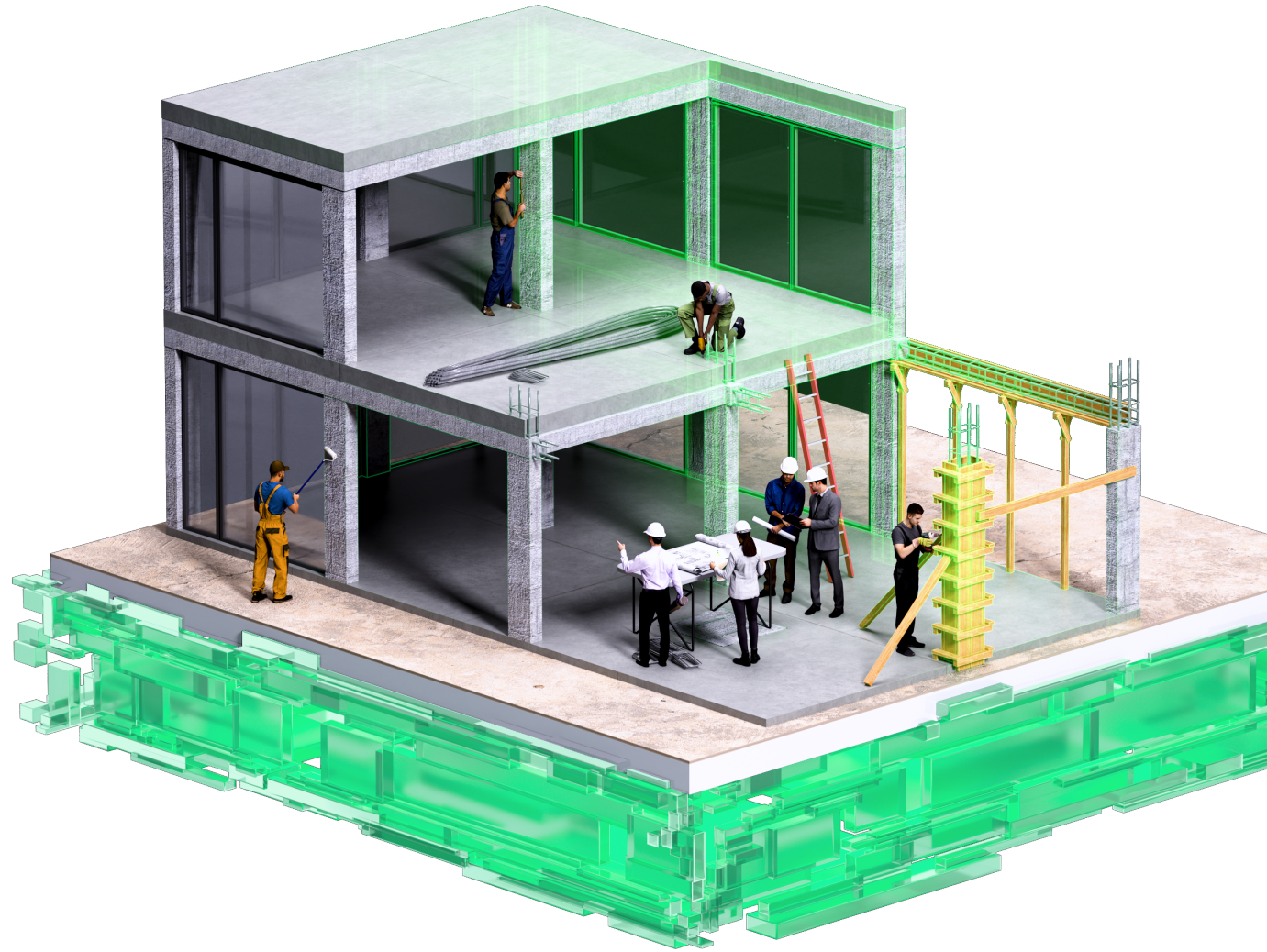
having to adapt quickly to changing market conditions. Now that leaders are feeling better equipped to handle business challenges, they have started making plans for a more certain future. Along with this new sense of optimism comes exploration of new technologies, processes, and ideas that will uncover new opportunities for growth—and shape the future of design and make.

Appendix

Methodology

Glossary

Thank you



Methodology

For this year's report, Autodesk surveyed and interviewed 5,399 industry leaders, futurists, and experts in the architecture, engineering, construction, and operations; design and manufacturing; and media and entertainment industries from countries around the globe. This report contains key findings from this research, including details at the sector and regional level.

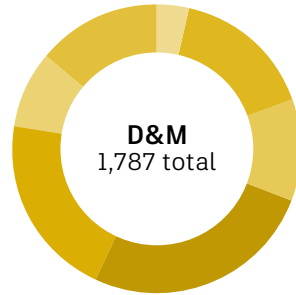
The quantitative data (n= 5,368) was collected between July and September 2023, through a 20-minute online survey.* Autodesk partnered with Qualtrics for the collection of this data. In addition, 31 qualitative interviews with business leaders and futurists were conducted in October and November 2023. In some instances, aggregated and anonymized Autodesk customer data has been analyzed to identify trends.

* The full questionnaire used in the survey can be found here.

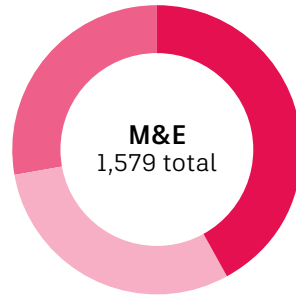
By industry



- 31% Construction services
- 20% Architecture services
- 14% Engineering service providers
- 11% Civil infrastructure owners
- 9% Utilities and telecom
- 7% Building owners
- 7% Mining, oil, and gas



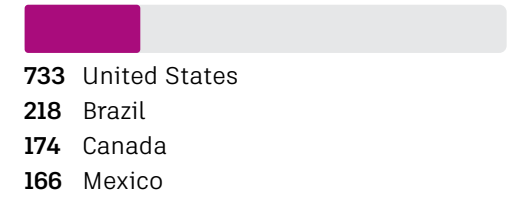
- 26% Customer products
- 21% Industrial machinery
- 16% Automotive and other transport (including supply chain)
- 14% Process manufacturing
- 11% Building products and fabrication
- 9% Life sciences manufacturing
- 4% Aerospace and defense equipment



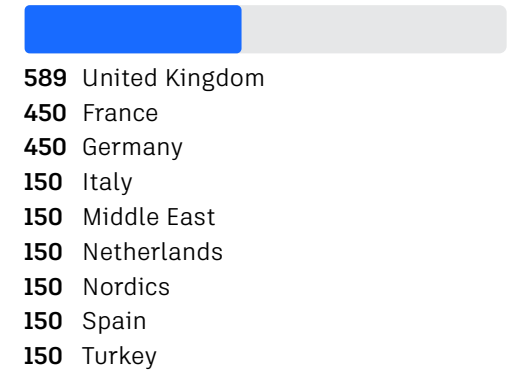
- 42% Advertising, publishing, and graphic design
- 30% Film and TV
- 28% Games

By region

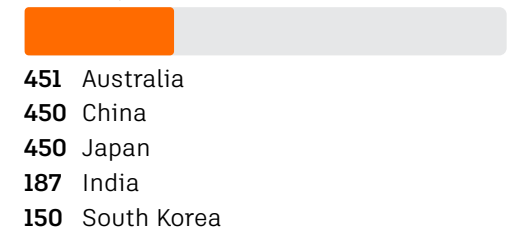
AMER: 1,291 total



EMEA: 2,389 total



APAC: 1,688 total



70%

of survey participants are decision-makers in their companies

11 years

is the average experience respondents have in their industry

80%

of respondents said that they used Autodesk products

Glossary

Company size:

- **Small:** 1–19 employees
- **Medium:** 20–4,999 employees
- **Large:** 5,000+ employees

Digital maturity:

Respondents were asked how far their companies were in their transformation journeys. Organizations that respondents said are in the “early stage” or “right in the middle” of their digital transformation journeys are considered less digitally mature companies. Those that respondents identified as “approaching the goal” or having “achieved the goal” of digital transformation are considered more digitally mature companies.

Industry:

AECO: Architecture, engineering, construction, and operations

- Architecture services
- Building owners (i.e., developers, real estate companies, governments)
- Civil infrastructure owners (e.g., transportation infrastructure, water infrastructure)
- Construction services
- Engineering service providers
- Mining, oil, and gas
- Utilities and telecom

D&M: Design and manufacturing

- Aerospace and defense equipment
- Automotive and other transportation (including supply chain)
- Building products and fabrication
- Consumer products
- Industrial machinery
- Life sciences manufacturing
- Process manufacturing

M&E: Media and entertainment

- Advertising, publishing, and graphic design
- Film and TV
- Games

Leaders and Experts:

- **Leaders:** Seventy percent of survey participants are decision-makers in their companies. In this report, this group is referred to as “leaders.” Job roles for the leaders group include business owner/entrepreneurs, directors, VP-level and C-level.
- **Experts:** The remaining 30% of respondents are referred to as “experts.” This group includes respondents at the non-managerial level and managers.

Performance:

Companies whose leaders and experts rated their organization’s performance on top business metrics as “above average” or “excellent” are considered top performers.

Region:

APAC: Asia-Pacific

- Australia, China, India, Japan, South Korea

EMEA: Europe, the Middle East, and Africa

- France, Germany, Italy, Middle East (Saudi Arabia, United Arab Emirates), Netherlands, Nordics (Denmark, Finland, Norway, Sweden), Spain, Turkey, United Kingdom

AMER: North, Central, and South America

- Brazil, Canada, Mexico, United States

Sustainability:

The survey questions about sustainability, for example in the list of changes companies are making, focus on environmental sustainability, however, this definition was not explicitly stated.

In one-on-one interviews, a descriptive definition was used incorporating the United Nations definition: “Meeting the needs of the present without compromising the ability of future generations to meet their own needs.” Respondents were told this includes efforts related to the environment (mitigating the effect on climate change), the community (social well-being, improving the life of populations), and corporate governance.

Thank you

Autodesk would like to thank the following industry leaders who participated in in-depth interviews to discuss industry trends and ways their companies are responding to changing times.



Milind D. Shinde
Founder and CEO
88 Pictures



Jean-Francois Guiderdoni
Director of Business Development
ACWA Robotics



Severin Tenim
Head of Strategic Projects &
Development
ALEC Engineering & Contracting



Hansjeet Duggal
Head of VFX
Artists Equity



Dave Mackenzie
Managing Principal for Digital
Aurecon



Dave Amantea
Chief Design Officer
Automobili Pininfarina



David Spilsbury
Chief Technology Officer
Axis Studios



Quansheng Xu
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Michael Dufhues
Board Member
Bremer SE



Christian Franz Hammerl
Team Leader, Research & Development
Bremer SE



Michał Latała
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Centralny Port Komunikacyjny



Lei Yuan
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China Baowu Design Institute/Baosteel
Engineering & Technology Group Co., Ltd.



Ji-Woong Hong
Executive Vice President
of BF Production
COM2US



Jong-Hyun Jin
Director of VFX
DEXTER STUDIOS



Miro Lin
Chief Executive Officer of Machine
Tool Business Group (Taichung)
Fair Friend Group



Marion Guignolle
Lead Technical Design Animator
Gearbox



Jinchun Hu
General Manager
JAC Italy Design Center S.R.L.



Damir Jaksic
CIO
KEO International Consultants



Gaspard Roche
Associate Global Head of Characters
Mikros Animation



Callahan Tufts
Design Lead
Nexii



Eiichiro Okano
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Digital Transformation Division
Obayashi Corporation



Robert da Silva Bressan
Engineer, Cultural and Transformational
Change Management
Petrobras



Cucu Juanda
Division Head of Business Systems
and Automation
PT Sanggar Sarana Baja



Robert Grysb
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Royal HasKoningDHV



Vince DiPofi
PE CEO
SSEO Group



Kim Dabbs
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Steelcase



Maria Fernanda Olmos
Global Principal, Digital Integration
Unispace



Kleber Gustavo Moreira
Manager of Excellence Center
in Project Management
Vale S.A.



Todd Rogers
BIM Manager
Walter P Moore



Richard Matchett
Digital Lead
Zutari

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