

INEIGHT GLOBAL CAPITAL PROJECTS OUTLOOK

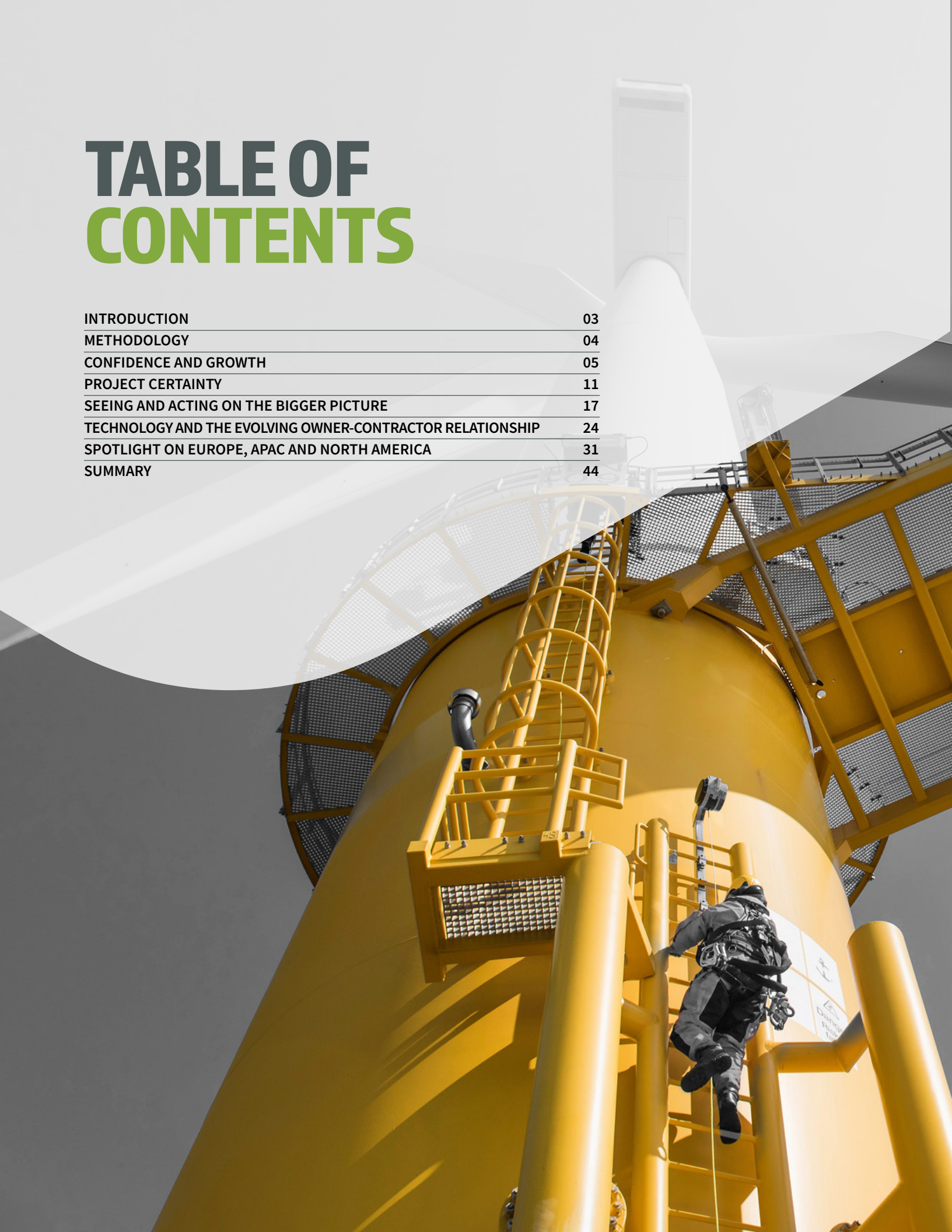
June 2023 | Third Edition



SEEING THE BIGGER PICTURE TOGETHER:
CONNECTED DATA FOR SMARTER DECISIONS

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INTRODUCTION

As the *Global Capital Projects Outlook* enters its third year, several strong trends are beginning to emerge. Despite another stormy 12 months, it seems nothing will hold the global construction sector back from feeling confident and resilient. Soaring capital project spend has the industry in good spirits, but for how long? Labor and skills shortages, unreliable supply chains, cost inflation, and the threat of economic recession remain ever-present.

Digital transformation has long been lauded as the answer to many, if not all, of the construction industry's weaknesses. With the pressure mounting, this belief is being put to the test, and this year's results show an industry that is moving in the right direction.

Project certainty has increased this year, and respondents are resoundingly positive about the potential for technology to help maintain this trend. This year, we also reveal the tremendous impact that historic project data and industry benchmarks can have on project delivery. However, a gap remains. While technology is being widely used to better execute everyday tasks, the value that connected data can have to improve project outcomes and support organizational success remains underappreciated. With unrelenting "big picture" challenges — from supply chain disturbances to the energy transition — the opportunities for technology adoption have increased tenfold. And so too has the threat of inaction.

For those at the forefront, the availability of new technologies will transform project delivery models and best practices over the next few years, bringing a new era of relationships, shared risk and transparency.

Across the following pages, you'll find insights into how macroeconomics and technology uptake is impacting the industry, as well as a glimpse into the future as



THE AVAILABILITY OF NEW TECHNOLOGIES WILL TRANSFORM PROJECT DELIVERY MODELS AND BEST PRACTICES OVER THE NEXT FEW YEARS.

— JAKE MACHOLTZ, CEO
INEIGHT

technology drives us forward. Beyond the Outlook's statistics, the power of connectedness, collaboration, and communication is frequently underlined. Economic stagnation, supply chain worries and cost inflation are all heavy on the mind. Whether positivity carries over into next year's Outlook will rely heavily on how the industry comes together to solve the challenges it will face.

While we must work together to weather the storm, there is also a tremendous opportunity for the industry to gain a higher level of data sophistication. Real-time connected data and communication is a vital steppingstone to gaining a complete understanding of the bigger picture. Only once this is in place can we fully realize the opportunity to make better decisions that improve project outcomes, predictability, and safety at every phase of construction.

Jake Macholtz, CEO
InEight

METHODOLOGY

This report is based on an online survey of 300 large enterprise capital project and construction professionals, conducted in February 2023.

The survey included 26 questions designed to gauge general confidence and optimism levels across the industry and assess the impact of and response to the macro environment. The survey also sought to identify how project delivery models and best practices are evolving.

Of the 300 respondents, with 100 participants drawn from each of our focus regions of North America, Europe and Asia-Pacific (APAC), each region has equal weighting in the report. Globally, 67% of respondents are project owners, and 33% are contractors.

All respondents are involved with the construction of capital projects, however, to get a true reading of the global construction sector worldwide, we included those working in broader industries:

- **CONSTRUCTION**
- **FINANCIAL SERVICES (EXCLUDING BANKING)**
- **IT/COMPUTER SERVICES**
- **MANUFACTURING**
- **OIL, GAS & CHEMICALS**
- **RETAIL**
- **HOSPITALS**
- **DISTRIBUTION**
- **BIOTECHNOLOGY**
- **DEFENSE**
- **LEISURE/ENTERTAINMENT**
- **MINING**
- **EDUCATION – STATE**
- **EDUCATION – PRIVATE**
- **CENTRAL GOVERNMENT OR NON-DEPARTMENTAL PUBLIC BODY (NDPB)**
- **TELECOMMUNICATIONS**
- **CHEMICALS/PHARMACEUTICALS**
- **UTILITIES**
- **PROPERTY**

The survey has been designed and conducted in conjunction with a specialized global enterprise technology market research partner, with results then analyzed and submitted to InEight experts and industry leaders for commentary based on their experiences and vantage points.

Where possible, results have been compared to our [previous survey in 2022](#). However, this is not possible in all cases due to new questions and wording alterations in this year's edition.

1 CONFIDENCE AND GROWTH

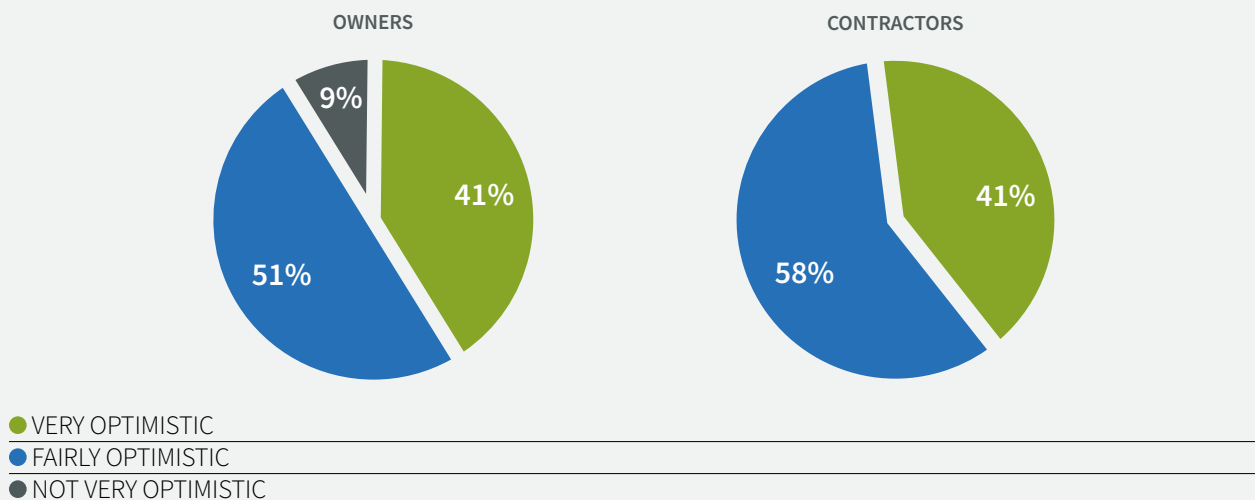
More than a year has passed since many central banks began to tighten monetary policy and raise interest rates to curb inflation. Yet the principal challenge for construction remains one of materials, equipment and labor sourcing with supply chain disruption, unprecedented cost increases and labor shortages all continuing to test the industry's resilience. Against this backdrop, it is remarkable the industry remains highly confident with its sights firmly set on the opportunities presented by sustainable building projects, digital technologies and a generous project pipeline.

CONFIDENCE DESPITE A TURBULENT YEAR

A consistently positive trend is emerging with construction industry optimism remaining high for a third year in a row (Globally: 92% in 2021, 96% in 2022 and 94% in 2023) with

APAC most confident (96% versus 93% in North America and 92% in Europe). However, unlike last year, contractors are significantly more positive than owners (99% versus 91%).

TO WHAT EXTENT ARE YOU OPTIMISTIC ABOUT YOUR ORGANIZATION'S PROSPECTS FOR GROWTH IN THE NEXT 12 MONTHS?



Economist Anirban Basu, CEO at Sage Policy Group, explains: “In North America at least, a construction backlog several quarters long is providing a buffer between contractors and an increasingly turbulent economy. Meanwhile, owners are feeling the effects of tightening monetary policy, with the cost of capital increasing and concerns over economic stagnation putting a dampener on optimism.”

Notably, respondents from companies with reported revenue below \$500 million are more positive than those reporting \$500 million or more (100% for \$75-250 million, 95% for \$250-500 million and 92% for all other categories), while respondents from APAC are more optimistic (96%) than their peers in North America (93%) and Europe (92%).

Despite a turbulent year in monetary policy, construction and capital project spending levels continue to trend upwards, with 86% reporting an increase compared to 76% in 2022 and 68% in 2021. Mirroring this optimism, owners report less of an increase than contractors (83% versus 93%). Analyzing sentiment by region, 28% of Europe respondents observe a significant increase in capital project spend — double the 14% in North America and substantially more than APAC’s 20%.

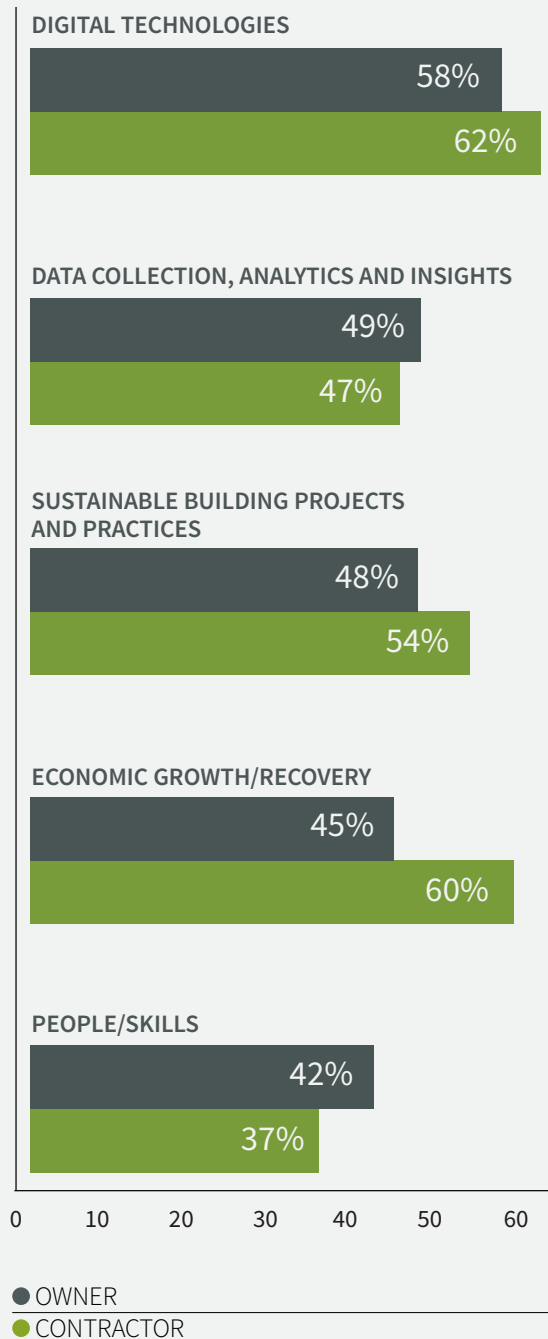
Jake Macholtz, CEO at InEight, says: “While the Inflation Reduction Act has dominated the news over the last year, Australia, for example, is quietly undertaking major infrastructure spend on some of the megaprojects started probably five years before those in North America got going on their own infrastructure spend. This created an ample pipeline of shovel-ready projects, lessening concern about access to capital as a result. An uptick in sustainable energy projects — solar, offshore wind and battery storage — is also underpinning this increase, as the cost per kilowatt to build sustainable generation is increasingly cost competitive to gas and coal-fired power plants.”



A CONSTRUCTION BACKLOG SEVERAL QUARTERS LONG IS PROVIDING A BUFFER BETWEEN CONTRACTORS AND AN INCREASINGLY TURBULENT ECONOMY.

— ANIRBAN BASU, CEO OF SAGE
POLICY GROUP

WHICH OF THE FOLLOWING DO YOU THINK WILL PROVIDE THE BIGGEST GROWTH OPPORTUNITIES FOR YOUR ORGANIZATION IN THE COMING YEAR?



OPPORTUNITIES AND THREATS

As the world increasingly gets onboard with addressing climate change and the need for more circular economy practices, sustainable building projects and practices (50%) are highlighted as a key opportunity for growth for the first time. Last year, digital technologies (59%), economic growth/recovery (50%), and data collection, analytics and insights (49%) also ranked highly.

Further highlighting the difference in impact of the current economic climate, contractors are significantly more likely to see economic growth/recovery as an opportunity (60% versus 45%) than owners.

There are some notable regional differences. Nearly three quarters (71%) of APAC respondents consider digital technologies a significant opportunity, while Europe respondents identify people/skills (48%), alongside digital technologies (49%) and economic growth/recovery (47%).

For the respondents who say their organizations complete projects on or ahead of schedule 80% or more of the time — our top performers, 75% say digital technologies are the most important opportunity for growth.

Basu agrees: “The construction sector still looks very much like it did four or five decades ago. Very few organizations have had the resources, financial or otherwise, to regularly embrace new technologies. But, in the face of supply chain delays and a shortage of skilled workers, we can expect this to change — and aggressively so.”

Indeed, concerns over staff and skills shortages are at the forefront of respondents’ minds, with 42% identifying it as a risk to growth — entering the top three for the first time and taking the top spot. This concern is particularly acute for those organizations completing on or ahead of schedule 80% or more of the time (50%) and for those organizations with more capital projects (21-50 capital projects: 52%, 50+ capital projects: 47%).

Ian Dickinson, Executive Vice President at construction solutions provider Graham, says: “Labor availability is top of mind: it’s proving fairly challenging to hire people in any significant numbers. There are also a lot of experienced people nearing retirement age and so loss of expertise is a significant factor.”

Other prominent concerns include stagnation or recession (40%), poor data collection, analytics, and insights (41%, rising 7% since 2022) and the political climate (35%), although respondents in North America (28%) are less concerned about the political climate than their peers in Europe (38%) and APAC (39%). Concern over the risk of climate change remains stable at 28%.

Contractors are significantly more concerned than owners about lagging digital technologies (40% versus 28%) while owners are more concerned about economic stagnation (42% versus 46%), the political climate (38% versus 30%) and poor data collection, analytics, and insights (37% versus 30%).

Brad Barth, Chief Product Officer at InEight, says: “Contractors are switched on to the potential for digital technologies to solve several challenges at once, but particularly around the shortage of skilled workers. They can institutionalize knowledge, act as a recruitment tool, and automate tasks to alleviate capacity crunches. Amid

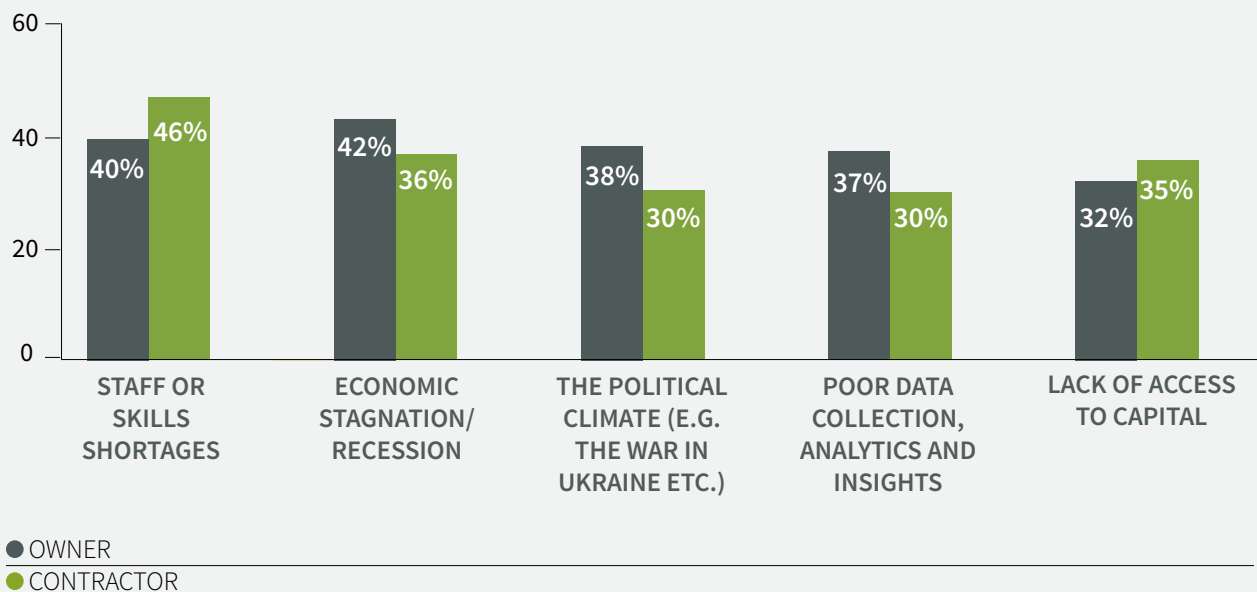
all of this, a truly collaborative process is impossible without full visibility. That’s where data and analytics become so important.”

Chris Dill, Vice President and CIO at Kiewit Technology Group, adds: “We have no shortage of work and no shortage of projects to be built to the point where the limiting factor I think really is labor. We’re short of experienced people on all of those projects that know how to build complex projects of that size and scope. The key is to supplement that with technology capabilities that can supercharge the productivity of the people we do have and try to get more done without always having to linearly scale human beings to projects.”

REMAINING RESILIENT

Despite an intensifying skills shortage along with disruption caused by cost inflation and supply chain delays, industry resilience remains high this year, slightly increasing from 91% in 2022 to 92% in 2023. European

WHICH OF THE FOLLOWING DO YOU THINK WILL BE THE BIGGEST RISKS TO GROWTH FOR YOUR ORGANIZATION IN THE COMING YEAR?



respondents feel less resilient (88%) than their peers in North America (93%) and APAC (94%) in 2023.

Jeff Quantrill, Head of Account Management for Europe at InEight, says: “The conflict in Ukraine and the many potential outcomes are weighing heavy on the minds of Europeans. This worry is very apparent in this year’s Outlook results.”

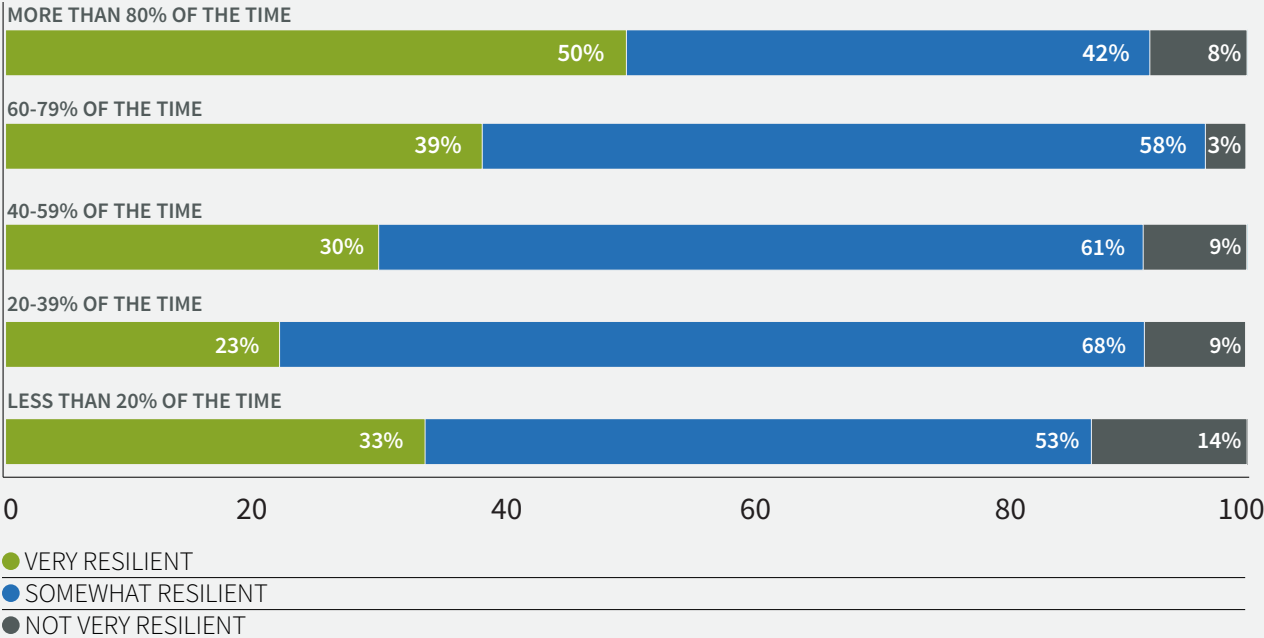
In line with a heightened feeling of optimism, contractors (94%) also feel slightly more resilient than owners (91%). “It’s a small difference but owners are more conscious of the current economic and political climate and their ability to move projects ahead,” adds Quantrill. “Most contractors, on the other hand, are operating at maximum capacity with many projects waiting in the wings creating a layer of resilience to the current climate.”

Tellingly, those respondents who are confident in their organization’s ability to complete projects on or ahead of schedule also appear more resilient in comparison to their less efficient peers.

Rob Bryant, Executive Vice President of Asia Pacific & Japan at InEight, says: “Money flowing into the industry has historically underpinned whether the industry feels resilient. But, in a post-COVID world, where organizations are adapting to the realities of the world we now live in, sustainability, productivity and resilience are becoming increasingly entwined. Those companies that proactively revisit expectations for everything from supply chain timelines and staff and craft ratios to productivity rates — to hone project certainty — have a better grip on the world which boosts resilience.”

Those respondents who are confident in their organization’s ability to complete projects on or ahead of schedule also appear more resilient in comparison to their less efficient peers.

HOW OFTEN DOES YOUR ORGANIZATION COMPLETE PROJECTS ON OR AHEAD OF THE ORIGINAL APPROVED SCHEDULE?





CHAPTER SUMMARY

Confidence remains remarkably high in the global construction industry. This is despite a challenging operating environment requiring organizations to think collaboratively and creatively to ease supply chain disruption, inflation and labor shortages.

However, stormier seas may yet lie ahead. “The economy has rebounded from COVID-19 with striking speed,” says Basu, “but ‘efficiency’ will be the watchword of 2023. Project finance has been increasingly difficult to secure at a competitive rate, and with economic recession front of mind, many project owners will emphasize cost containment.

“The need for owners to exercise more caution than usual may ultimately reduce the availability of privately financed work. Meanwhile, merger and acquisition activity is likely to grow as contractors continue the scramble to secure sufficient human capital to deliver on the government project pipeline.”

All that said, the impact of the energy transition on the project pipeline cannot be understated. Investors are increasingly scrutinizing environmental, social and governance (ESG) performance which naturally makes many sustainable energy projects highly investable, and an equally attractive construction segment in which to specialize. This, coupled with the infinite opportunity of digital technology adoption, should give the construction industry a glimmer of sunshine on the horizon.

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PROJECT CERTAINTY

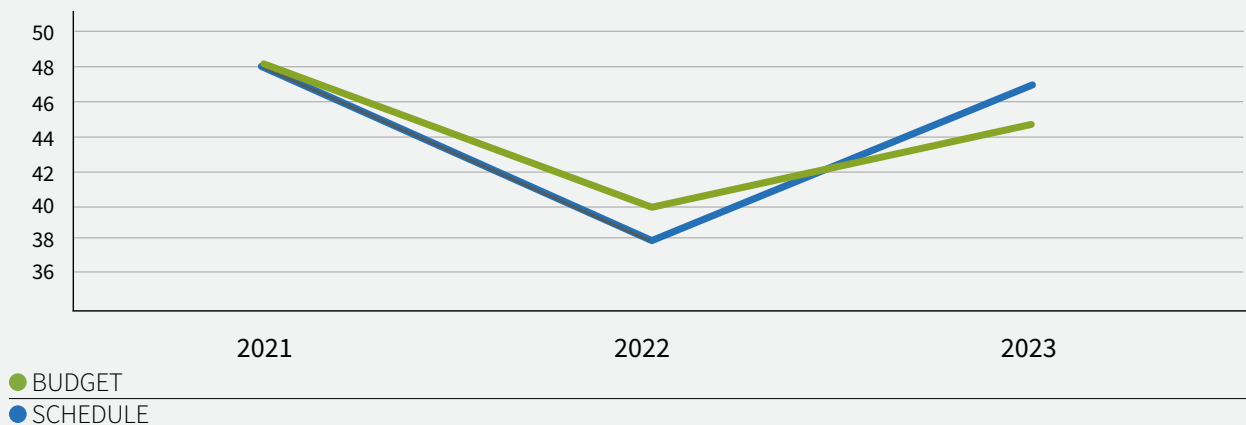
There has been a step change in project certainty this year with a marked increase in projects staying on schedule, although average overspend is also increasing. Industry is growing progressively smarter from experience, with industry benchmarks and historic data used almost half the time and a clear trend in the data suggesting this is helping organizations hit cost and schedule targets. Yet a volatile risk landscape, communication barriers among stakeholders and reduced visibility of project status continue to affect project certainty. Consequently, real-time project status and stakeholder communication emerge as the two technology features considered most key to improving project outcomes.

ON TIME AND ON BUDGET?

As global supply chain pressures begin to ease and construction undergoes rapid digital modernization, more capital projects are now being completed on time and within budget. Forty-seven percent of projects were completed on or ahead of schedule compared with 40% in 2022. Forty-five percent also stayed on or below budget, compared with 42% last year.

Owners and contractors agree that project certainty is improving. Owners report projects completed on time and within budget 49% and 47% of the time respectively compared with 43% and 45% last year. Contractors similarly say projects were completed on time and within budget 44% and 40% respectively, a significant improvement on 35% and 38% in 2022.

HOW OFTEN DOES YOUR ORGANIZATION COMPLETE CONSTRUCTION-RELATED PROJECTS ON OR AHEAD OF APPROVED SCHEDULE AND BUDGET?



However, accelerated delivery is coming at the expense of cost efficiency. Projects that stayed within schedule over 80% of the time overspent by 28% on average, and also experienced the worst scope creep (20% compared to an average of 18%). Overall, overspend has increased to an average 21% compared with 17% last year. This 4% increase in overspend could be equivalent to as much as \$328 billion, based on Statista’s global construction forecast for 2022.

Catie Williams, Vice President of Product Development at InEight, says: “Cost and scope are being sacrificed to speed because companies are monitoring project metrics in isolation without seeing the web of interdependencies between them. For example, delivering projects faster may require ramping up the workforce at greater cost. Companies need to consider time, cost and scope holistically so they are fully aware of the trade-offs and can make informed decisions.”

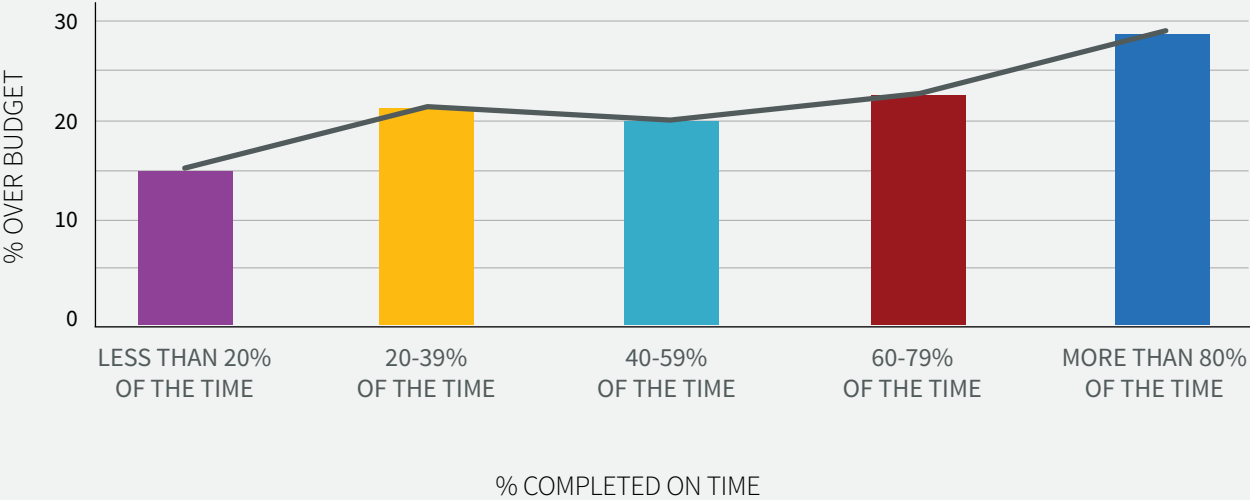
In a reversal of last year, the largest companies with the most capital projects on the books performed slightly worse at staying on time (44% versus 53% last year) and

on budget (46% versus 63% last year). This could be related to challenges achieving effective communication and workflow standardization across large organizations, with the biggest companies also the most likely to cite communication gaps with stakeholders (63%) and non-standardized systems and processes (60%) as affecting project certainty.

Perhaps relatedly, the largest organizations were also the most skeptical when it comes to the benefits of real-time stakeholder communications and real-time project status.

So why are larger organizations falling behind on project performance and digital transformation? Williams says: “Large organizations with many disparate departments face greater challenges in synchronizing all their systems and stakeholders. Achieving digital transformation at a mature company with many legacy systems is like turning a tanker, while smaller organizations are nimbler, and will thus see the benefits sooner. Yet for bigger players with many complex projects, it is even more important to leverage technologies that ensure disparate stakeholders are all pulling in the same direction.”

THERE IS A CLEAR RELATIONSHIP BETWEEN COMPLETING A PROJECT ON SCHEDULE AND AN INCREASE IN COST OVERRUNS



INFLUENCING FACTORS

Amidst ongoing supply chain volatility and skills shortages, unmanaged or unexpected risks (such as supply chain, labor, or safety concerns) are cited as the biggest barrier to project certainty for 59% of respondents.

Ian Dickinson, Executive Vice President at Graham, notes: “The ‘new normal’ is that equipment and materials that would previously have taken eight or 10 months now take 12 to 14 months. There are major challenges sourcing large structural steel elements such as bridge girders, and equipment such as electrical and control equipment and switch gear among others. We are still waiting for some equipment that was ordered over 12 months ago.”

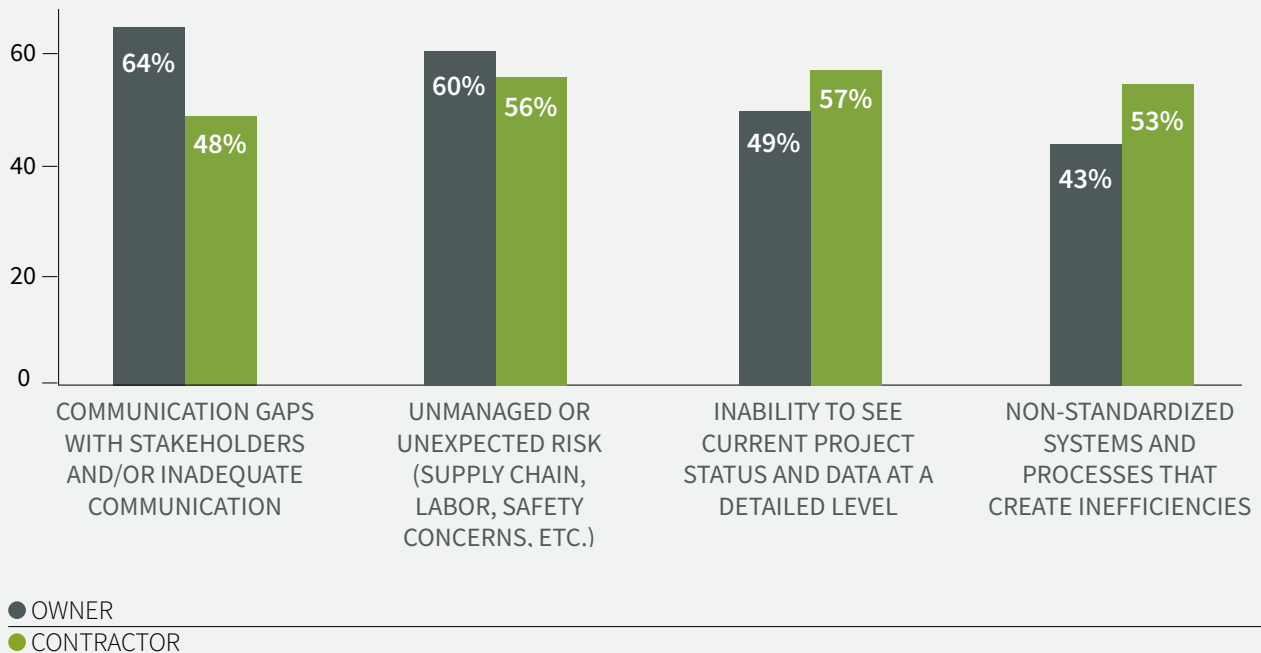
Brad Barth, Chief Product Officer at InEight, adds: “The globalization of supply chains and the increase in sudden, systemic threats such as extreme weather means risks are increasingly volatile and transcend individual countries and companies. Yet many stakeholders tend to hide vulnerabilities and make trade-offs between scope, cost

and schedule without consulting their project partners, leading to projects that are over-promised and under-delivered. Instead, risk planning should be baked in at the design stage and decisions made collaboratively whenever possible.”

Perhaps relatedly, communication gaps with stakeholders are ranked equally to unmanaged and unexpected risks as the biggest barrier to timely and cost-efficient project delivery. The communications gap is significantly wider among owners than among contractors (64% versus 48%), possibly reflecting increased demand for closer collaboration among owners.

Petter Merok, Industry Executive, Architecture, Engineering & Construction (AEC) at Microsoft, highlights: “There’s a lot of valuable information in every company, but it’s usually stored in different places so they’re not able to get the benefits. We now see a growing interest in collaboration even among competitors to enable smarter projects with

WHICH CHALLENGES DO YOU FEEL HAVE THE BIGGEST IMPACT WHEN THINKING ABOUT COMPLETING PROJECTS ON-TIME AND ON-BUDGET?



better margins and have employees work more efficiently together internally and externally. And that's built on a digital framework that enables collaborative innovation.”

This inability to access data and to use it to understand project status at a detailed level is the number one challenge for contractors (57%) and its impact should not be understated. There is a positive correlation between live visibility of progress and project certainty. Organizations that stay on schedule over 80% of the time are significantly less likely to say project performance is impacted by poor visibility of project status (40% compared to an average of 50%).

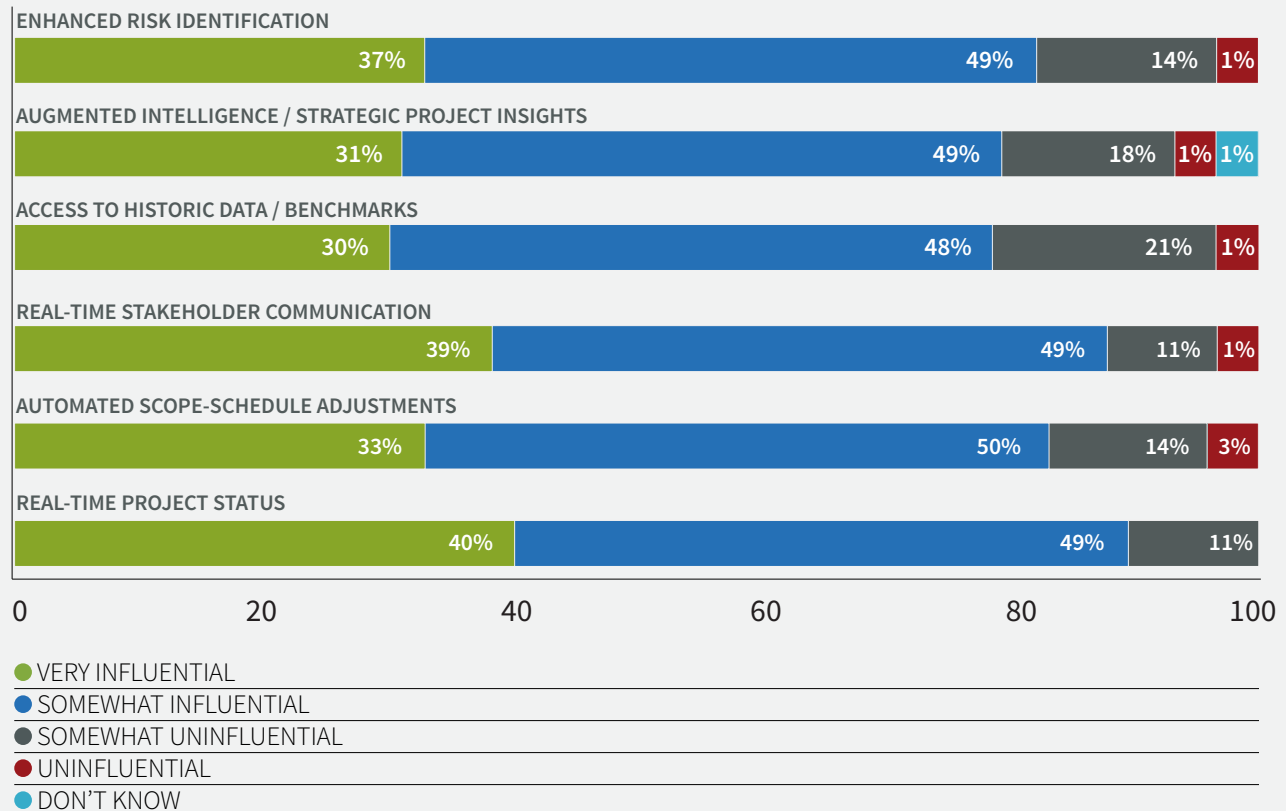
Williams says: “Many projects do not have a single standard for measuring progress which impedes transparency at a time when delivery models increasingly

require joint liability, and thus shared visibility among partners. We need to see industry coalesce around a common yardstick such as Earned Value Management to enable transparent measurement of progress among all stakeholders at every stage. Automating measurement can also help remove human bias and error.”

Relatedly, real-time project status (89%) and real-time stakeholder communication (88%) are seen as the technology features that most positively influence project outcomes, followed by enhanced risk identification (86%).

There are signs that digital transformation is accelerating and improving project outcomes. Non-standardized systems and processes that create inefficiencies has dropped out of the top three top challenges since last year (from 52% to 46%). And industry benchmarks and/

IF USED TO THEIR FULL CAPABILITY, HOW MUCH DO THE FOLLOWING TECHNOLOGY FEATURES INFLUENCE PROJECT OUTCOMES?



or historic project data are now being used to improve project certainty 47% and 48% of the time respectively.

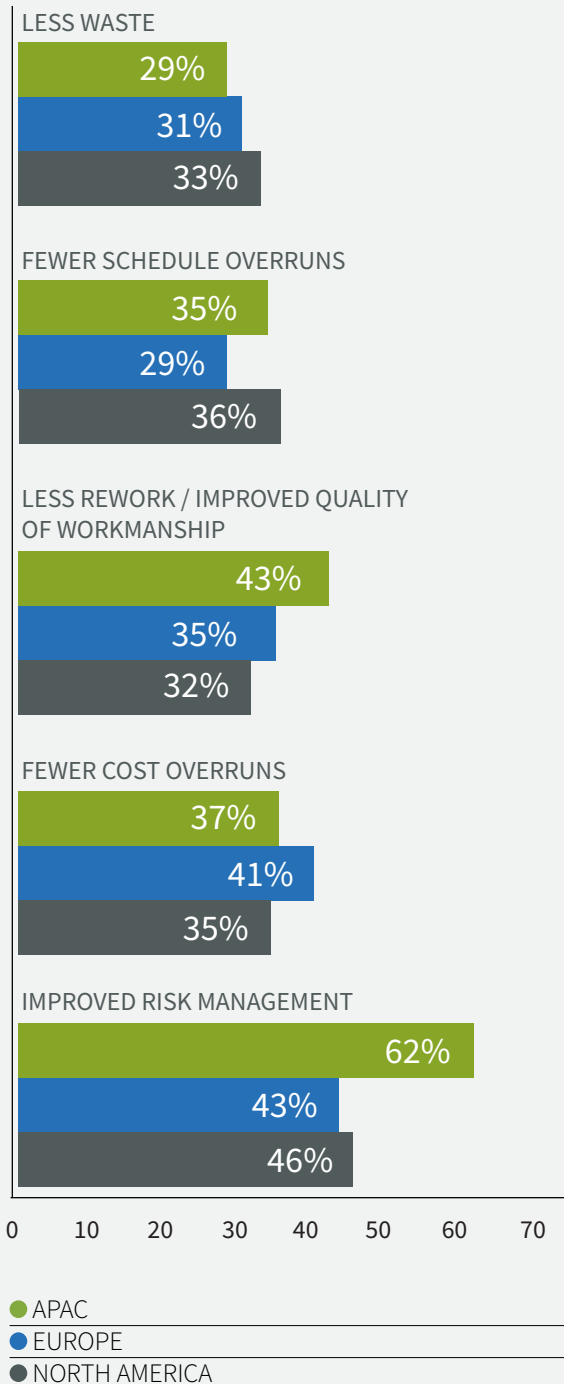
This is also feeding into improved project certainty as those who complete projects within schedule over 80% of the time were also the most likely to use industry benchmarks (66%) and historic project data (69%). Conversely, those who run over budget or over schedule 80% of the time were the least likely to use them.

Dickinson says: “We use our own historic actuals and previous estimate databases extensively, particularly for conceptual estimating, and hard estimating. We also harness publicly available data to track things such as material price indices and we participate in peer groups with major GCs where we share anonymized data to help us do benchmarking.”

When asked how their organizations benefit from using historic project data and/or industry benchmarks, 50% say it improves risk management, 46% say it enhances employee productivity and 38% say it reduces cost overruns. Yet adoption varies by company size with those with the fewest capital projects most likely to report using industry benchmarks (52%) and historic project data (51%). The largest portfolios are the least likely (43% for benchmarks, 46% for historic project data), possibly due to the greater complexity of mining greater volumes of data.

Williams remarks: “There is a growing shift from gut-driven to data-driven estimating that enables companies to make more realistic forecasts. Businesses are increasingly using historic data to compile risk libraries that help predict and prevent issues, find ways to boost productivity such as reducing strain on resources, or identify opportunities to reduce overspend such as switching suppliers. We see a future where past data is used by AI algorithms to automatically optimize project forecasts and processes.”

HOW DOES YOUR ORGANIZATION BENEFIT FROM USING HISTORIC PROJECT DATA AND INDUSTRY BENCHMARKS?





CHAPTER SUMMARY

Project performance is significantly improving as forecasts are increasingly fueled by past data and best practice benchmarks. Yet the disconnect between cost and schedule means budget discipline has been a casualty of accelerated delivery times. The industry remains deeply fragmented with project certainty hampered by communication barriers, a blurry picture of project status and unexpected risks. Larger organizations with bigger turning circles have seen slightly smaller improvements in performance and are thus more skeptical of the benefits of new technologies.

Williams concludes: “The story that emerges is that an integrated system is fundamental to project outcomes whether that is integrating data from past projects or among stakeholders. There is often a messy patchwork of point solutions and project measurement methods that hamper the transparency needed for better risk management, collaboration and project outcomes. Yet we are now seeing increasing standardization of systems and processes and a growing feedback loop of historic data across projects that is making a material difference to project outcomes.”

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SEEING AND ACTING ON THE BIGGER PICTURE

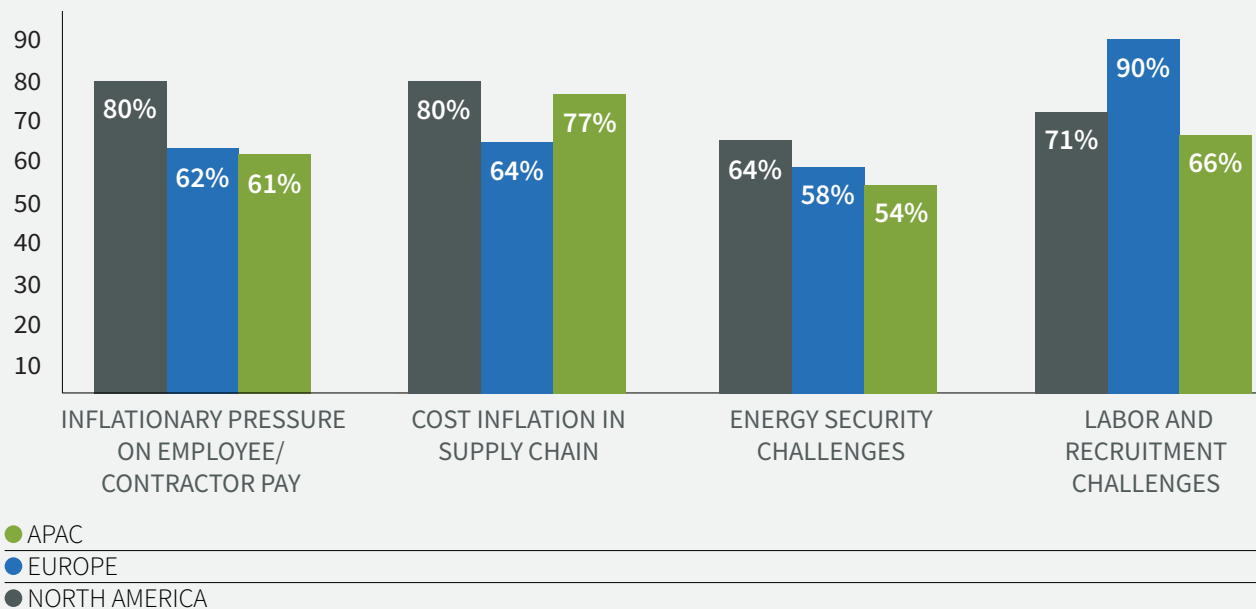
Few respondents have escaped some level of disruption to their projects in the last year as the effects of supply chain delays and inflation make themselves felt. Companies are using technology to keep tabs on the bigger picture and to maintain control, but approaches to that tech and its reported benefits differ widely.

DEALING WITH DISRUPTION

Disruption has been ubiquitous in the last 12 months, with every factor we asked about more likely to have caused disruption than not. The standout factors, however, are supply chain and labor challenges.

Nearly three quarters of respondents (74%) report cost inflation as disruptive and 70% cite delays and disturbances in the supply chain. On the labor side, 68% point to pay inflation and 64% point to the related issue of labor and recruitment challenges.

TO WHAT EXTENT HAVE THE FOLLOWING FACTORS DISRUPTED YOUR COMPANY OVER THE PAST 12 MONTHS?



Respondents in one region, however, stand out for the levels of disruption they report. In North America, 80% report disruption from pressure on pay versus 62% in Europe and 61% in APAC. Similar patterns are seen with supply chain cost inflation (80% versus 64% and 77%), energy security (64% versus 58% and 54%), and labor and recruitment (71% versus 54% and 66%).

Why might that be? Nate St. John, Director, Product Management at InEight, says: “North America relies a lot on imports. Especially if you look at some of the larger projects — like liquefied natural gas plants or offshore wind — a lot of the supply chain is abroad. That may change in the future, but it’s the dynamic we see today.”

Differences are also apparent between owners and contractors. Eighty percent of the former report supply chain cost inflation as disruptive versus 71% of the latter — perhaps reflective of an imbalanced risk-sharing model that still persists between the two (see Chapter 4). Likewise, contractors are also more disrupted by changing working practices (66% versus 55%).

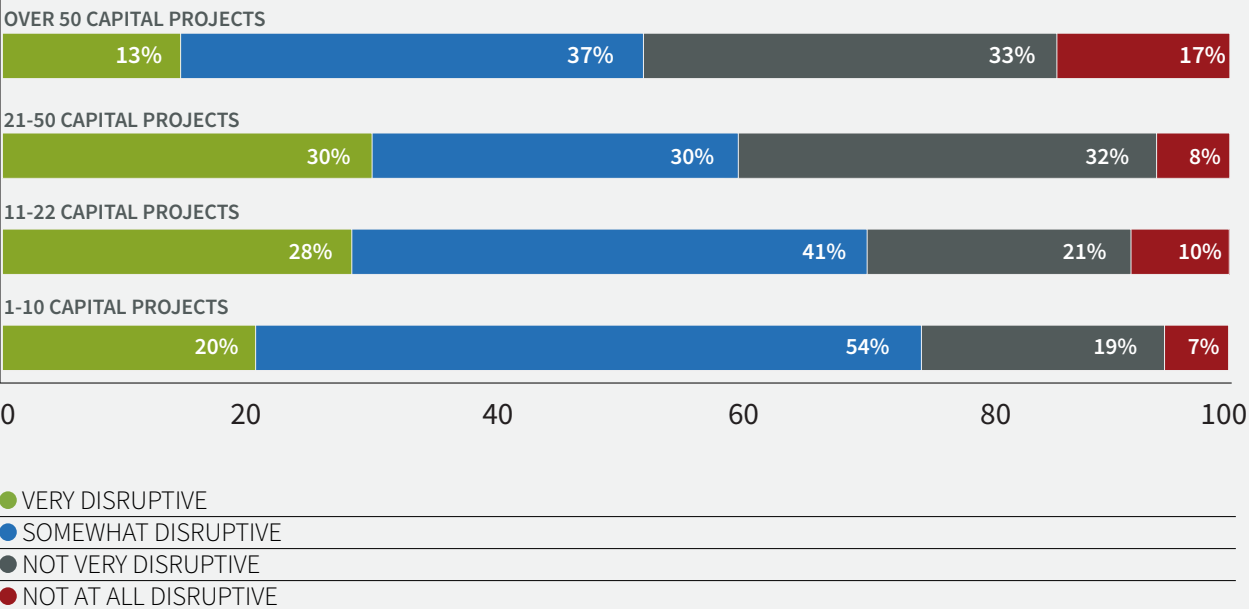
Whether owner or contractor though, bigger does seem to be better. Organizations with over 50 capital projects report less disruption than their peers, with only half struggling with labor and recruitment versus the 64% average. We also see greater capital project numbers negatively correlating with disruption from inflationary pay pressure, and the smallest firms by revenue found changing working practices particularly disruptive (85% versus 59% average).

DISRUPTION AND DELIVERY

How specifically are these factors affecting project delivery though? We asked respondents to report impacts of these factors on project scope, cost, schedule, collaboration and workmanship.

Project cost seems to be the area where companies feel disruption most keenly. Predictably, 35% say supply chain cost inflation has the biggest influence on project cost, followed by supply chain disturbance (20%). APAC companies are particularly affected — 48% say supply chain

TO WHAT EXTENT HAS INFLATIONARY PRESSURE ON PAY DISRUPTED YOUR COMPANY OVER THE PAST 12 MONTHS?



cost inflation disrupts project costs, versus 29% and 28% of their European and North American peers, respectively.

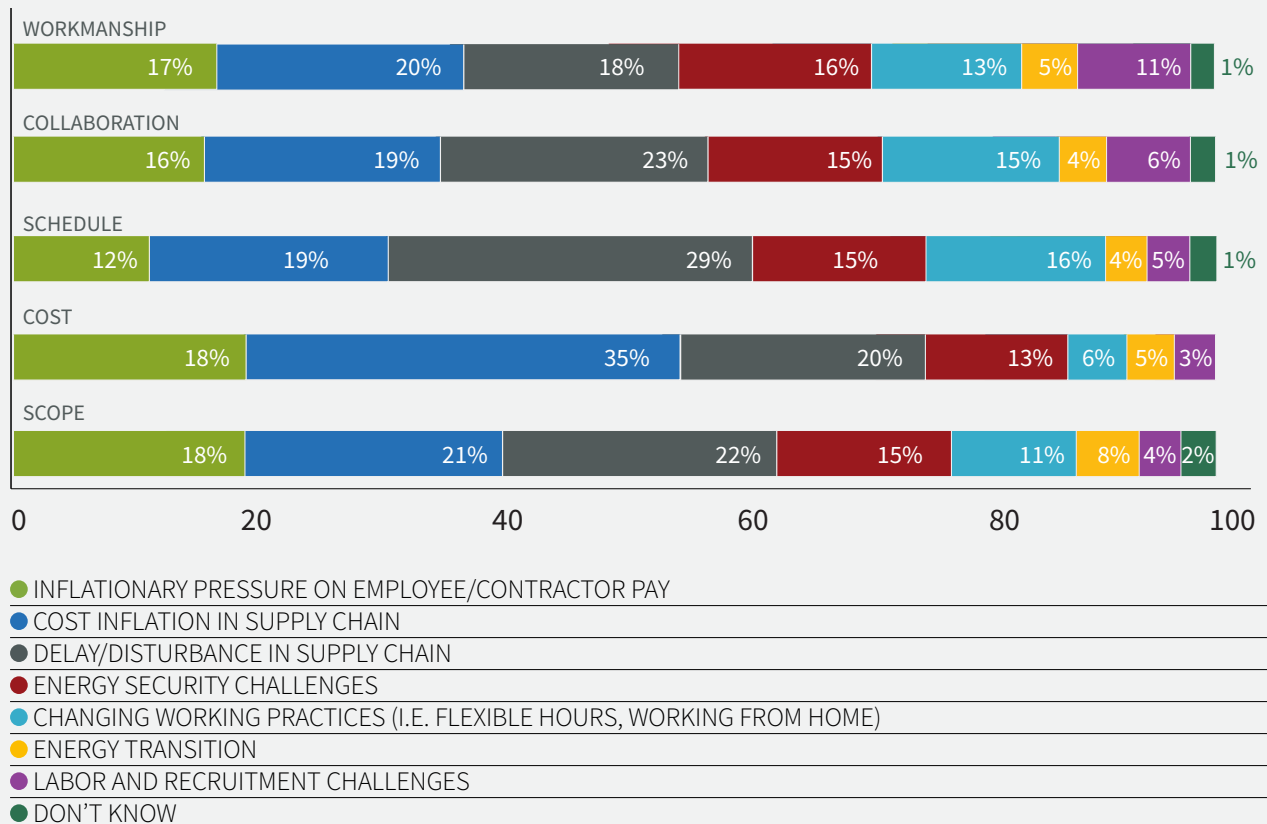
In fact, those same two supply chain factors — delays and disturbances, and cost inflation — appear repeatedly across the board. As well as for cost, delays and disturbances are the top disruptors for scope, schedule and collaboration. For each of these, supply chain cost inflation is second. For workmanship, the same factors make up the top two, only in reverse.

Brad Barth, Chief Product Officer at InEight, understands these concerns for workmanship, but ultimately feels confident decisions lean toward delivering on safeguarding infrastructure: “Think about a scenario where supply chain issues mean companies turn to

inferior materials, or labor shortages mean they rely on less experienced workers — you can see workmanship suffering. However, when push comes to shove, I don’t think this risk is the one to watch. Our industry has extensive quality and compliance requirements, so when something has to give, it will be costs and schedules that suffer.”

There are some interesting nuances to observe though. For contractors, energy security seems to be of particular concern: 20% of this group say this is disruptive to schedule, and 23% say the same for workmanship, equaling or surpassing cost inflation in these cases.

WHAT DISRUPTIVE FACTORS HAVE THE BIGGEST INFLUENCE ON WORKMANSHIP, COLLABORATION, SCHEDULES, COSTS AND SCOPE?



TECH TO THE RESCUE?

Construction companies are not idly suffering these disruptions, however. They are deploying technology to understand and combat the big picture disruptions.

By far, the most popular technologies are project management or project controls software, which were selected by the majority of respondents (58%). This alone is hardly illuminating, as such software is often considered table stakes for today's complex operating environment. To gauge how advanced technological approaches are becoming, we must consider how companies are deploying these technologies.

Encouragingly, the second most selected response is the use of artificial intelligence and machine learning (50%). However, Christopher Dill, CTO at Kiewit, warns that this may mask a wide range in sophistication of responses:

“You have to separate AI and machine learning. For AI, we're at the peak of the hype cycle, but practical use cases in construction are still very few. I would say that belongs more to the next phase of the sector's technological development. What you do see though, is companies working to enhance and unlock the value of the data they've accrued, to put together analytics and predictive models for early warnings and suggested courses of action — and that can certainly draw on machine learning already.”

In any case, the direction of advancement is encouraging. Risk-adjusted project planning software and connected worksite communication tech are used by nearly half of respondents (47%), and data analytics by 39%.

Together, these point to an industry making greater efforts to understand and engage with the big picture operating environment — and those efforts seem to be paying off. Of those organizations completing projects on time or ahead of schedule more than 80% of the time, 69% use project management or project controls software to combat these challenges (versus 58% average), and 56% use connected worksite communication (versus 47% average).

There are also interesting differences in approach between owners and contractors. Whereas 63% of owners look to project management or project controls software, only 48% of contractors do the same.



OF ORGANIZATIONS WHO COMPLETE PROJECTS ON TIME OR AHEAD OF SCHEDULE MORE THAN 80% OF THE TIME, 69% USE PROJECT CONTROLS SOFTWARE.

Conversely, contractors are more likely to use artificial intelligence and machine learning (60%) and risk-adjusted project planning software (58%) versus owners (46% and 42% respectively). However, before concluding that contractors are using more advanced techniques, it's worth noting that 43% of owners use data analytics here, while only 30% of contractors say the same.

Brad Barth notes: "Contractors have a reputation in some peoples' minds for not being tech savvy, but by nature contractors are innovative. They're entrepreneurs that find ways to get things done whatever the challenges, so there's no surprise to see them draw on the tech tools at their disposal."

ASSESSING TECH'S IMPACT

It is one thing to report on using particular categories of technology to mitigate big picture challenges, but it is another to say that these investments are truly having an impact.

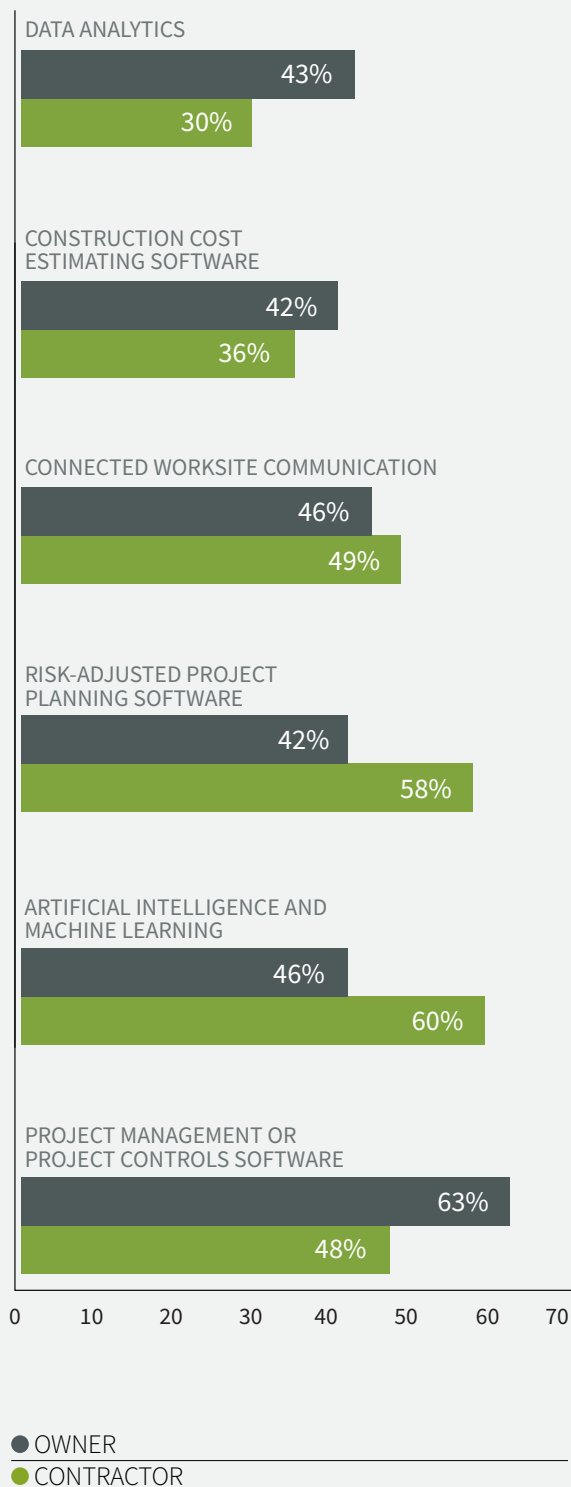
Interestingly, respondents are widely using technology to help give evidence or reassurance that they are complying with environmental, health and safety (EHS) policies. This is the most cited benefit of project management or controls software (selected by 50% of respondents), risk-adjusted project planning software (47%), construction cost and estimating software (46%), and artificial intelligence and machine learning (46%). Only for connected worksite communications and data analytics do respondents not select EHS as the top benefit.

After EHS compliance, respondents are most likely to see benefits from employing these various technology categories in their communication with colleagues, and in helping to prioritize tasks and manage workflow.

This creates an interesting impression. The most frequently cited benefits across different technologies are to fairly everyday functions: EHS compliance, communication and task planning. In contrast, more high-level benefits such as gaining an overview of all projects and events, or using historical data to inform future decision making, do not feature so highly.

Andy Trewick, President and CEO at Graham, explains: "We need those project management tools to do our day job, which is to do an estimate, transfer that estimate into a budget for a project and then match the cost against the

WHAT TECHNOLOGIES ARE YOUR ORGANIZATION USING TO COMBAT THESE CHALLENGES?



budget and forecast. That's just day to day. But we have a tremendous amount of data, and there are lots of things we can do with the data, a lot of intelligence in the data that we create.”

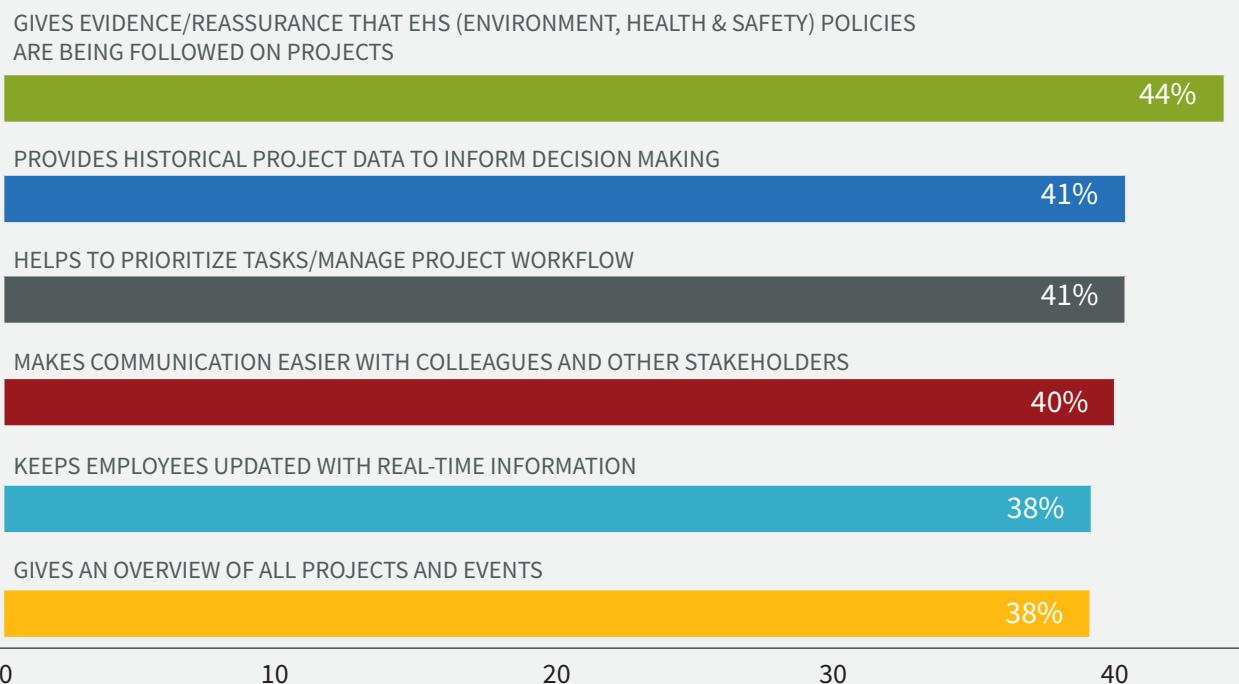
Petter Merok, Industry Executive, Architecture, Engineering & Construction (AEC) at Microsoft, agrees: “Customers are doing more with less, meaning that it isn't necessarily a spending freeze, they're looking for ways to improve efficiencies. Because ultimately, what technology can and will be helping the construction industry do is get a better insight and overview of all running projects.”

Indeed, more future-facing perceived benefits of technology can be seen in responses focused on artificial intelligence and machine learning, and data analytics. Forty percent of all respondents say that the former helps give an overview of all projects and events, and 46% say data analytics helps in the same way. What's more, 36% say artificial intelligence and machine learning provide historical data to inform decision making, and 48% say data analytics does the same.

Why aren't these numbers higher? Perhaps there is a clue in words of caution from Cameron Mills, Director, Project Controls, of Victoria, Australia's North East Link Program: “Understanding data management, data integrity, that's so important. And whilst benchmarking is used, I don't put a lot of faith in benchmarking unless I know where the data sets have come from and how they've been developed, and what really is informing that information. Anyone who says they've got good benchmarking, the very first thing you want to do is sit down and have a look at what they've really got, and how they've developed it, and how they've managed it, and how they've received that information.”

“Garbage in, garbage out” has become axiomatic for anyone accustomed to working with data. Our respondents demonstrate a genuine desire to see the bigger picture of project certainty, and also a recognition that the industry has farther to go on data quality and standardization. However, the optimism is there that the requisite improvements will happen.

IMPACT OF TECHNOLOGY INVESTMENT





CHAPTER SUMMARY

Disruption to projects is commonplace and companies are all too aware of its effects on their capital projects. Most in the industry seem to have taken some technological steps to gain a better idea of the big picture and how factors feed into that disruption. Yet, fewer are doing so at the sophisticated level that today's technology enables. As familiarity with technology grows, it's possible to envision that project certainty and control will improve in step.

4

TECHNOLOGY AND THE EVOLVING OWNER-CONTRACTOR RELATIONSHIP

While contractor adoption of best practices is outpacing that of owners, supply chain challenges and opportunities for data analytics and AI are driving a transition to delivery models that demands greater collaboration. Amidst a global craft skills shortage and ongoing supply chain volatility, businesses are turning to technology to boost productivity and risk management. As a result, construction organizations will increasingly rely on technologies to understand the critical interplay between scope, cost and schedule.

A NEW OWNER-CONTRACTOR RELATIONSHIP?

Amidst ongoing supply chain cost increases and constraints, the traditional silos between owner and contractor are being dissolved and replaced with closer collaboration. The collaborative Integrated Project Delivery (IPD) method and Design-Build are now the

most widely used delivery models at 44% and 43% respectively. The traditional siloed Design-Bid-Build model is third most popular at 42% while Construction Management Multi-Prime is used on 41% of projects and Construction Manager at Risk on 40%. And there are

Integrated project delivery (IPD) is a construction project delivery method that seeks efficiency and involvement of all participants (people, systems, business structures and practices) through all phases of design, fabrication, and construction - American Institute of Architects

Design-Build (DB) project delivery is where the owner manages only one contract with a single point of responsibility. The designer and contractor work together from beginning, providing unified project recommendations to fit the owner's schedule and budget - DBIA

Design-Bid-Build (DBB) is the traditional method of project delivery whereby design and construction are separate contracts - US Department of Energy

Construction Management Multi-Prime is an alternative project system in which the owner holds separate contracts with contractors of various disciplines. In this system, the owner, or its CM, manages the overall schedule and budget during the entire construction phase - AIA-MBA Joint Committee

signs that collaborative delivery models are the most successful at supporting on-time project delivery with IPD used by the majority (62%) of companies that stay on schedule over 80% of the time.

Brad Barth, Chief Product Officer at InEight, says: “Budgets and schedules are often created in a vacuum which produces a gap between expectation and reality. Industry increasingly recognizes the need for more iterative, cooperative approaches where targets are collaboratively developed and continually molded to project realities. When everyone has equal visibility of design assumptions or supply chain challenges and their impact on project outcomes, this reduces uncertainty and enables more predictable delivery. This also means you can model ‘what-ifs’ of various scope-cost-schedule scenarios to help optimize project metrics to create the best outcomes.”

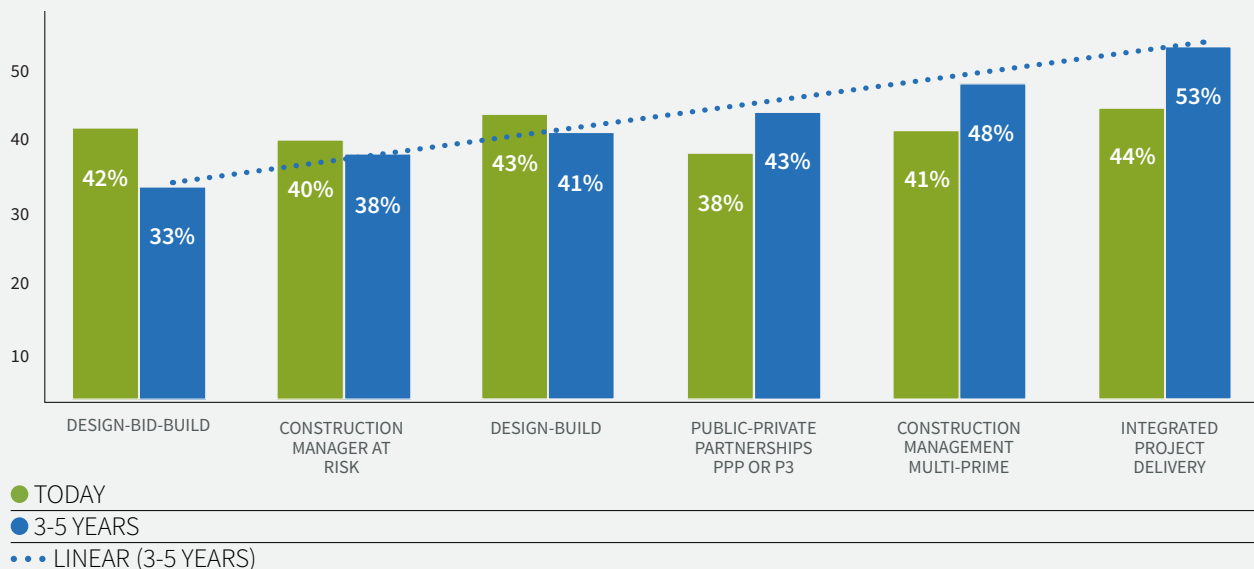
Future trends also suggest an increasing uptake of collaborative delivery models. Integrated Project Delivery is expected to see the biggest increase in adoption over

the next three-to-five years with a 9% rise in use, while use of the traditional Design-Bid-Build model will decline by the same proportion.

Ian Dickinson, Executive Vice President at Graham, says: “The uncertainty around supply chain delays or costs and labor availability means we’re no longer willing to take on all those risks, so we share them with the owner. The projects that have progressed in the last 12-15 months are collaborative, early-contractor involvement models where we work with the owners and designers to value engineer the design to mitigate those risks. That ranges from choosing materials that are more readily available to making design changes that reduce on-site labor costs.”

Comparing the regions, Integrated Project Delivery will become the predominant model in both APAC (65%) and in North America (50%) while Construction Management Multi-Prime and Public-Private Partnerships will be the most popular option in Europe (50%). The shift towards more collaborative delivery models is chiefly driven by

WHICH TYPES OF CONSTRUCTION PROJECT DELIVERY METHODS DO YOU EXPECT TO PREDOMINANTLY ENGAGE WITH IN THE NEXT 3-5 YEARS?



supply chain challenges (41%) and opportunities for data analytics (39%). Supply chain challenges are seemingly particularly acute in APAC where over half (51%) of respondents say it will be the biggest driver of changing delivery models.

Jake Macholtz, CEO of InEight, adds: “Amidst escalating supply chain costs and ongoing delays, contractors can no longer shoulder the entire burden of risk. We’re seeing a shift towards more sharing of risks, rewards and resources among owner, engineer, and contractor. And sharing project data among all stakeholders also provides a more integrated dataset to fuel emerging construction 4.0 technologies such as artificial intelligence.”

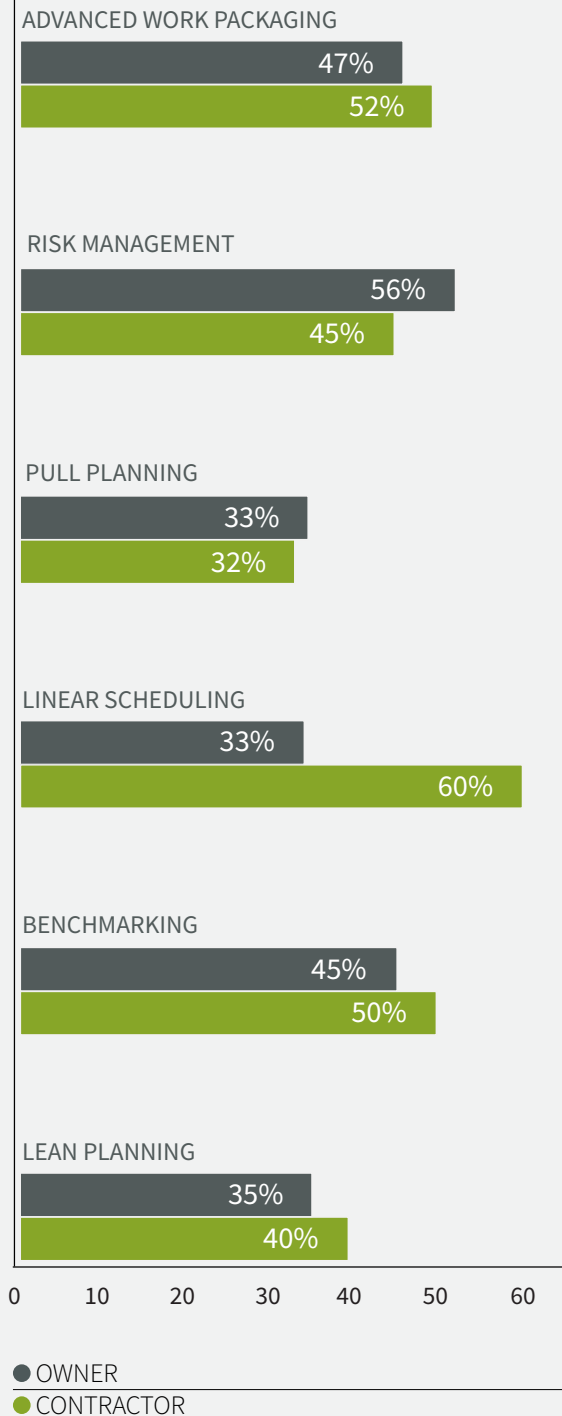
When asked to cite the benefits of different delivery models, there were, however, no clear winners. Design-Build is seen as the best model for improved collaboration (35%) while Design-Bid-Build is seen as best for improved cost management (38%). The biggest perceived benefit of Integrated Project Delivery is improved data collection and sharing, but owners are somewhat more positive about this (41%) than contractors (32%).

Macholtz says: “Traditionally, all that owners received was a schedule and a final price. Without knowing what happened in between, they were locked out of the data. It is therefore unsurprising that owners are keen on improved collaboration and data sharing as they want to lift the veil of secrecy around the intermediate steps between design and delivery so they can reduce risks and avoid surprises.”

CHANGING BEST PRACTICES

Against the backdrop of a turbulent year, when asked what best practices or approaches they are currently using, Risk Management is cited as the most frequently used by 52% of respondents. This could reflect ongoing supply chain and skills shortages with unmanaged or unexpected risks (such as supply chain, labor or safety concerns) also the biggest threats to project certainty (see Chapter 2). Advanced Work Packaging (AWP) is the second most widely used (48%) followed by Benchmarking (47%) and Linear Scheduling (42%).

WHICH OF THE FOLLOWING BEST PRACTICES OR APPROACHES IS YOUR ORGANIZATION CURRENTLY USING?



Only about a third of all respondents are using Pull Planning (32%) or Lean Planning (37%). Owners and contractors largely use the same best practices and approaches, yet almost double the percentage of contractors (60%) use Linear Scheduling as owners (33%).

Barth says: “Traditional Critical Path Method (CPM) schedules still prevail in the construction industry, but contractors are increasingly incorporating other planning methodologies to enhance communication clarity and predictability, particularly at the detailed short interval/3-week look ahead level. Instead of replacing CPM schedules, recent technological advancements enable the direct integration of these fit-for-purpose planning methods, providing appropriate plan fidelity for different stakeholders.”

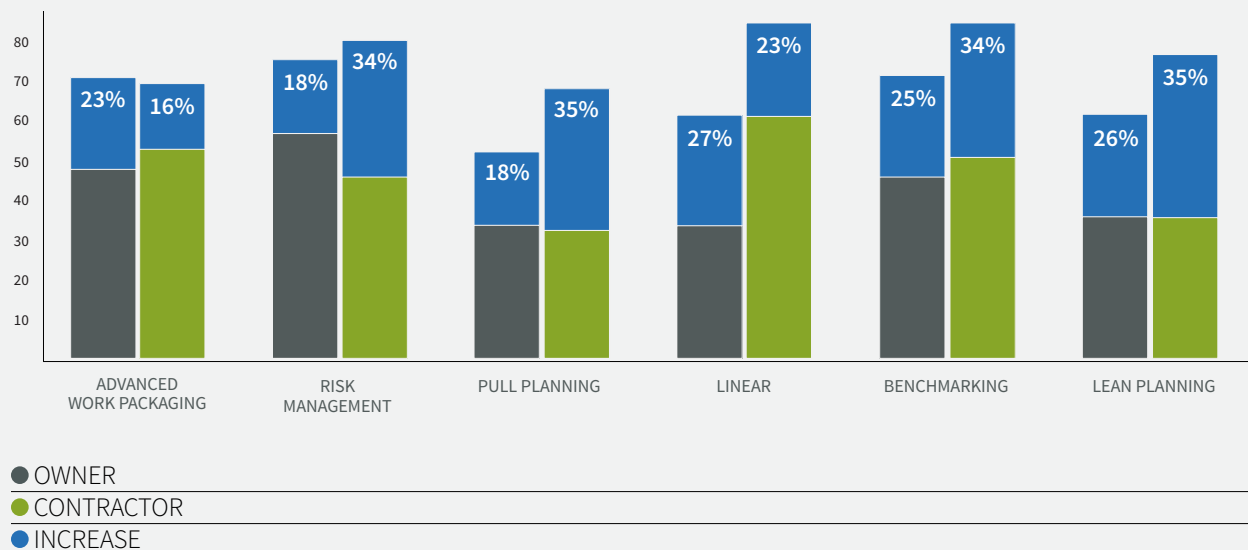
Looking forward, Lean Planning will see the biggest increase in uptake with almost a third more organizations planning to use it, followed by Benchmarking (28%) and Linear Scheduling (26%). Advanced Work Packaging sees the smallest increase in adoption and languishes in fifth place.

What does this tell us about industry priorities? Macholtz observes: “Lean Planning, Linear Scheduling and Pull Planning are all subsets of AWP so the fact they are all expected to see higher rates of adoption than AWP indicates a disjointed approach that is failing to integrate these business processes. Similarly, Benchmarking should be first choice since it offers the basis for measuring best practice in the first place and is therefore the one on which all others depend.”

Yet when it comes to future adoption, owners and contractors have somewhat divergent priorities. Owners intend to adopt Linear Scheduling (27%), Lean Planning (26%) and Benchmarking (25%) while contractors are most interested in Pull Planning (35%) and Risk Management (34%).

With contractor use of best practices already ahead of owners for all techniques except Risk Management and Pull Planning, further increases in contractor adoption could see the gap widen in the next three to five years.

WHICH PRACTICES/TECHNIQUES DO YOU EXPECT TO ADOPT IN THE NEXT 3-5 YEARS?



This would see many more contractors than owners using Benchmarking, Linear Scheduling, Lean Planning and Pull Planning. Yet Macholtz believes disparate practices will not necessarily jeopardize owner-contractor collaboration: “Connected data and continuous communications can bridge the gap where there are divergent practices between owner and contractor. More progressive delivery models such as IPD also foster closer collaboration and that will help transcend differences in techniques and best practices.”

The biggest drivers of changing best practices will be availability of new technologies that support different models (40%), indicating that improvements in best practice are following in the wake of digital transformation. Opportunities for greater collaboration, supply chain challenges and opportunities for data analytics and AI appear as the next biggest motors of change. As identified earlier, this mirrors the drivers of more collaborative delivery models, indicating that supply chain volatility and the promise of connected data are spurring progressive change across the industry.

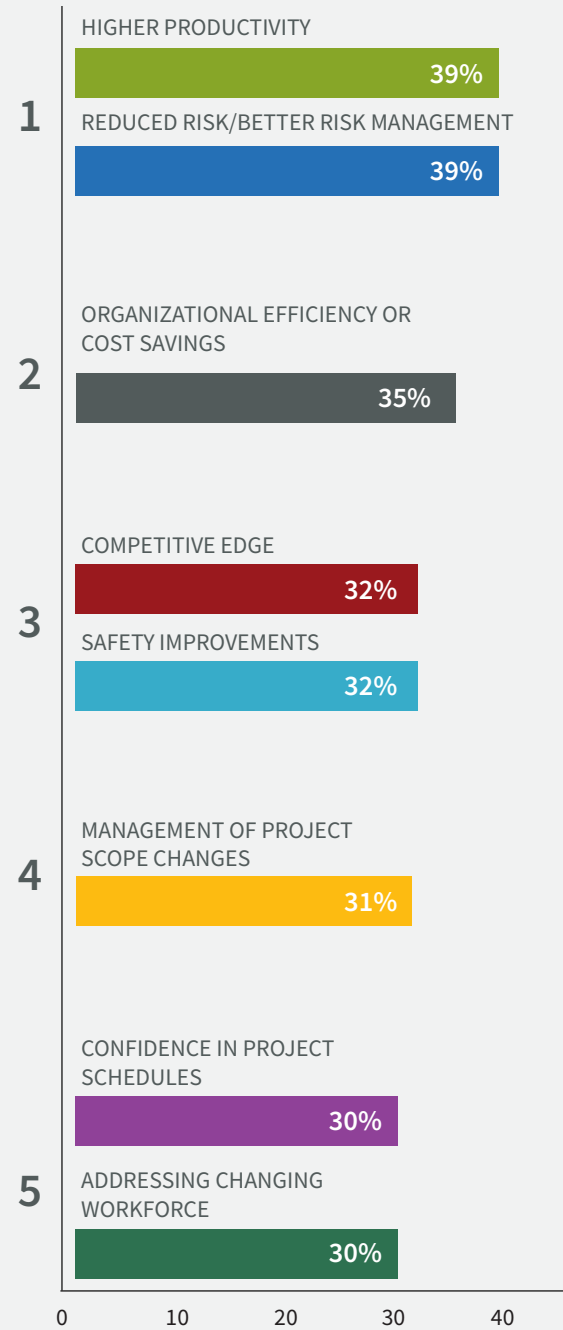
Perhaps surprisingly, only 33% of owners say greater collaboration will drive adoption of best practices in comparison to 47% of contractors, while pressure on costs is seen as a greater driver by owners (39%) than contractors (32%). This could reflect rising contractor demand for more collaboration with owners as a buffer against supply chain volatility, and the higher costs faced by owners as they take on more risk.

THE ROAD TO CONSTRUCTION 4.0

When asked to consider the biggest benefits of investing in technology, the joint biggest benefits were higher productivity and better risk management (39% each). This was followed by organizational efficiency or cost savings (35%), mirroring the priorities last year. However, fewer respondents see confidence in project costs as a benefit this year (28% versus 35% in 2022), perhaps related to the rise in average project overspend seen in Chapter 2.

Anirban Basu, CEO at Sage Policy Group, says: “A long-term bias in favor of college degrees over craft skills has created an unbalanced labor force and construction skills

WHAT DO YOU SEE AS THE MOST SIGNIFICANT BENEFITS OF GREATER INVESTMENT IN TECHNOLOGY AT YOUR ORGANIZATION?



shortage which drives demand for greater productivity. The typical construction site in America still looks much as it did five decades ago with one person managing a piece of heavy equipment while five others wait for the next step. Technology combined with a shift in processes is fundamental to boosting productivity and achieving greater coordination, consistency and efficiency across different tasks.”

Exploring aspirations for how digital technology might improve respondents’ personal experience at work, over half (57%) cited better real-time insights into the relationship between scope, cost and schedule as the most desired benefit. Macholtz comments: “Real-time connected data is the missing link between scope, cost and schedule and is crucial to bridging the gap between project performance and expectations. Real-time data on all project metrics is fundamental to how you can control time, cost and scope and improve your outcomes based on that.”

Dickinson concurs: “Previously you’d estimate a project 15 times to arrive at a credible answer; we simply don’t have enough people to do that anymore. Technology is a vital enabler to working smarter and more efficiently for pre-construction optioneering.”

Fifty-one percent also want digital technology to bring them closer to operational reality and give them more control, while a further 50% hope that digital technology can improve their access to site/project information. These are ahead of more humble aspirations such as the hope that automating more of their roles could save time (48%), indicating that employees want to harness technologies to drive broader business benefits over lower-order outcomes such as efficiency.

Owners are slightly more interested than contractors in how digital technology could bring them closer to operational reality (53% versus 48%), reflecting the fact that owners see technology as key to taking a more hands-on role and attaining more early visibility and control of construction risks.

HOW DO YOU HOPE THAT DIGITAL TECHNOLOGY MIGHT IMPROVE YOUR EXPERIENCE AT WORK PERSONALLY IN THE FUTURE?

I HOPE IT CAN GIVE ME REAL-TIME INSIGHTS INTO THE RELATIONSHIP BETWEEN SCOPE, COST AND SCHEDULE



I HOPE IT CAN BRING ME CLOSER TO OPERATIONAL REALITY/GIVE ME MORE CONTROL



I HOPE IT CAN AUTOMATE MORE OF MY ROLE TO SAVE TIME



I HOPE IT CAN IMPROVE COMMUNICATION BETWEEN ME AND OTHER STAKEHOLDERS



I HOPE IT CAN IMPROVE MY ACCESS TO SITE/PROJECT INFORMATION



I HOPE IT CAN IMPROVE OUR RETURN ON INVESTMENT



DON'T KNOW



0 10 20 30 40 50 60

● OWNER
● CONTRACTOR



CHAPTER SUMMARY

With ongoing supply chain turbulence, the industry is moving towards a fairer distribution of risks with Integrated Project Delivery set to rise in place of the declining Design-Bid-Build model. Yet best practice adoption remains disjointed with individual best practices such as Lean Scheduling preferred over combined Advanced Work Packaging and a growing gap between owner and contractor practices. This indicates that progress towards best practices remains patchy and piecemeal rather than being systematic, strategically driven and consistent.

Supply chain challenges and connected data emerge as prime drivers behind the shift to more progressive delivery models and best practices across the industry. And the industry is increasingly harnessing technology for higher order benefits from productivity to highlighting the interdependencies between project metrics to improve project certainty. These are all signs that construction organizations are increasingly joining the data dots to see the bigger picture.

SPOTLIGHT ON EUROPE

Europe finds itself in a strange moment. On the one hand, the COVID-19 rebound continues and capital project spending is going up. Yet at the same time, rampant inflation and the war in Ukraine are having a wide impact, posing risks to both the economic environment and supply chains. Despite this, the sector seems to be in good health, thanks in part to a robust pipeline of public infrastructure projects.

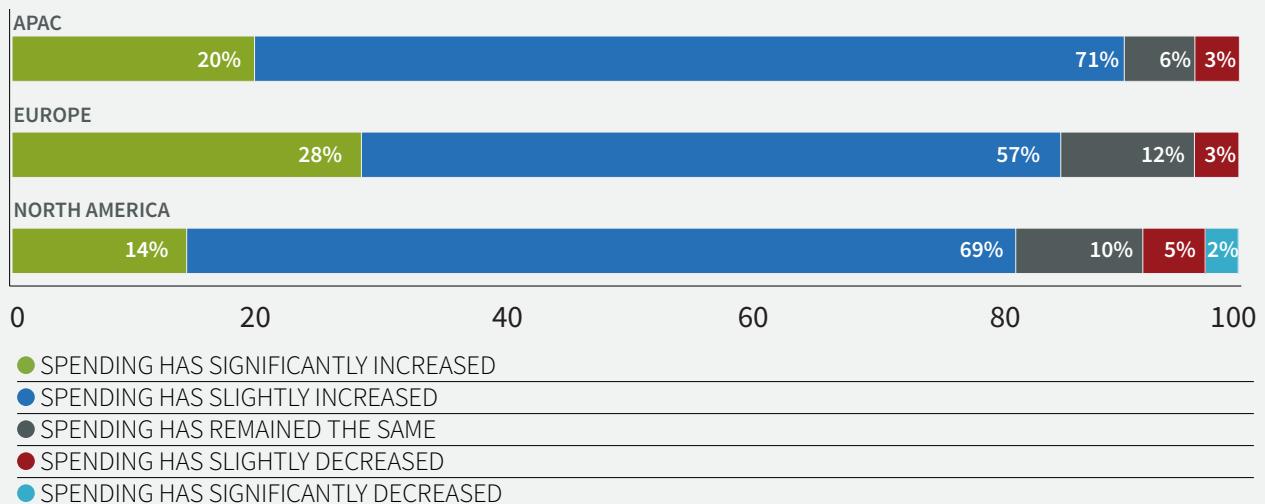
The European capital projects context is characterized by a moment of vibrant but fragile health. Globally, 83% of respondents report having observed some increase in capital project spending in the last year, and European respondents are slightly above average in this regard at 85%.

The strength of the sector is more apparent in the fact that 28% of Europeans report a “significant increase,”

versus just 20% of their APAC peers and 14% of respondents in North America.

Jeff Quantrill, Head of Account Management, Europe at InEight, notes that this has caught some by surprise: “It’s been a tough year economically, and the mood has not always been bullish. In the UK, we would compare notes on which infrastructure projects we thought would get

THINKING SPECIFICALLY ABOUT CONSTRUCTION AND CAPITAL PROJECTS SPENDING, IN YOUR OPINION, HAS YOUR INDUSTRY SEEN AN INCREASE OR DECREASE OVER THE PAST YEAR?



tightened or canceled, but it never happened. Europe has a heritage of sound infrastructure investment, and the EU’s push on the Green Deal in recent years has only accelerated that. Public sector projects drive a lot of project flow in this part of the world and that in turn invites greater emphasis on transparency for those projects.”

However, at the same time as expressing optimism — and respondents across the globe are similarly optimistic to one another — European respondents do sound a small note of concern regarding resilience. Though 88% of respondents say their organization is either “very” or “fairly” resilient, this tracks lower than peers in North America (93%) and APAC (94%). They are also markedly less likely to select “very” resilient, with only 29% doing so versus 36% in both North America and APAC.

This may partly be due to the war in Ukraine which, in Quantrill’s estimation, may be “more present in our thoughts” in this region of the world. Indeed, 38% of European respondents cite the political climate as a major risk to growth for the coming year, versus just 28% in North America (although it should be noted that APAC respondents harbor their own concerns, polling at 39%).

However, the war does not seem to be the only factor — labor challenges are a concern for 41%. Meanwhile a

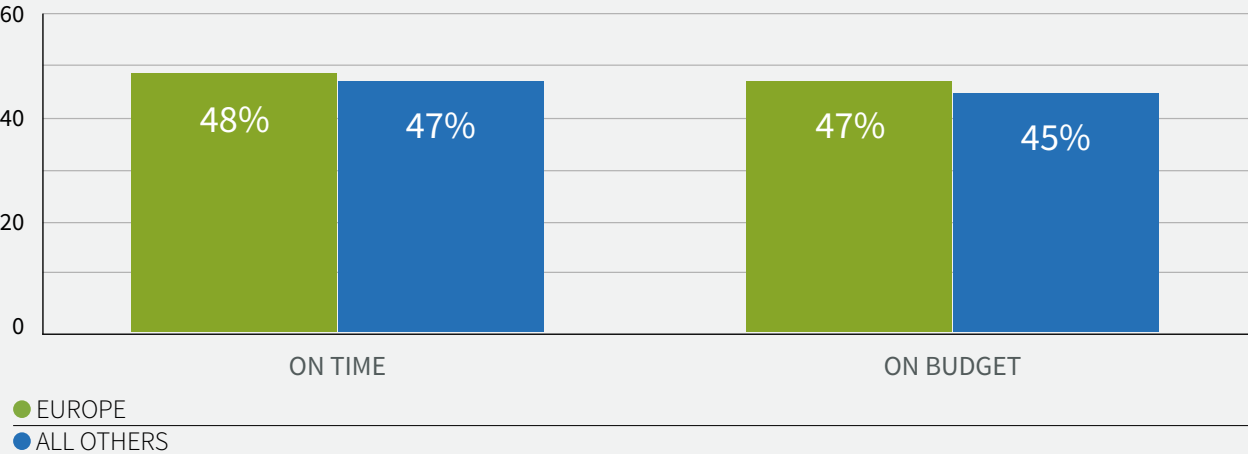
further 41% report lack of access to capital as a major challenge, versus just 33% in North America and 24% in APAC. This stands in stark contrast to last year’s survey, in which Europeans reported the least trouble in this respect.

As might be expected from a capital projects landscape dominated by public sector owners and mature, large contractors, Europe performs solidly when it comes to most measures of project certainty and technology adoption. Respondents report completing projects on-time and on-budget just under half of the time — a touch behind APAC and a touch ahead of North America.

Similar to their North American peers, Europeans struggle most with communication that allows them to meet budgets and schedules, whereas in APAC unexpected risks are seen as the bigger threat. European companies also struggle with access to historical data to a greater extent than their peers.

Neither of these findings surprise Quantrill: “On communication, you have to account for the multilingual nature of Europe. Though English is an almost universal second language, there are places where you can cross the street and speak a different language here. North America is more or less monolingual, and APAC is more separated by sea borders.

HOW OFTEN DOES YOUR ORGANIZATION COMPLETE CONSTRUCTION-RELATED PROJECTS ON OR AHEAD OF THE ORIGINAL APPROVED SCHEDULE?



“As for the data, the competitive landscape in Europe is dominated by very established and mature construction firms, many of which are household names. That means a lot of projects over a lot of decades in a lot of countries with slightly different contexts which makes historical data devilishly hard to collect, let alone to standardize and organize.”

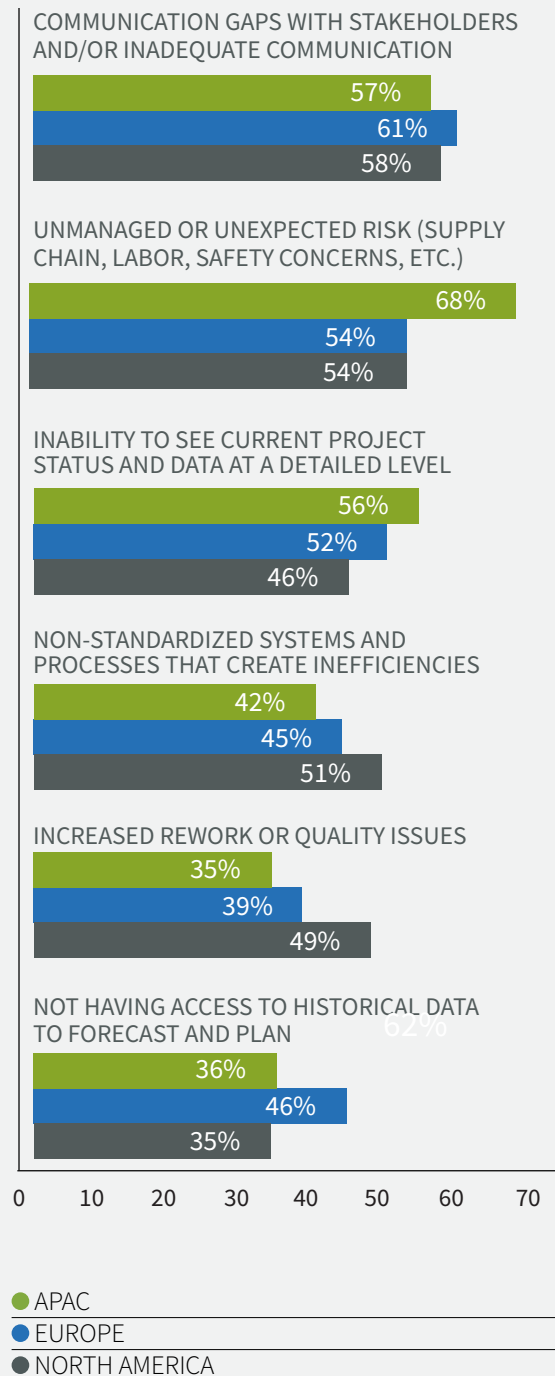
However, when European companies do get access to data, they seem to use it well. Nearly six in 10 (57%) of European respondents use historical data to inform decision-making, versus just half in APAC and 38% in North America. Cited benefits include enhanced employee productivity (42%) and risk management (40%, alongside fewer costs (41%) and scope changes (30%). Europeans are also more likely to use construction cost estimating software to automate tasks (44% versus 38% in North America and 35% in APAC).

The relative size of major European contractors also likely contributes to the popularity of the Construction Manager at Risk project delivery model. While only 38% of North Americans and 37% of APAC respondents engage with this model today, 45% of Europeans do. Larger contractors may be more able to absorb the risk this model entails, and as a result, reap the rewards which respondents say include improved data collection and sharing and improved schedule management.

However, as elsewhere, project delivery models are expected to change in the next three to five years. In this timeline, Europe distinguishes itself from both North America and APAC, which expect Integrated Project Delivery (IPD) to become the predominant model. Europeans place their bets instead on Construction Management Multi-Prime (50% expect to be engaged with this model) and PPP models (50%), with IPD slightly behind (45%).

Asked for the factors driving the adoption of new risk-sharing models and operational best practices, the need for better communication (41%) is most pressing for European respondents — in line with the challenges to project certainty they identify. This is followed by the availability of new technologies that support different models (39%) and the need for greater transparency (38%), which may be considered especially important for publicly funded infrastructure projects.

WHICH CHALLENGES DO YOU FEEL HAVE THE BIGGEST IMPACT WHEN THINKING ABOUT COMPLETING PROJECTS ON-TIME AND ON-BUDGET?





CHAPTER SUMMARY

Europe's balance of public sector owners and larger contractors creates a subtly different set of project delivery models and attitudes to risk sharing. However, though both the starting point and the direction of travel are slightly different than for peers in APAC and North America, the drive to more sophisticated and data-driven models is the same. Success in adopting these models will be critical in resolving the apparent tension between healthy project spending and lingering concerns over resilience in the coming years.

SPOTLIGHT ON APAC

APAC continues to enjoy strong performance based on a healthy pipeline of capital projects. Retaining its title as the region with the most projects completed on time and on budget, greater focus on sustainability and shared risk highlights a sector that continues to look forward and innovate.

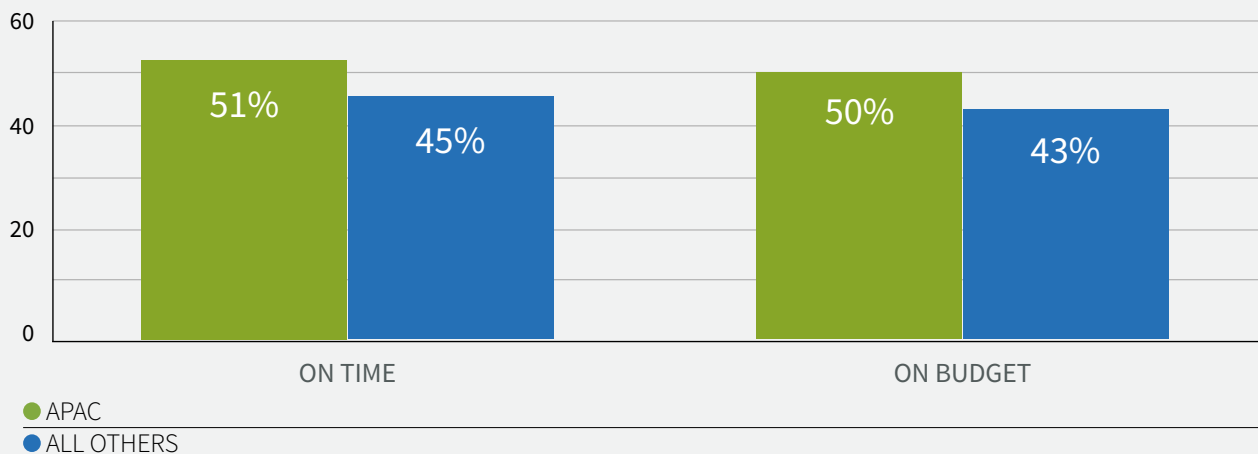
In 2022's Outlook, respondents reported that projects were completed on time 45% of the time, and on budget 46% of the time. This year, the same figures nudge into a razor-thin majority, with 51% of projects completed on time and 50% on budget.

Rob Bryant, Executive Vice President, Asia-Pacific & Japan at InEight, cautions against mistaking this for a tipping point, however: "It sounds good to say that projects are

now completed on time more often than they aren't in region — but to call it a tipping point, that trend needs to hold for a few years, and for a gap of more than one or two percentage points. That said, we can be cautiously optimistic of seeing that tipping point in the near future."

The industry's mood in region is high: 96% of APAC respondents feel optimistic about the coming 12 months, compared to 93% of their North American peers and 92%

HOW OFTEN DOES YOUR ORGANIZATION COMPLETE CONSTRUCTION-RELATED PROJECTS ON OR AHEAD OF THE ORIGINAL APPROVED SCHEDULE?



of those in Europe. Similarly, 94% feel their organization is a resilient one, marginally more than in North America (93%) and Europe (88%). Though the margins are slim, the repeated notes of positivity strengthen the case that APAC continues to enjoy a strong position.

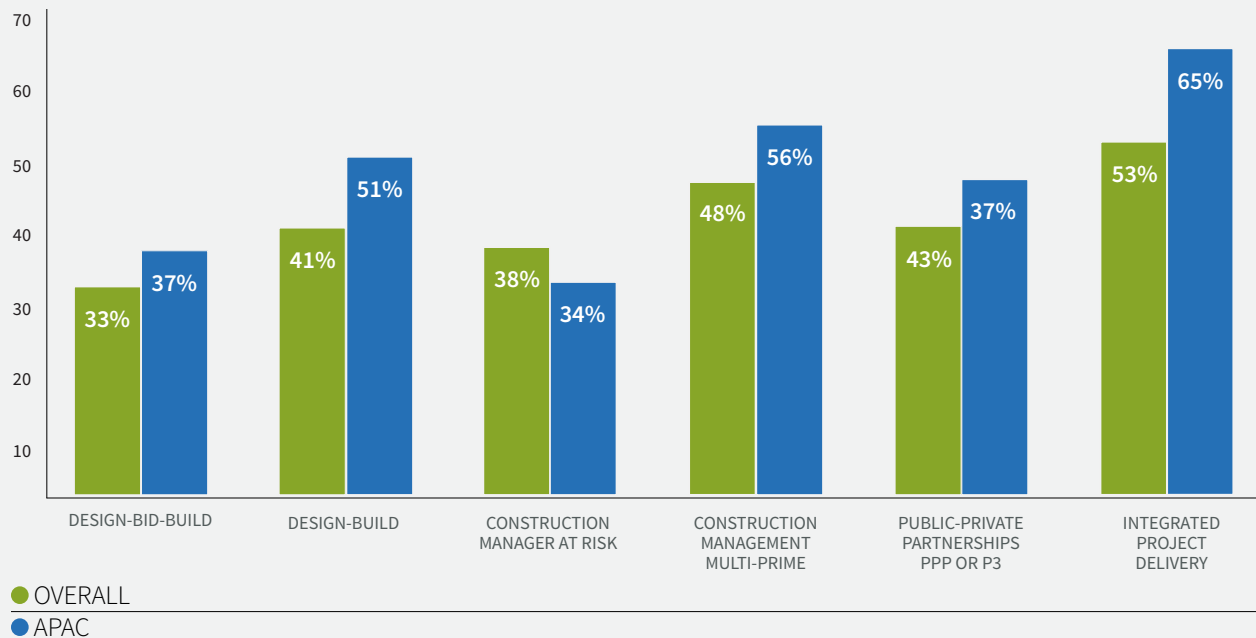
This optimism is also reflected in the sources of opportunity that respondents identify for the next year. For example, all three regions report that digital technologies are the biggest opportunity for growth, but while this is identified by 57% of North Americans and 49% of Europeans, an impressive 71% of APAC respondents are enthused by these technological opportunities.

It is also worth noting that sustainable building projects and practices have entered the overall top three sources of opportunity this year, having been selected by 50% of respondents. However, this is a trend led by APAC, where it is the second most popular selection at 57%. It does not enter the top three sources of opportunity or pass 50% for either North America or Europe.



AN IMPRESSIVE 71% OF APAC RESPONDENTS ARE ENTHUSED BY THESE TECHNOLOGICAL OPPORTUNITIES.

WHICH TYPES OF CONSTRUCTION PROJECT DELIVERY METHODS DO YOU EXPECT TO PREDOMINATELY ENGAGE WITHIN THE NEXT 3-5 YEARS?



For Bryant, this is evidence of the region’s continued leadership position: “In the last two Outlooks, we saw APAC establish itself as a tech leader and then consolidate. What we see in these results is that the region remains tech savvy and willing to invest, and is now staking out a bit of a leadership bid in the sustainability sense, too.”

And these are not the only ways in which APAC appears to have a narrow leadership position. The region also seems to be forward-thinking with regards to evolving project delivery models and risk sharing between owners and contractors.

Though no specific project delivery model appears to be a clear favorite across the industry, the use of Integrated Project Delivery (IPD), Public-Private Partnerships and Construction Management Multi-Prime are expected to rise, while the use of Design-Bid-Build is expected to fall. Of these, IPD is the most heralded option, with a 9% increase in uptake expected over the next three to five years, versus 5% and 7% respectively.

We also see that IPD is particularly popular among today’s industry leaders: 62% of organizations that deliver projects on or ahead of schedule more than 80% of the time use Integrated Project Delivery.

Taken together, these findings imply that though there is no clear superior model, IPD is potentially the most respected and useful project delivery model in the industry. It is encouraging then, that APAC respondents are most likely to use it already, and most likely to see it as the future model of choice — once again demonstrating leadership.

It would be a mistake to assume that things are easy for the sector in APAC, however. Challenges continue to abound.

Globally, respondents’ top two challenges to growth are identical: staff or skills shortages (selected by 42%), and economic stagnation or recession (40%). These are closely followed by poor data collection, analytics and insights and the political climate (both 35%).

However, even if respondents in APAC follow the same trends, they seem to express higher levels of concern. Forty-four percent worry about staff or skills shortages versus 41% in Europe and 40% in North America, moving



INTEGRATED PROJECT DELIVERY (IPD) IS POTENTIALLY THE MOST RESPECTED AND USEFUL PROJECT DELIVERY MODEL IN THE INDUSTRY.

up the global average. Similar patterns can be seen in concern about economic stagnation or recession (43% in APAC, 41% in Europe, 37% in North America), and data issues (39% in APAC, 38% in Europe, 28% in North America). Looking to the future, respondents are hopeful that technology investment could address changing workforce requirements (43%) and improve risk management (46%).

When asked specifically about challenges for completing projects on time and on schedule, APAC respondents are significantly more likely to fret about unmanaged and unexpected risk (68% selected this as a top-three challenge). In contrast, only 54% of European and North American respondents say the same.

In fact, even the biggest challenges for these regions seem to be less worrisome than unexpected risks are in APAC: 61% of Europeans and 58% of North Americans say that communications gaps with stakeholders pose the greatest challenge.

Bryant sees this as partially a result of the region’s geography: “As a region, APAC is less characterized by a single contiguous landmass than either Europe or North America. The result is that countries tend to be more reliant on sea or airborne imports for both materials and — in some cases — labor, versus those in the other two regions. That perhaps makes capital projects here more exposed to supply chain disruptions or unexpected shocks elsewhere, and I think project owners and contractors are sensitive to that.”



CHAPTER SUMMARY

APAC continues to lead the industry on a number of fronts, notable new project delivery models and adoption of sustainability practices. However, at the same time it seems more exposed to — or at least concerned by — a number of challenges today and in the near future. It is possible that these are two sides of the same coin, and that a region acutely aware of the challenges it faces is taking a proactive approach in meeting them.

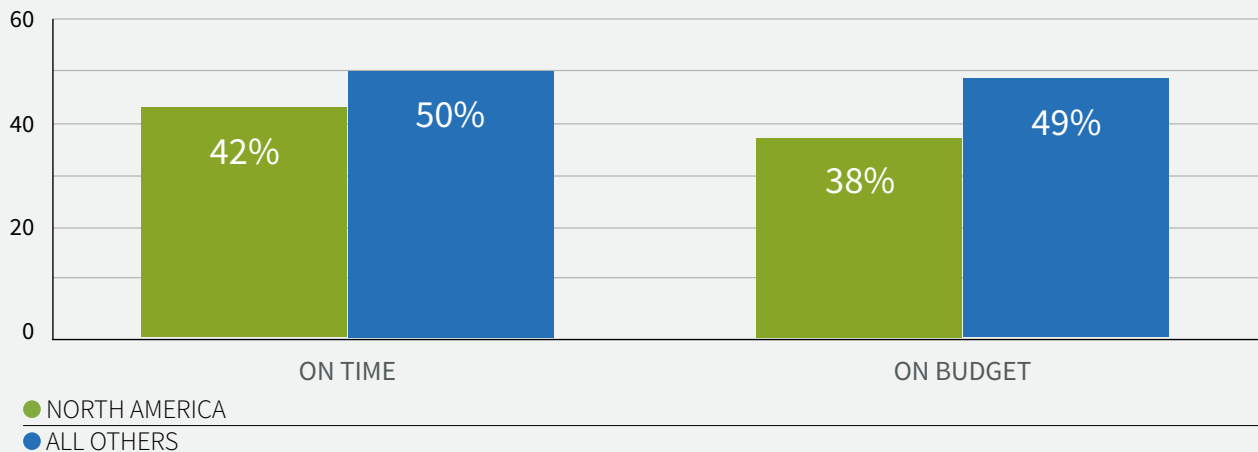
SPOTLIGHT ON NORTH AMERICA

North America’s construction industry is the global laggard on project performance due to siloed systems, fragmented communications, and supply chain challenges. This is exacerbated by the fact that the region trails its global peers on many aspects of digital modernization from connected worksite communication to benchmarking. It is also sensitive to disruption from global challenges including inflationary pressures on supply chain and labor costs. Yet this turbulent background is helping forge a new industry from adoption of best practices to progressive delivery models. Perhaps as a result, optimism and resilience remain strong.

North America falls behind its global peers on project performance due to siloed systems, processes, and people alongside its unique sensitivity to global supply chain disruption. Only 42% of North American projects stayed on time and 38% within budget compared with 51% and 50% respectively in APAC and 48% and 47%

for Europe. North America’s comparatively poor project performance could also explain why capital investment in projects is lower than any other region with 14% seeing a significant increase compared with 28% in Europe and 20% in APAC.

HOW OFTEN DOES YOUR ORGANIZATION COMPLETE CONSTRUCTION-RELATED PROJECTS ON OR AHEAD OF THE ORIGINAL APPROVED SCHEDULE?



North America is also the only region where non-standardized systems and processes are still among the three biggest barriers to project certainty (51% versus a global average of 46%). Perhaps relatedly, North American organizations also report communication barriers with other stakeholders have the biggest impact on project certainty (58%). This is partly explained by the fact that North American organizations trail their global peers on using AI and worksite communication technologies to enhance communications with colleagues. North America is also in last place when it comes to using project management or controls software to automate tasks to save time, indicating the region is somewhat of a laggard on wider digital technology adoption.

Nate St. John, Director, Product Management at InEight, explains that project certainty trails in North America because it is also falling behind on digital transformation: “North America’s industry is more technologically conservative than other regions which can impede standardization and communication among stakeholders. Embracing ‘Construction 4.0’ technologies also runs in parallel with more academic approaches to project management which are more prevalent in other regions such as Europe.”

North America is also behind other regions on harnessing historic data (45%) and benchmarks (45%) to inform decision-making, which could explain why project certainty in the region has not improved since last year. Perhaps in recognition of this, more North American organizations plan to adopt benchmarking than anywhere else in the next three to five years (30% versus a global average of 28%).

Catie Williams, Vice President of Product Development at InEight, says: “Other regions like APAC are more advanced on adopting standards for measuring progress such as Earned Value Management. This means they are more likely to see the value of using past data to improve future metrics and performance.”

Ongoing supply chain disruption is also a factor in project performance with North American respondents citing unmanaged or unexpected risks (supply chain, labor, safety concerns, etc.) as the second biggest barrier to project certainty. North American respondents also feel the most exposed to global supply chain turbulence, with



PROJECT CERTAINTY IN THE REGION HAS NOT IMPROVED SINCE LAST YEAR.

many more reporting being disrupted by supply chain cost (80%) and labor cost (80%) inflation in the past year than their global peers.

St. John says: “North America’s construction industry is heavily reliant on imports which means it is more exposed to the headwinds from global supply chain volatility and price escalation. For example, the U.S. is deeply dependent on imported components for new Liquefied Natural Gas (LNG) projects. And it is accelerating construction of infrastructure such as offshore wind where the domestic supply chain is still in its infancy.”

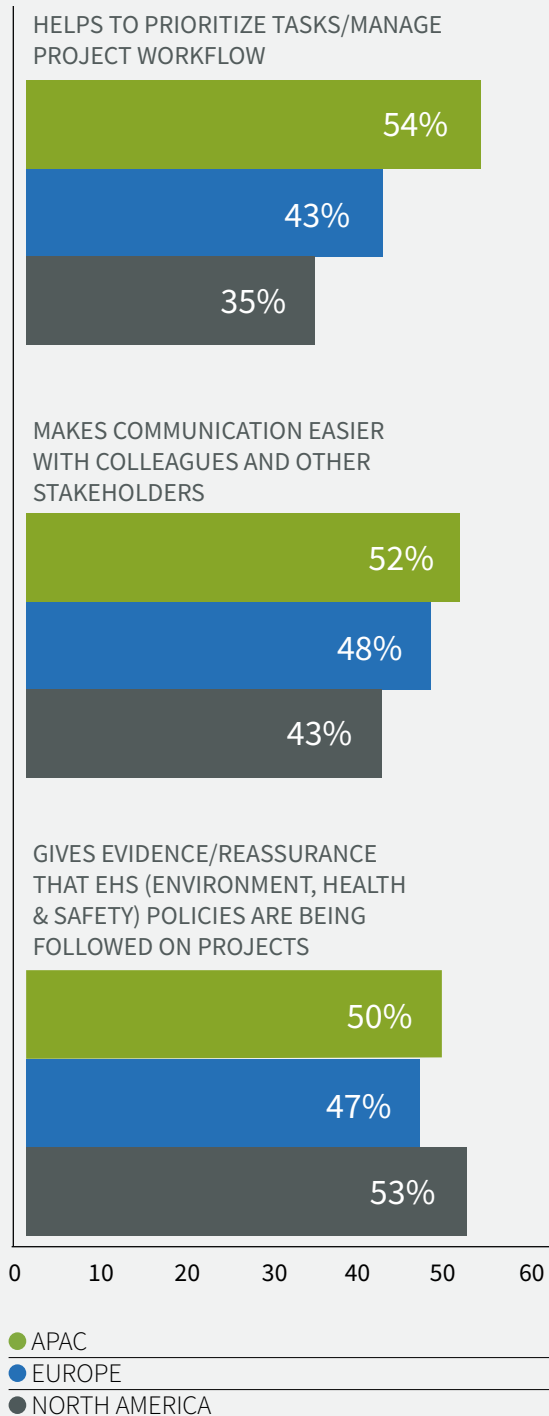
A series of other factors could also be affecting project certainty. In addition to being worst hit by supply chain inflation costs, North America experienced the worst disruption from inflationary pressure on employee/contractor pay, labor and recruitment challenges, and even energy security in the past year. Consequently, the intensifying skills shortage (40%) is considered a key risk to growth.

Andy Trewick, CEO of North American construction solutions provider Graham, says: “We are facing a lack of resources and people with a diminishing craft skills base and difficulties getting materials particularly from Europe. Inflationary pressures have also been a concern the last 12 months and interest rates are being raised to compensate. There are fears over the regional banking structure, and with several banks failing recently there is nervousness about any project tied to the financial markets. Amidst rising costs and risks, investors are increasingly re-evaluating the economics of developing new projects, and that’s a challenge for us.”

Yet there is also evidence that the region’s particular sensitivity to supply chain challenges is driving progressive changes to North America’s delivery models and practices. Supply chain challenges emerge as the biggest driving force behind changing delivery models in the region. As a result, more collaborative Integrated Project Delivery (IPD) methods are set to become the delivery model of choice for 50% over the coming three to five years.

St. John says: “A more volatile supply chain renders it essential for all stakeholders to work together on

HOW DOES PROJECT MANAGEMENT OR PROJECT CONTROLS TECHNOLOGY HELP YOUR ORGANIZATION?



identifying and mitigating risk at an early stage. We're increasingly retiring the old ways in which there were rigid risk allocations, roles and responsibilities. Companies are seeing that if you can integrate ideas and iterate earlier in the project life cycle it is easier to mitigate risks and improve project certainty. The growing scale and complexity of projects from new nationwide rail links to renewables also demands a more collaborative approach."

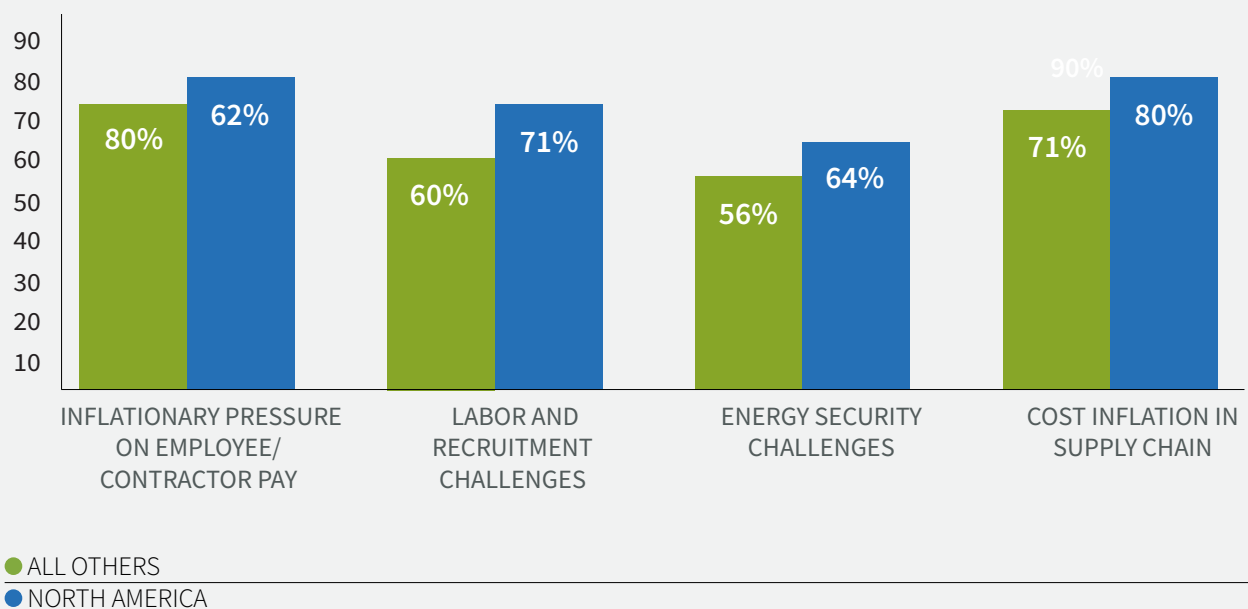
The region is also alone in citing supply chain challenges as the prime driver behind changing best practices, followed by opportunities for greater collaboration. This means North America is also the most likely to adopt key best practices such as Benchmarking, Pull Planning and Linear Scheduling over the next three to five years, indicating a hunger for positive transformation. Reflecting the region's particularly acute challenges around collaboration and integration, North America is also

most likely to cite improved data collection and sharing as a benefit from adopting best practices (43% against a global average of 40%).

And despite the economic turbulence, there is ongoing optimism and stoicism in the region. Ninety-three percent of organizations in North America feel resilient despite the events of the past year compared with just 88% in Europe. Ninety-three percent are also confident of their growth prospects in the following year, only slightly below the global average of 94%.

St. John notes: "North America has adjusted very well to the new normal of the lingering effects of COVID-era supply chain disruption and inflation. And some of the economic storms we have been hit with are perhaps now tailing off with supply chains gradually stabilizing — so that is producing greater confidence."

TO WHAT EXTENT HAVE THE FOLLOWING FACTORS DISRUPTED YOUR COMPANY OVER THE PAST 12 MONTHS?





A CLIMATE OF ADVERSITY IS ALSO HELPING DRIVE POSITIVE PROGRESS.

CHAPTER SUMMARY

A technologically conservative mindset has left a North American construction industry mired in fragmented systems and communications silos and trailing its competitors on technology adoption. Significant reliance on imports has left the region over-exposed to global economic headwinds and there are signs that volatile costs and risks are also hampering investment in capital projects. Combined, these circumstances have created an industry that runs late or over budget more than any of its global peers. Yet a climate of adversity is also helping drive positive progress. Supply chain challenges are spurring North American firms to switch from siloed models to collaborative Integrated Project Delivery methods and are out in front when it comes to their intentions to adopt best practices such as benchmarking. This points to a brighter future which is reflected in this region's continued optimism and robust resilience.

CLOSING SUMMARY

When we first started the Global Capital Projects Outlook three years ago, no one could have predicted the extraordinary turn of events that followed, nor the remarkable way in which the construction industry would rise to the challenge. With three years of data to reflect on, we can say with full confidence that it is an industry made of grit and determination, unshakable in its confidence and resilience even in the face of extreme pressure.

As the challenges look set to remain, so do the returns on technology investment as evidenced in this year's results. Reflecting on our four key themes we have affirmed that:

THE ENERGY TRANSITION IS A BEACON OF HOPE.

Faced with supply chain disruption, inflation and labor shortages, the operating environment continues to be extremely challenging for many construction companies. Project finance is also increasingly difficult to secure, but renewable energy and sustainable infrastructure projects remain highly investable. Indeed, the U.N. is calling for a tripling of clean energy investment to \$5 trillion USD per year by 2030, giving confidence to the industry's future.

THERE IS A CLEAR DIVIDE BETWEEN THE DATA HAVES AND HAVE NOTS.

Where we see the use of historical data and industry benchmarks it is having a markedly positive impact on project certainty. Through connected data, construction organizations can more astutely balance the tradeoffs between scope, cost and schedule. However, over half of the industry still has not yet integrated this information into project planning and/or execution, leaving tremendously valuable operational awareness out of the jobsite. The resulting operational blind spots have ripple effects exacerbated by lack of transparency and data sharing, creating communication barriers, unexpected risks, misaligned expectations and poor project outcomes.

OPPORTUNITY LIES IN TECHNOLOGY

SOPHISTICATION. Most of the construction industry is tuned in to the benefits of project management and controls software to understand the bigger picture and streamline everyday tasks. However, there is still an

opportunity to tap into the likes of connected worksite communication, artificial intelligence, and machine learning which will create benefits across EHS compliance, workflow planning and management, and collaboration.

SHARED RISK AND GREATER COLLABORATION ARE COMING TO THE FORE.

External forces such as supply chain challenges alongside internal sophistication around connected data are expected to rapidly shift the project delivery models and best practices in use over the next three to five years. Project delivery models with a more pragmatic distribution of risk and greater opportunities for collaboration will become more prominent.

As yet another tough year unfolds, those construction organizations that remain unwavering in their pursuit of technology sophistication will continue to pull ahead. Through greater collaboration, consistency and control we can forge a better future — a future in which all project stakeholders have the data they need, when and where they need it to optimize project decision-making. This is the path to driving predictable project outcomes, and until that vision becomes a reality, we will not stop.



Jake Macholtz, CEO
InEight

About InEight

InEight provides field-tested project management software for the owners, contractors, engineers and designers who are building the world around us. Over 575,000 users and more than 850 customers worldwide rely on InEight for real-time insights that help manage risk and keep projects on schedule and under budget across the entire life cycle. From pre-planning to design, from estimating to scheduling, and from field execution to turnover, InEight has powered more than \$1 trillion in projects globally across infrastructure, public sector, energy and power, oil, gas and chemical, mining, and commercial. For more information, follow InEight on LinkedIn or visit [InEight.com](https://ineight.com).

