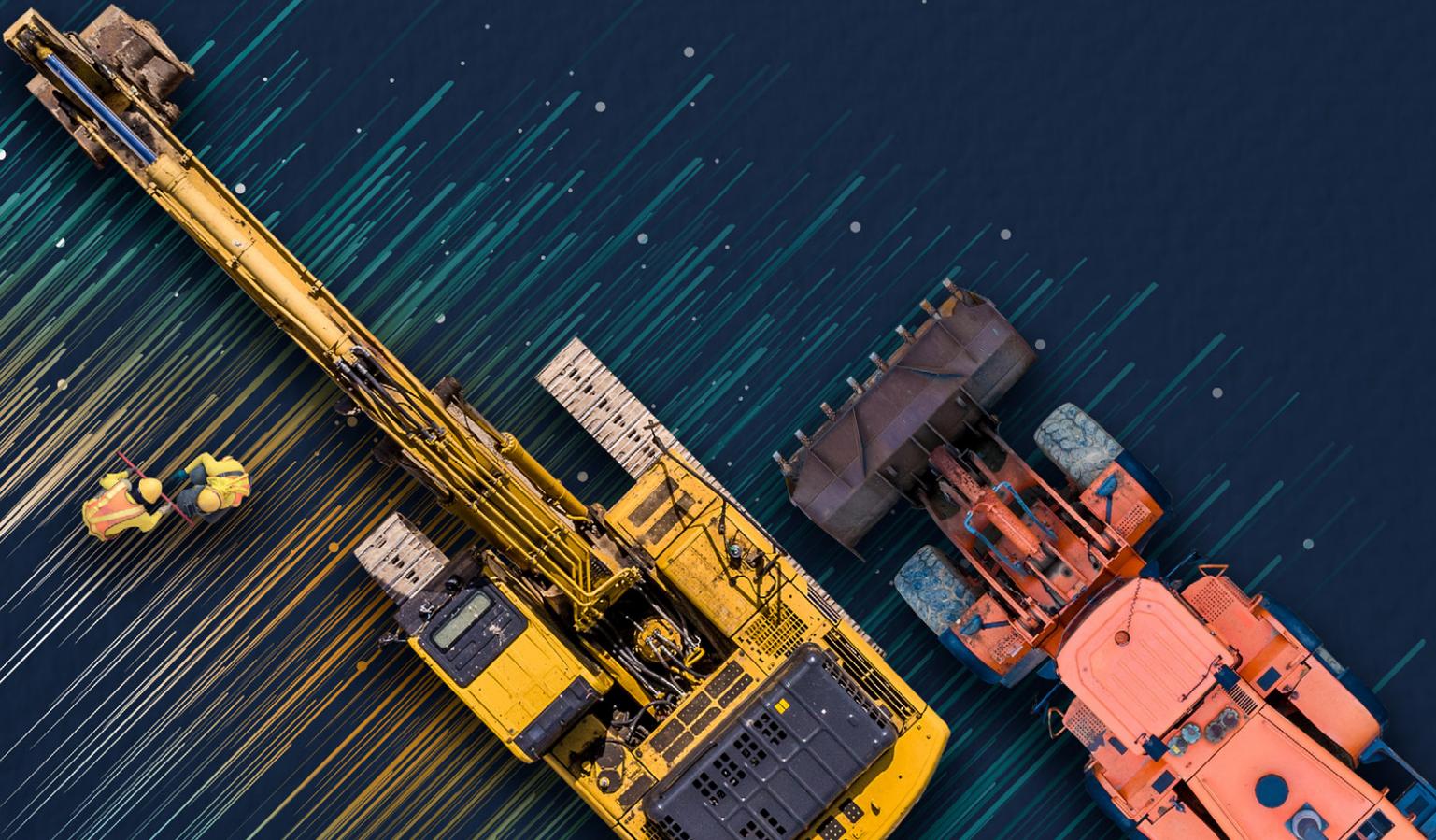


2018 Industry Report for Australia/New Zealand

CONSTRUCTION DISCONNECTED

Rethinking the management
of project data and mobile
collaboration to reduce
costs and improve schedules



About The Report

In April 2018, PlanGrid partnered with FMI to survey nearly 600 construction leaders from around the world to discover:

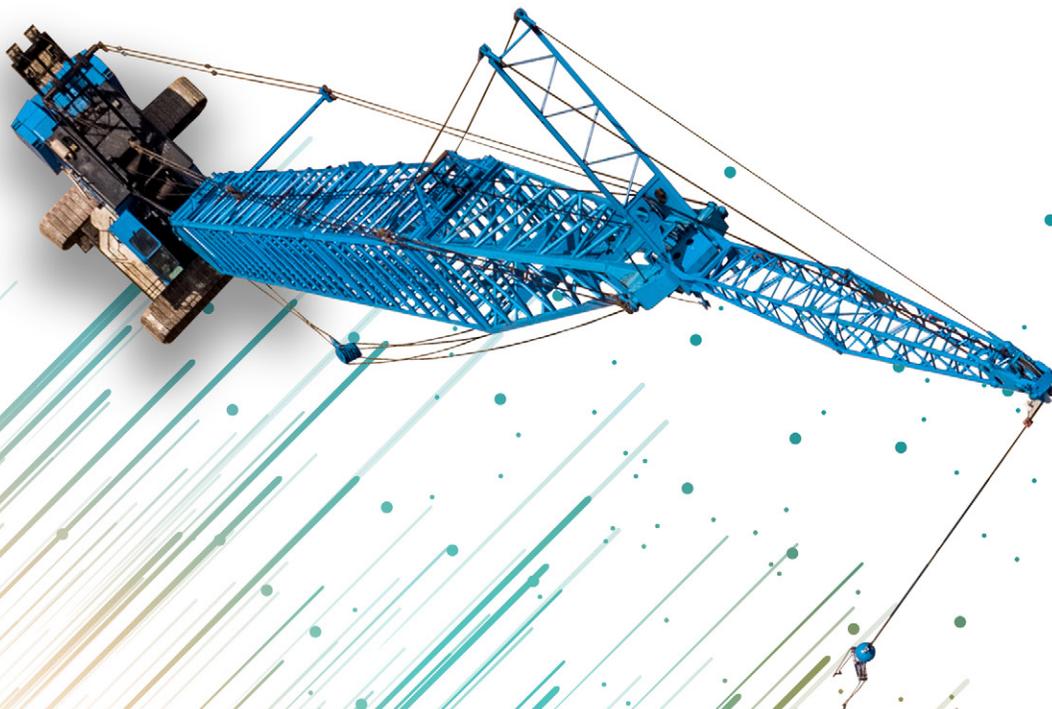
- What activities require the most time during their week and the costs associated with each activity.
- The causes of poor data and communication on projects and the costs to the industry.
- The top reasons for investing in construction-specific technology and what factors influence decision making.
- If the deployment and usage of technology align with how technology investment decisions are made.

In this report, we define construction-specific technology and/or software as products built explicitly for engineering and construction firms for field collaboration, reporting, project management, estimating, safety and more. Survey respondents were asked not to consider their experience with email clients (e.g., Microsoft Outlook), CRM software (e.g., Salesforce, Microsoft Dynamics), ERP systems (e.g., Oracle, Vista) or other similar platforms. U.S. dollars are used in figures and cost estimates for consistency with the global cost estimates.



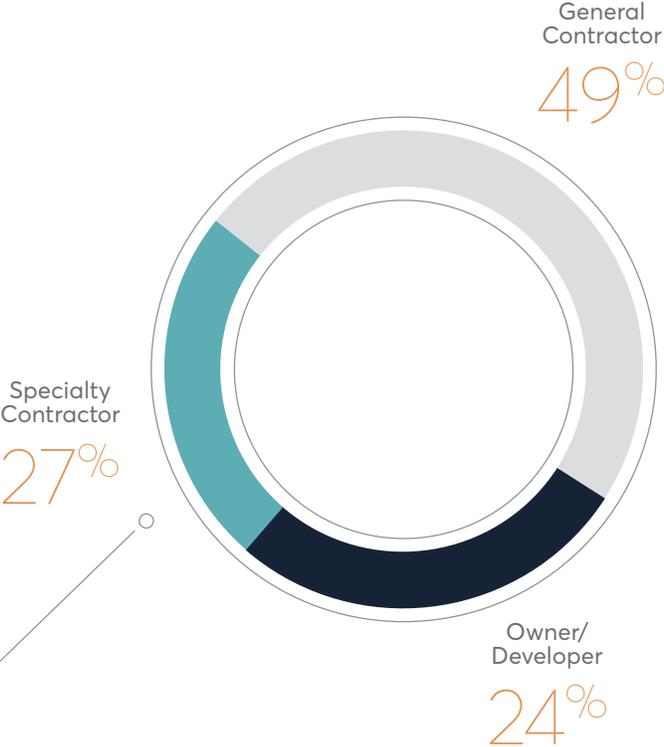
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Survey Demographics

Participants in the study included 599 total participants, including 40 from Australia and another 40 from New Zealand, with the rest coming primarily from the United States. Of those surveyed in Australia and New Zealand 49% work for general contractor firms 27.5% came from speciality trades and 23.75% were owners. Over 300 global respondents came from the commercial sector and other respondents represent industrial and manufacturing, heavy civil, healthcare, power (oil and gas, and energy), education and government.



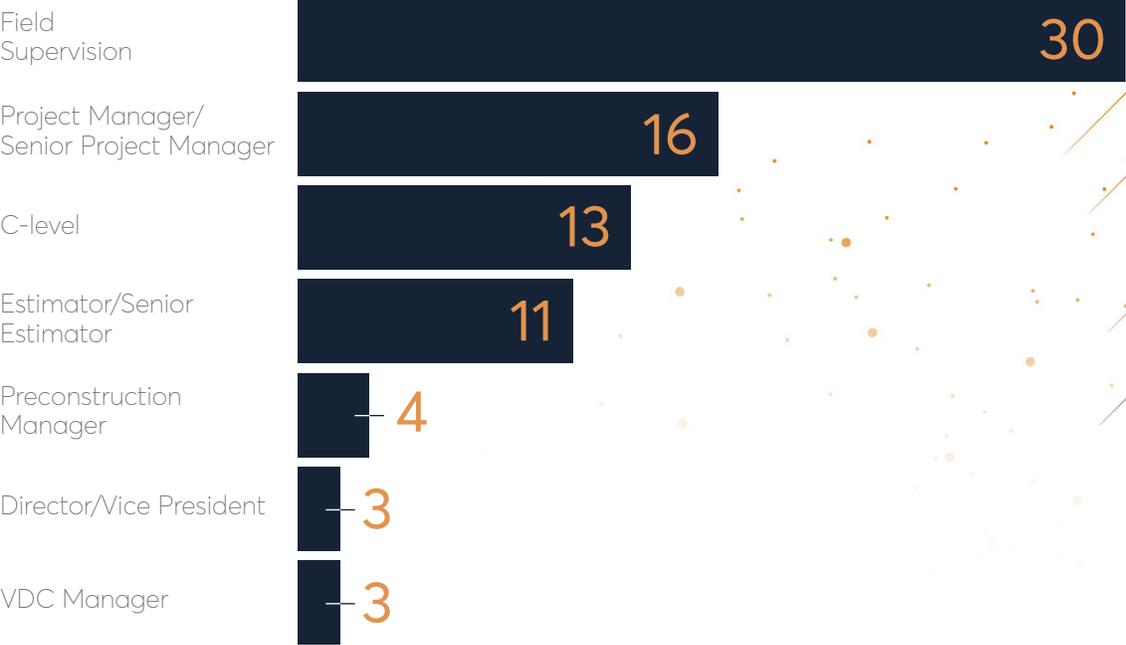
80 Total ANZ participants

40 + 40
Australia + New Zealand

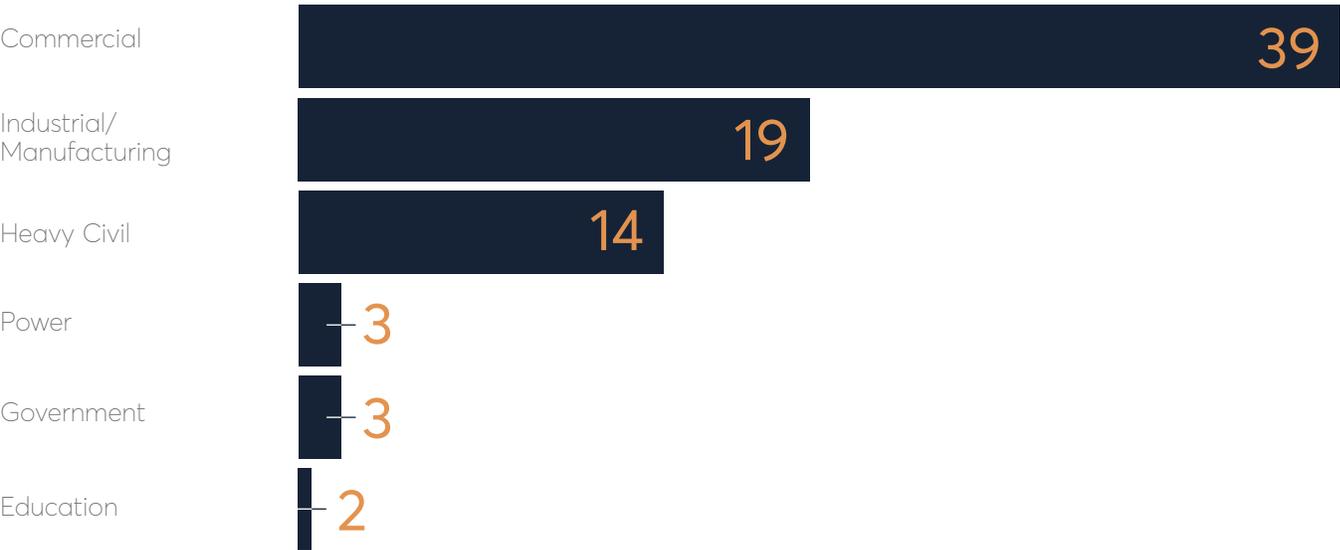


Survey Demographics

Position/Title



Industry/Sector



Executive Summary



ANZ will spend

\$36.5 Billion USD

in labour costs on non-optimal activities in 2018.

Where is Time Being Wasted?

Construction professionals spend

33%

of time on non-optimal activities.



Only

67%

of their time is spent on optimal activities.

11.5+ Hours lost per person each week that could be spent on priority activities.

Opportunity to maximise time spent on optimal activities.

4.9

Hours/week

Looking for project data/information

3.4

Hours/week

Conflict resolution

3.2

Hours/week

Dealing with mistakes and rework

8.7

Hours/week

Project execution and coordination

7.3

Hours/week

Organising the jobsite

6.9

Hours/week

Communicating/interacting with project stakeholders

The Connection Between Rework, Bad Data and Communication

On average,

59%

of all rework in ANZ is caused by poor data and miscommunication.

\$14.2 Billion

total ANZ construction spending will go towards rework by year end.

\$8.4 Billion

of rework in the ANZ will be caused by poor data and miscommunication in 2018.

52%

of all rework globally is caused by poor data and miscommunication.



How Construction Can Improve Data and Communication

Top 3 reasons for using construction technology



Improving project productivity



Better access to project data information



Improving accuracy of project data information

Most important considerations for technology investment include



Ease of implementation / use



Cost / return on investment



Gaining a competitive advantage



Matching client expectations

Mobile Technology Adoption is Lagging

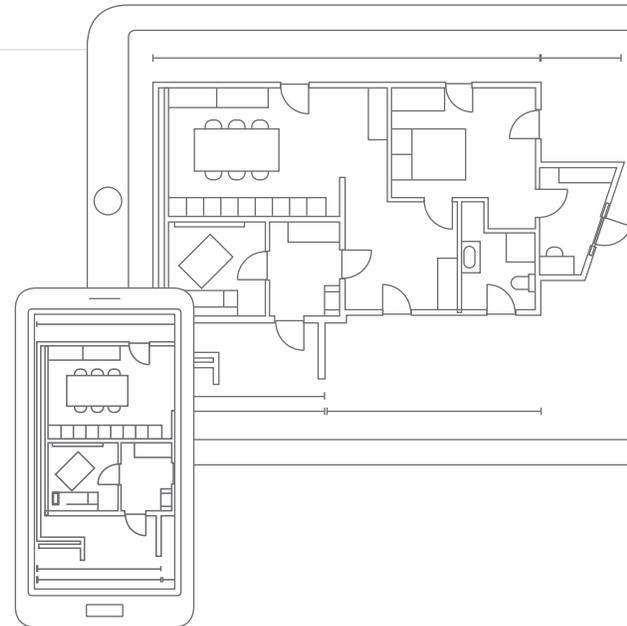
Only



of general contractors and subcontractors provide mobile devices to project managers and field supervisors.



consistently use apps on a mobile device to access project data and collaborate.



The Construction Technology Disconnect

Considering Field Needs

VS

Listening to Field Needs

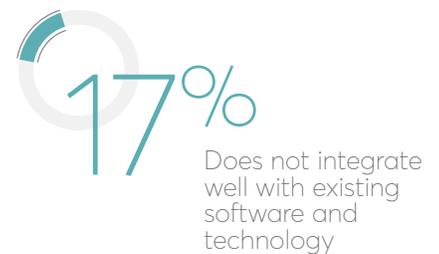
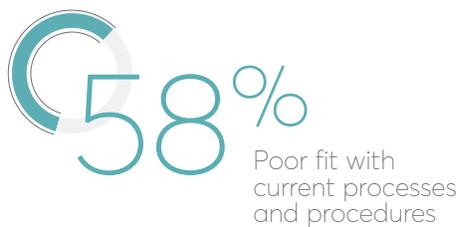


said the needs of field staff is a top consideration for investing in technology.



receive feedback from potential users of new technology before buying.

Reasons Why Technology Fails





1

**WHERE CONSTRUCTION
TEAMS SPEND AND
LOSE TIME**

Time spent on non-optimal activities will cost the ANZ construction industry \$36.5 Billion in 2018 alone.

Construction professionals are spending a considerable amount of time on activities that take away from actual building on their project sites. Finding strategic ways to optimise their time is a critical step in reducing waste and staying competitive in today's market.

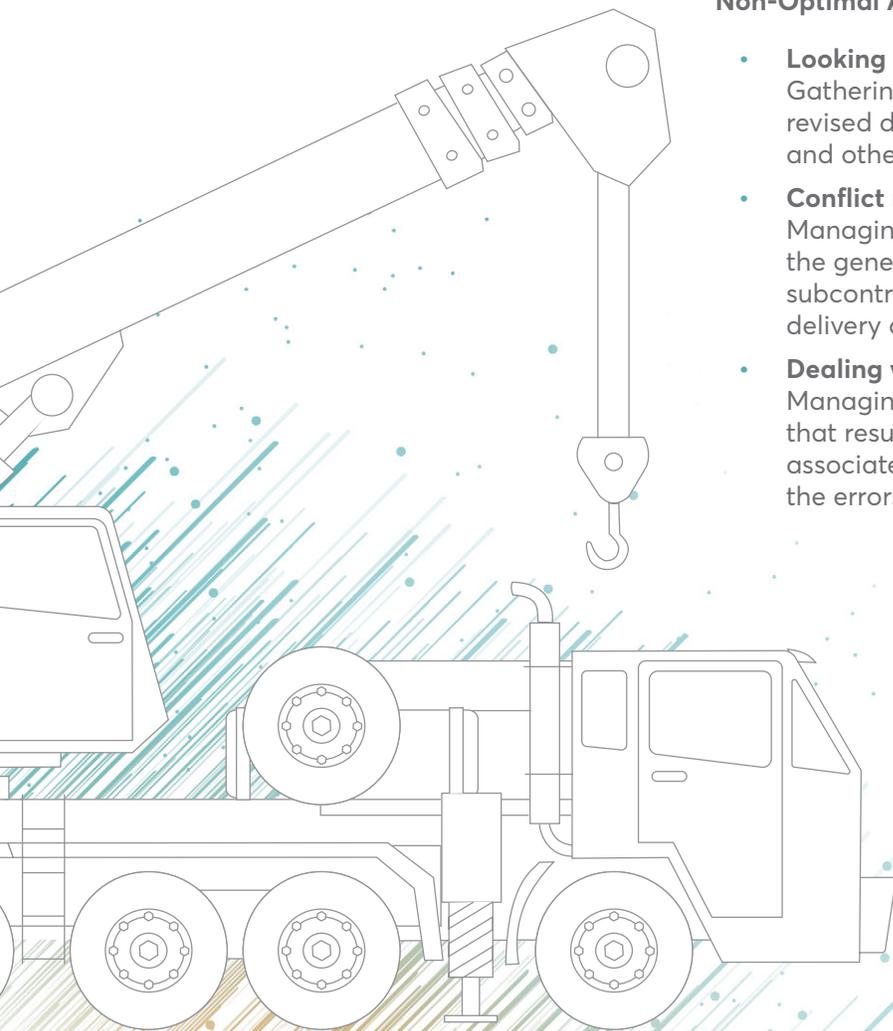
Where does time actually go for construction industry professionals? Six categories of construction activities were used to define the work related to project delivery:

Optimal Activities

- **Project execution and coordination**
The direction, regulation and supervision of a project from early development to completion.
- **Interacting with external stakeholders**
Effectively managing relationships with other key stakeholders including contractors, owners and designers while gathering their feedback and direction on a project.
- **Organising people and the jobsite**
Coordination of resources (labor and materials) for successful project delivery.

Non-Optimal Activities

- **Looking for project data**
Gathering project information such as revised drawings, material cut sheets and other relevant data at the jobsite.
- **Conflict resolution**
Managing disagreements between the general contractors, owners and subcontractors responsible for the delivery of a construction project.
- **Dealing with mistakes and rework**
Managing the mistakes on a project that result in rework, assessing the associated costs and determining why the errors happened.



Chapter 1 - Where Construction Teams Spend and Lose Time

Each respondent estimated the time spent on these six activities, grouped into the following categories:

Optimal Activities

- Project execution and coordination

Acceptable Activities

- Interacting with external stakeholders
- Organising people and the jobsite

Non-Optimal Activities

- Looking for project data
- Conflict resolution
- Dealing with mistakes and rework

When asked how their time is spent, ANZ respondents indicated spending 8.7 hours on optimal activities including project execution and coordination. They're also spending 6.9 hours communicating with project stakeholders and 7.4 hours organising the job site and people.

Time spent on non-optimal activities included 4.9 hours looking for project data, 3.4 hours on conflict resolution and 3.2 hours dealing with mistakes and rework. This adds up to 11.5 hours per week spent on tasks that take construction professionals away from optimal activities.

On average how many hours per week do you spend on the following activities?

Optimal Activities

Project execution and coordination

8.7
Hours

25.2%

Acceptable Activities

Organising the job site and people

7.4
Hours

21.4%

Communicating/interacting with project stakeholders

6.9
Hours

20%

Non-Optimal Activities

Looking for project data/information

4.9
Hours

14.2%

Conflict resolution

3.4
Hours

9.9%

Dealing with mistakes/rework

3.2
Hours

9.3%

33%

of working hours are spent on non-optimal activities

Chapter 1 - Where Construction Teams Spend and Lose Time

With 34.5 total hours spent across all activities per week, each team member is spending 14.2% of their time looking for project data, 9.9% on conflict resolution and 9.3% of their time dealing with mistakes and rework. This means construction teams are spending an average of 33% of their work hours on non-optimal activities each week.

In 2018, time spent on non-optimal activities such as dealing with mistakes and rework, looking for

project data and handling conflict resolution will cost the ANZ industry an estimated \$36.5 billion in labour costs.

Using known forecasting data for global construction spend, the worldwide cost of non-optimal labor activities can be predicted. Assuming a \$10.5 trillion spend, the waste amounts to \$1.4 trillion globally. While waste can never be entirely eliminated, the cost highlights the global opportunity available to those who focus on efficiency and process at every stage of construction.

“I would not be surprised if as much as half of the rework we experience is because of poor communication. There’s a lot of moving parts. It only takes one person to miss something or not tell someone what they did or where they put something to cause a problem.”

-Senior Project Manager
Commercial Construction Manager/General Contractor



*Cost of non-optimal labor activities for ANZ = (2018 construction spending forecast) x (39% [percentage of completed contracts attributed to labour]) x (33% [percentage of total activities that are non-optimal])

Where teams are spending more time than expected

Respondents were asked where they typically spend more time than expected and gave a fairly even distribution in their answers.

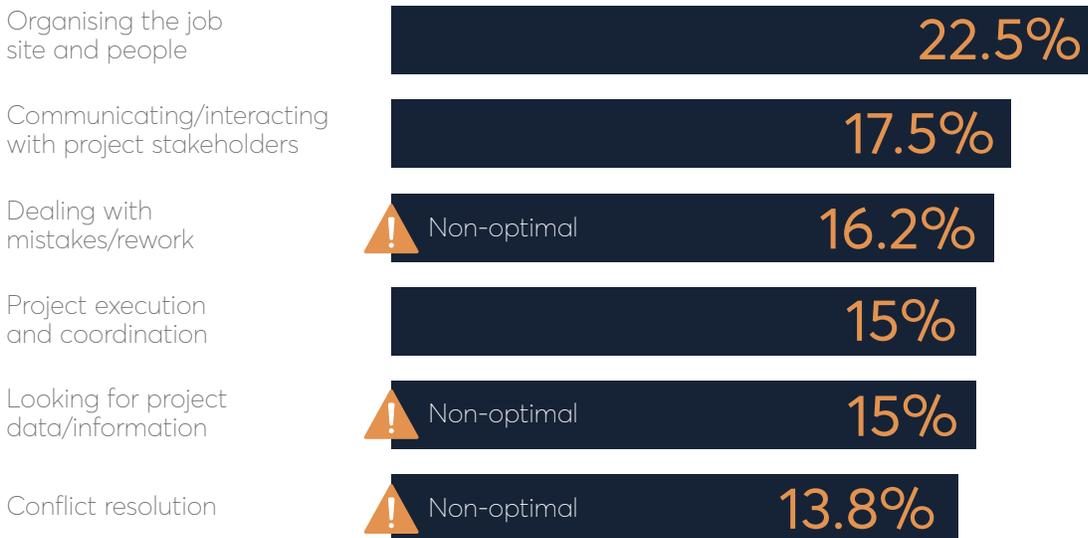
Non-optimal activities made up 45% of responses, suggesting that while respondents may see these activities as not preferable, they anticipate the

demands of projects requiring that they spend time on these activities. Organising the jobsite and people was the top selection (22.5%) for requiring more time than expected. This suggests that while important, communication on projects with various contractors is inefficient and should be a target for improvement.

45%

of respondents spend more time than expected on non-optimal activities

In which of the following areas do you most frequently spend more time than expected?

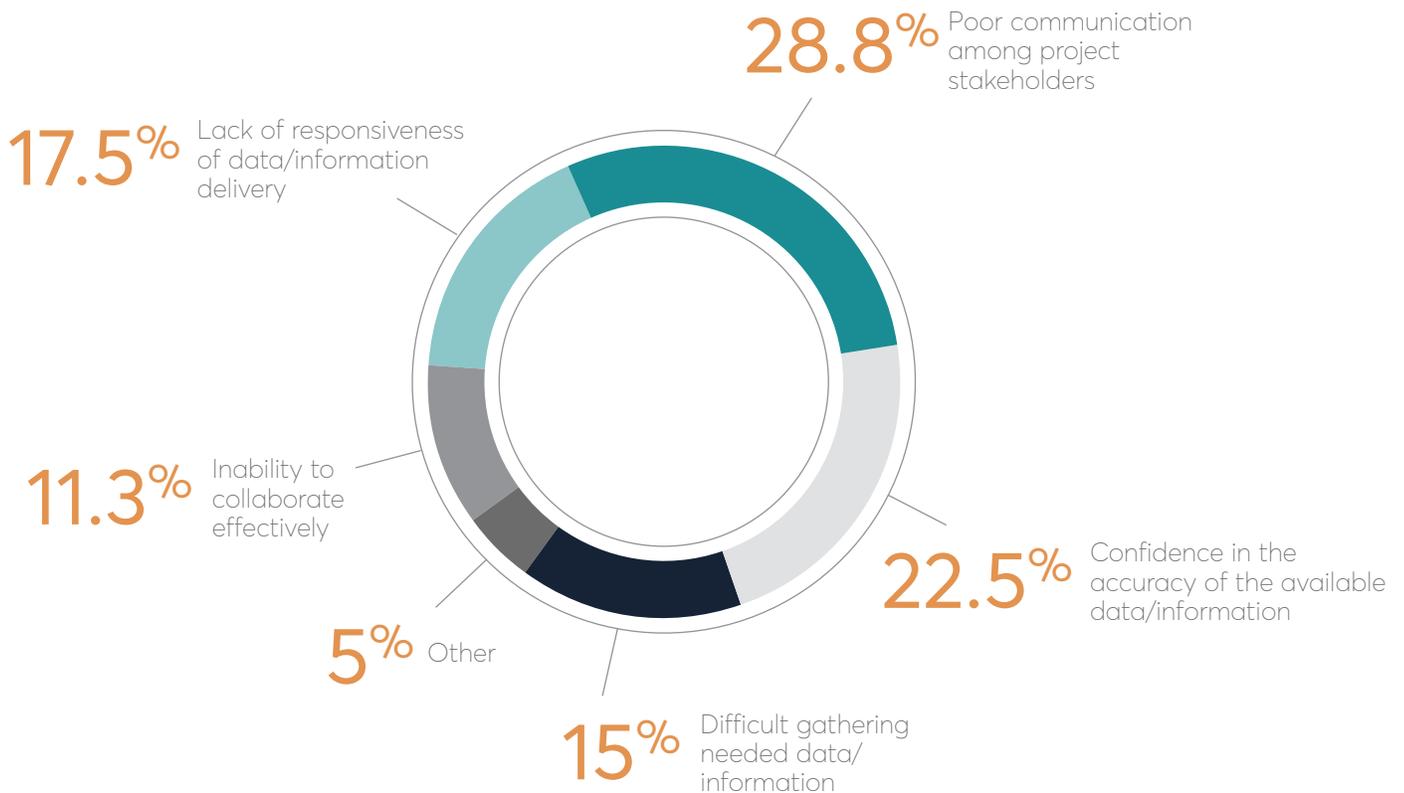


What's causing the extra time waste?

The most common single selection for spending more time than expected on a task was poor communication among project stakeholders (28.8% of respondents). Regardless of the activity, when more time is spent than expected, the majority of respondents suggest it was due to inaccurate project data or difficulty accessing the information they need.

While many of the non-optimal activities that occur on a project site cannot be eliminated altogether, analysing and improving the amount of time required is an essential goal in order for construction teams to be competitive and profitable in today's market.

Why do you spend more time than expected on this task?





2

**POOR DATA AND
COMMUNICATION
ARE A BURDEN ON
THE CONSTRUCTION
INDUSTRY**

59% of all rework in ANZ is caused by poor data and miscommunication

Effective communication and the ability to access accurate project data is critical at every stage of construction. Poor data and communication often causes rework and can have long-term cost implications for owners and developers. FMI forecasts that construction spending will reach \$284 billion in Australia / New Zealand in 2018. With rework estimated at 5% of overall construction costs, this suggests that \$14.2 billion of construction spending will be on rework for the year.

The survey found that in ANZ, rework directly caused by inaccurate, inaccessible and incompatible project data accounts for 59% of the total quantity of rework. Applied to the ANZ industry at large, this cost is more than \$8.4 billion annually.

Globally, an average of 52% of rework was caused by poor project data and communication, representing a worldwide cost of \$280 billion in 2018.

59% (\$280 Billion)
of rework caused by poor project data and communication globally

Forecasted Cost of Rework 2018
(5% of total construction spend*)

Cost of Rework Caused by Poor
Data and Communication

United States



\$65.2 Billion

\$31.3 Billion

Australia/
New Zealand



\$14.2 Billion

\$8.4 Billion

United Kingdom



\$17.6 Billion

\$10.8 Billion

*FMI completed contracts data

Breaking down the causes and costs of rework

To further break down the \$8.4 billion that is wasted on rework in ANZ—when asked what they attribute rework to on their projects, 30% of respondents pointed to poor project data and 29% cited poor communication among stakeholders.

When viewing each item as individual contributors to rework, poor communication represents an annual cost of \$4.1 billion to the ANZ construction industry and poor project data represents \$4.3 billion. The remaining 41% of rework could be caused by a number of other factors including design changes or issues, faulty or delayed materials, unforeseen conditions and more.



\$8.4 Billion

OR

59% of all rework in ANZ is caused by poor data and miscommunication

30%

poor project data

\$4.3 Billion

29%

poor communication

\$4.1 Billion

The causes of miscommunication

When asked about the cause of poor communication among project stakeholders, the top choice was unresponsiveness to questions/requests (30% of respondents), followed by the inability of project stakeholders to collaborate effectively (30% of respondents).

Top cause of poor communication among project stakeholders

30% chose unresponsiveness to questions/requests

30% chose inability of project stakeholders to collaborate effectively

What is the primary cause of poor communication among project stakeholders? Select one.

Unresponsiveness to questions/requests

30%

Inability of project stakeholders to collaborate effectively

30%

No common platform for all project stakeholders to communicate and share project data

20%

Project stakeholders spread out across different places

20%

The causes of poor project data and information

When asked what the primary cause of poor project data and information was, 30% chose erroneous or incorrect project data—meaning it was outdated or otherwise faulty, while 27.5% cited difficulty accessing needed project data.

When construction firms are forming their technology deployment strategy, a top priority should be choosing tools that enable teams to more easily communicate and access accurate project data.

Top cause of poor project data and information

30%
chose erroneous or incorrect project data

27.5%
chose difficulty accessing needed project data

What is the primary cause of poor project data and information?

Erroneous or incorrect project data/information

30%

Difficulty accessing needed project data/information

27.5%

Inability of project stakeholders to easily share project data/information

22.5%

Project stakeholders withholding project data/information

16.25%

Other

3.75%

Improved data could strengthen relationships between contractors and owners/developers

To understand the challenges ANZ owners have, they were asked how capturing and retaining more data during design, construction and closeout would impact their projects over their full lifespan. With 73.5% of owners indicating that it will reduce lifecycle operation costs, it's clear they feel strongly about this issue.

73.5%

of owners indicate that capturing and retaining more data during design, construction, and closeout will reduce or significantly reduce lifecycle operations costs.

Providing construction teams with better access to project information and the ability to capture data from the field more accurately not only has short-term benefits, but will also benefit the contractor/owner relationship and reduce long-term costs.

● Capturing and retaining more lifecycle data/information during design, construction, and closeout would:

Reduce lifecycle operations costs

42%

Significantly reduce lifecycle operations costs

31.5%

Have no impact on lifecycle operations costs

16%

Increase lifecycle operations costs

10.5%

Improved data could strengthen relationships between contractors and owners/developers

Many types of data can be captured on a project, however, owners' top choices to reduce long-term facilities costs included as-built data for general information sharing and contractor or vendor operational performance data.

This clearly shows that post-construction, the most value that you can add for owners is to provide them with complete, accurate as-builts and data that shows the quality and vendor performance of work done

during construction. A basic as-built is contractually mandated, but viewing the comprehensiveness of the turnover phase as a differentiator can help firms stand out from the crowd.

ANZ owners are increasing their use of technology throughout the operational phase of the facility and are coming to rely on the seamless transition of all construction data into their facilities and operations teams. Contractors able to anticipate this need by providing this data have a large advantage over firms that do not.

As an owner/developer, please rank the following categories of construction data based on their value in helping reduce costs for long term facilities operations.

More Valuable



Less Valuable

- 1 Contractor or vendor operational performance
- 2 Internal access to as-built data for general information sharing between departments
- 3 Building equipment data for asset management
- 4 Historical construction data (change orders, schedules, daily reports, etc.)
- 5 Building systems sequence of operations (backup power generation, chiller systems, boiler systems, etc.)
- 6 Portable (mobile) facility data for preventative maintenance and repairs
- 7 Facility emergency preparedness data (valve locations, O&M manuals)



3

**PRIORITISING
PRODUCTIVITY
IMPROVEMENTS
YET INVESTING IN
OFFICE-BASED
SOLUTIONS**

While the industry aims to improve productivity, investments are going toward solutions for office staff

Over the last decade, there has been a dramatic increase in available technology for the construction industry. While many aspects of the jobsite may look the same, everything is becoming smarter. From GPS-connected heavy machinery and drone imaging to the adoption of new generations of business-ready mobile devices, the technology on site is radically different. In times of radical change, it can be challenging to prioritise areas of investment and understand how to measure the ROI. This section reveals the key motivations for technology investment and key considerations and stakeholders that are involved and impacted.



Top reasons for investment

The reasons that participants gave for investing in construction-specific technology directly reflect the challenges with project data integrity and accessibility that the industry is experiencing. In addition to the goal of improving project productivity (46% of respondents), the two biggest reasons for investing were to gain better access to project data (36% of respondents) and to improve the accuracy of project productivity (46% of respondents).

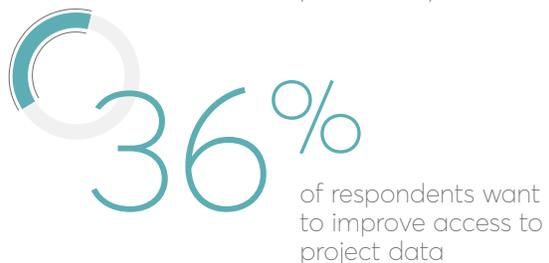
The alignment of these top motivations with the previously identified challenges is promising. Beyond the top three, the responses show alignment around the need to boost productivity, with only 10% indicating that they don't rely on industry-specific technology to build.

“I will say it's gotten better than it used to be, but it could still be better. A lot of time could be saved if I could just get the information I needed from my laptop instead of asking someone back in the office for it and having to wait an hour or even a day for them to get back to me.”

-Superintendent

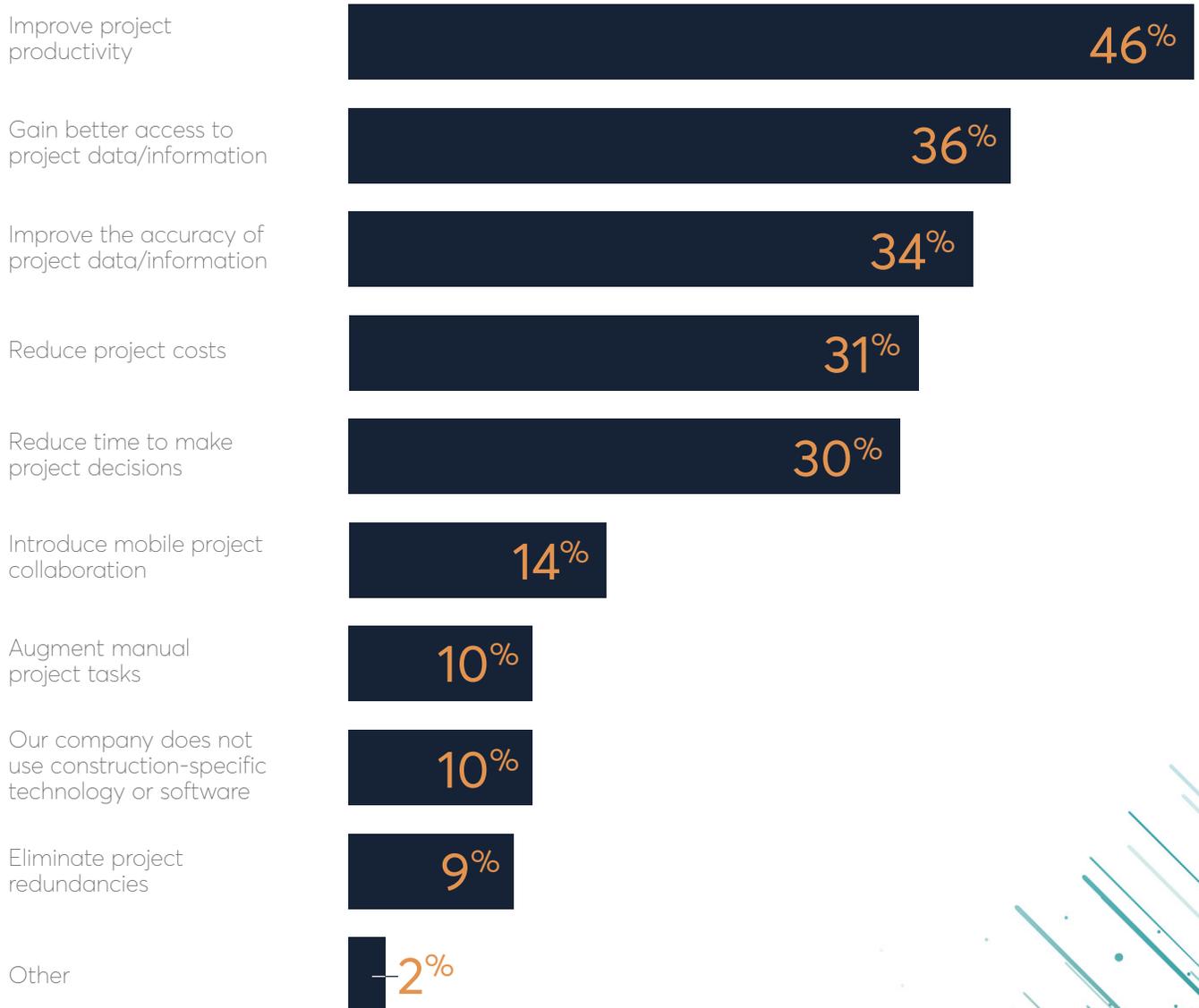
Commercial Construction Manager/General Contractor

Improving productivity and access to project data are top reasons for tech investment in ANZ



Top reasons for investment

For what reasons have you or your company used construction-specific technology or software? Select all that apply.



Important considerations when investing in construction tech

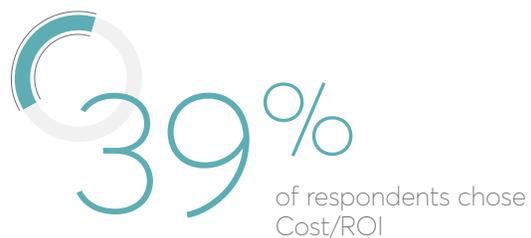
To further understand why teams are choosing construction technology, respondents were asked to pick their top two reasons for investment. Two responses were clear leaders: cost/ROI was selected by 39% of respondents whilst ease of implementation/use received 37% of selections. Again, we see alignment around what the industry needs from construction technology: Improvement in the predictability and quality of project delivery through tools that are easy to use by all stakeholders.

Minimising recurrent challenges 25% of selections, gaining a competitive advantage received 27% selections and matching client expectations received 27% of selections. This forms a second tier with significant value. These three selections suggest a new urgency in technology as a differentiator: technology helps

advanced firms stand out from the competition by offering better outcomes and visibility to owners. To provide this improved service, firms must build an integrated tool chain where information is reliable and project status is always visible. Data entered in one system needs to be automatically shared with other critical systems. In addition to providing greater efficiency within the team, there is less opportunity for error and long-term data loss.

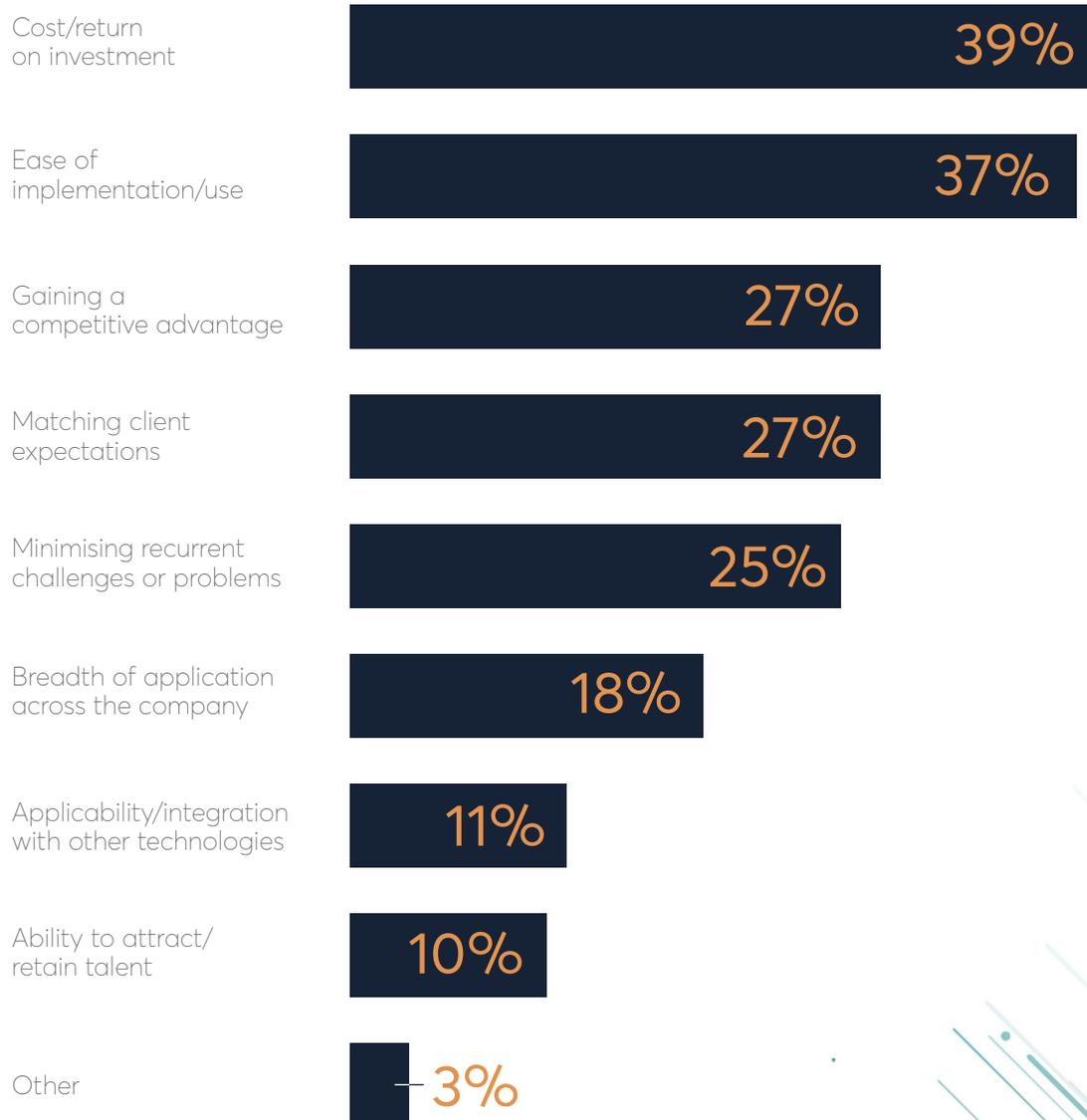
It was slightly surprising to see the firm's ability to attract and retain talent as the lowest-ranked value on the list. While the labour shortage remains a key consideration in other aspects of the business, it does not seem to outweigh the higher order value proposition of the other considerations.

Top considerations when investing in construction technology



Important considerations when investing in construction tech

What is most important to you or your company when considering investment in construction-specific technology or software? Select the top two.



Technology is still purchased primarily to suit the needs of office staff, not field staff

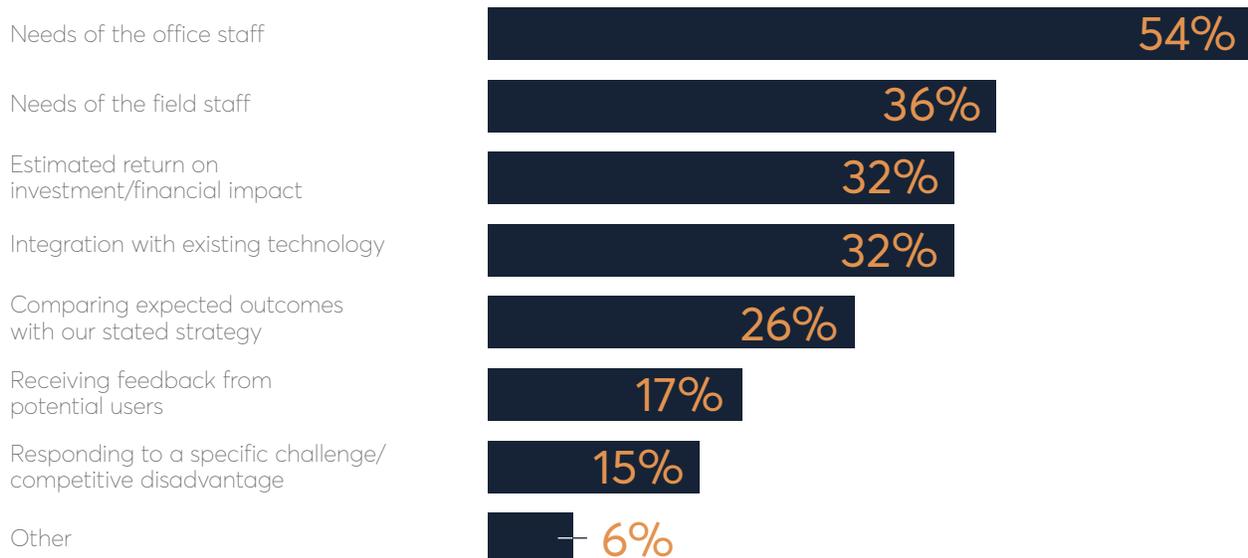
In Australia / New Zealand, technology is still primarily purchased in order to suit the needs of teams working in offices (54%). While 36% consider the needs of the field staff while making technology decisions, what's been recorded is only 17% of decision makers considered receiving feedback from potential users of new technology before investing in it.

This suggests that firms are not fully piloting new technology before adoption. Understanding the needs of teams on paper is different than responding to data gathered through

a pilot where the end users in the field are given an opportunity to evaluate the technology for themselves.

Managing adoption of technology through an intentional series of pilot phases minimises the upfront commitment to any particular vendor while preserving the flexibility to adapt and change when new information is presented. It also transforms the role of the end user from a passive recipient of a corporate mandate to an active participant in the decision making process. Because all of the stakeholders have had a chance to provide input, they will be more committed to the program's success.

When investing in construction-specific technology or software, what is involved in the decision? Select all that apply.



An aerial, top-down view of several pieces of heavy construction machinery, including compactors and rollers, arranged in a diagonal line across the frame. The background is a dark blue gradient with light blue streaks and small white dots, suggesting a night sky or a digital interface. A large white number '4' is enclosed in a thin white circle in the upper right quadrant. A thin white line extends from the bottom of the circle towards the text below.

4

**MOBILE
TECHNOLOGY
USAGE IS LOW
AND INCONSISTENT**

Less than half of firms deploy mobile devices to PMs and field supervision

When asked to which employees their company provides smartphones and tablets, only 44% of general contractors and specialty contractors provide mobile devices to project managers and field supervision. Further, only 8% of companies consistently use apps on those devices to access project data and collaborate with project stakeholders.

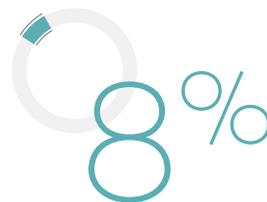
Less than one-tenth of companies consistently use their devices to collaborate effectively—despite the fact that over half of participants indicated that their reason for using construction-specific technology was to gain better access to project data. This suggests a significant disconnect occurring between when the decision to purchase technology is made and the eventual deployment and adoption of those tools.

“Construction is a project management business, which means good communication is critical. There are so many technologies available on the market, that I think it’s malpractice not to be utilising for this purpose.”

-Chief Operating Officer
Nonresidential Construction Manager/
General Contractor



of general contractors and specialty trade contractors provide mobile devices to their project managers and field supervisors.



of companies consistently use apps on mobile devices to access project data and collaborate with project stakeholders.

Chapter 4 - Mobile Technology Usage is Low and Inconsistent

Teams that are using mobile devices less than 80% of the time for collaboration and data access are not using them effectively. Their need for project information and communication tools is not lower than that of other groups, so this implies they are relying on other tools for collaboration instead of fully utilising their mobile devices.

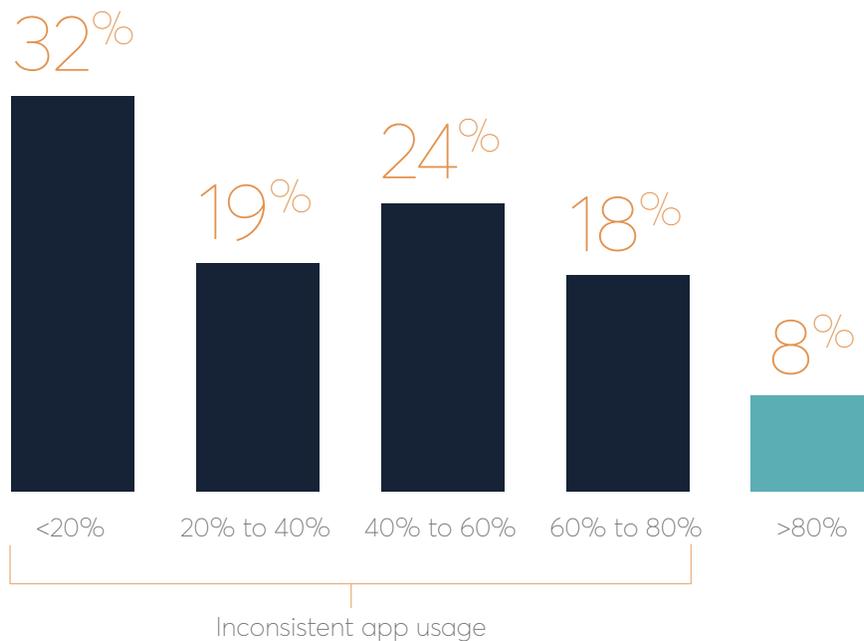
While it may seem extreme to assert that usage lower than 80% is not acceptable, anything below that mark indicates teams are working from data sources that are unreliable and rapidly deprecated. It also means decisions are disconnected from the official project archive. This results in a long-term disadvantage for the

operational phase of the asset's life because potentially critical decisions and changes can be lost.

Almost half of the responses indicate usage between 40% and 80% of the time, which is encouraging. This suggests an understanding of the importance of these devices but an inconsistent adoption within the team. Clearly defining process and standards will help these organisations grow into consistent users of technology.

More than one-third of responses indicate little to no usage for these critical workflows. The challenge to these organisations is more fundamental and will likely involve a strategic re-examination of current priorities and technology investments.

How frequently does your company use apps on mobile devices to access project data and information and collaborate with stakeholders (i.e. for more than just making/receiving emails, phone calls, and text messages)?



Usage lower than 80% indicates that teams are working from data sources that are unreliable and rapidly deprecated.

Expectations with construction tech are often met, but should they be?

In their own words, respondents' experience with construction-specific technology or software has met or exceeded expectations. While there are instances of failed technology deployment, a greater number of people are finding success. Nearly twice the number of respondents had an experience with technology that exceeded expectations (29% of respondents) versus those that had failed efforts (15% of respondents).

There is a clear disconnect between the satisfaction respondents have with construction technology and the actual utilisation of mobile devices for

communication and sharing project data. Construction teams are purchasing these tools to solve the challenges they are experiencing in the field, but less than 10% are properly leveraging them. It is possible that the feedback loop is not complete, meaning the decision-makers for technology are getting an incomplete picture of how solutions are being adopted by the users in the field. Even if this user feedback is being taken into consideration, it seems safe to suggest that expectations are being set too low for the evaluation of construction technology.

What has been your experience with construction-specific technology or software compared to expectations overall?

Significantly exceeded expectations

8%

Somewhat exceeded expectations

21%

Met expectations

56%

Somewhat failed expectations

15%

Why construction technology expectations are not met

The most frequently cited reasons for missed expectations for construction-specific technology or software was poor fit with their existing work processes and procedures (39% of respondents), low adoption (6% of respondents) and not integrating with existing technology and software (11% of respondents). There is a clear relationship between inadequate training (11% of respondents) and the tools being difficult to use (6% of respondents). This ties directly into poor implementation and rollout strategy (11% of respondents).

Reasons for technology expectations not being met

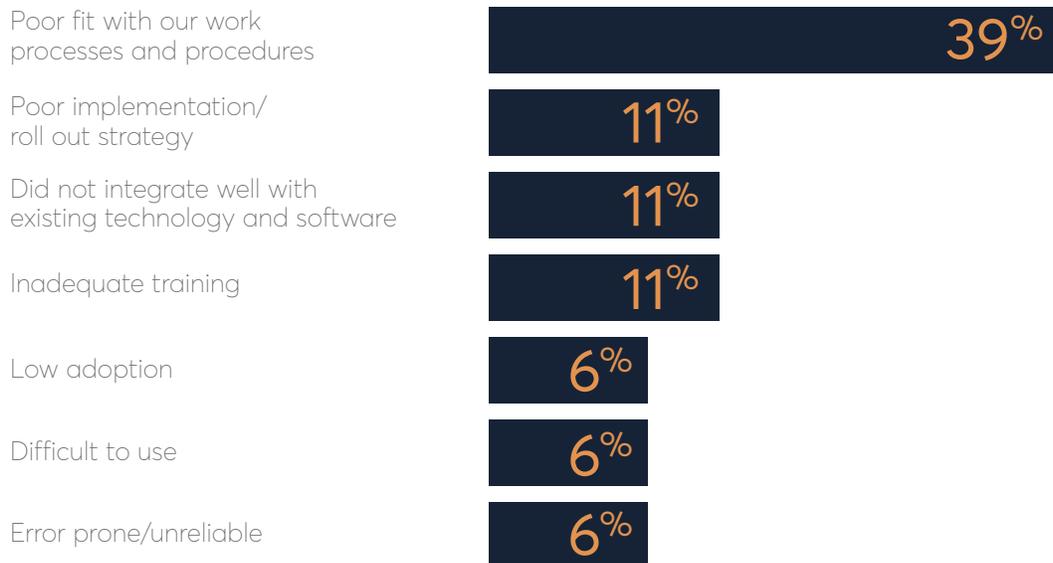
39%

Voted poor fit with their existing work processes and procedures

6%

Voted low adoption

When your expectations of construction-specific technology or software were not met, what was the underlying reason?



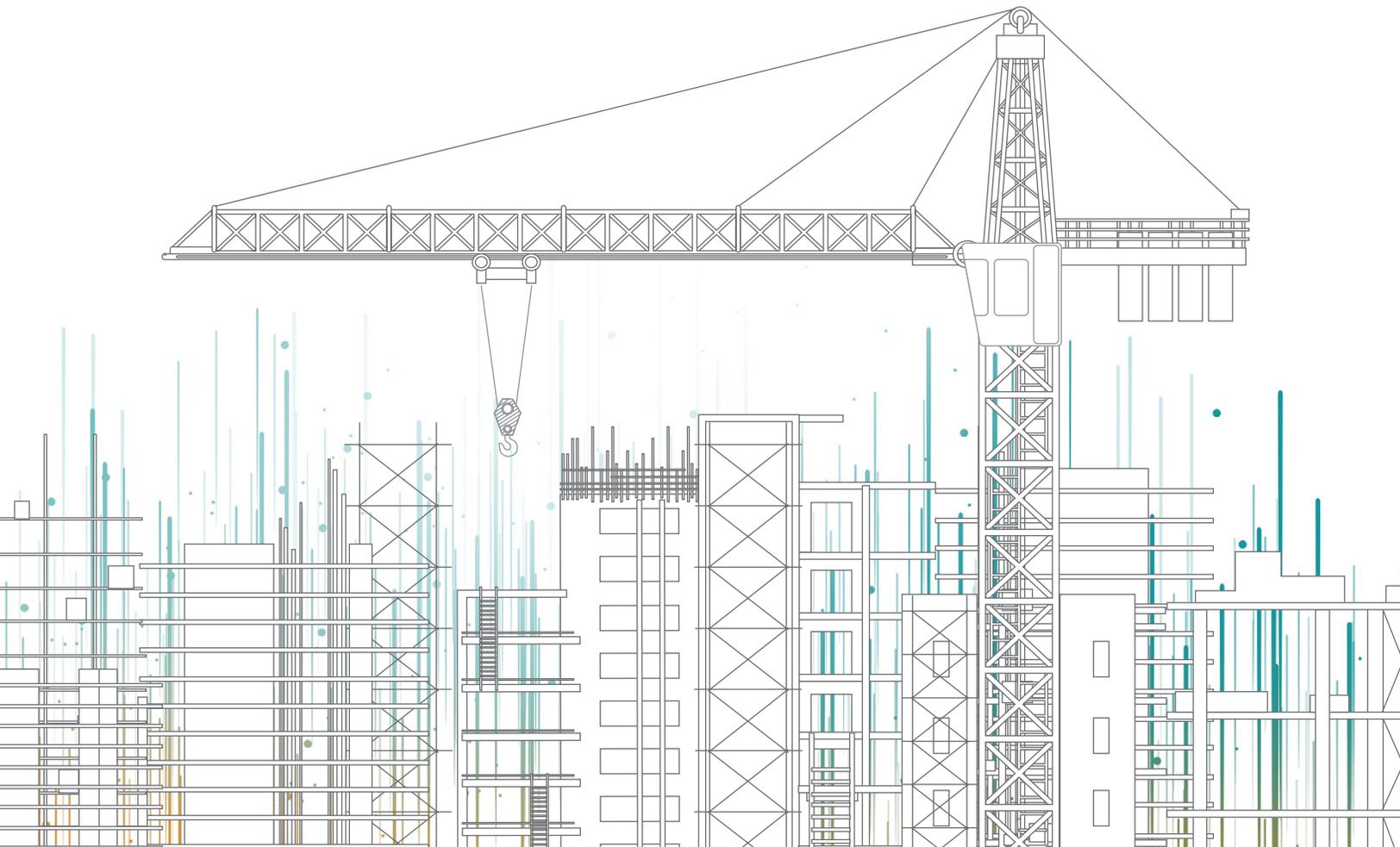
Why construction technology expectations are not met

In the usage spectrum of construction specific software, users that showed moderate use were most disappointed by poor fit with existing work processes and procedures. Respondents who exhibited maximum use were most disappointed by inadequate training and error-prone software. Respondents who showed minimal use were most disappointed by poor fit and low adoption.

Organisations are not receiving input from their end users in the decision making process, leading to poor fit and low adoption of technology

upon rollout. It also seems that teams are not providing the proper level of training to their users, further decreasing adoption levels and missing user expectations.

ANZ teams are lagging behind in mobile technology, but many are not implementing the right strategy for a successful deployment. It is important to understand the specific workflows and needs of the team while reviewing potential solutions with real input from the end user. This will help in the selection of a solution that is easy to use, achieves high levels of adoption and delivers impact.



Construction Disconnected

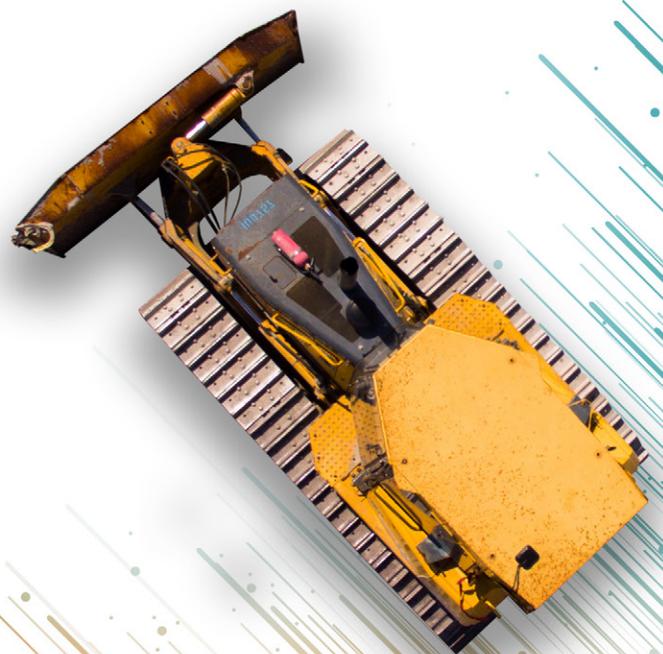
The construction industry has reached a turning point. Firms are recognising the need to enable better communication and access to project information for their entire team. However, many are off to a rocky start in this transition and the opportunity remains for firms to optimise how to invest in and approach technology deployment.

Industry leaders need to better strategise the rollout of mobile devices alongside best in class solutions that are proven to support the workflow needs of their teams in the field. With strategic deployment, you increase the chance of achieving the high levels of technology adoption needed in the field and office. Objectively implementing and evaluating a pilot program will allow teams to make the right choices for mobile device and technology rollout.

Today, very few decision makers are including potential users in the decision making process before making technology investments. Teams need to employ a methodical approach to the rollout of construction technology by including all stakeholders; otherwise, adoption levels will continue to be low. Leaders also need to focus on refining their relationship with the tools they've already deployed, choosing the correct next steps in integrating new technology and further reducing waste.

Construction teams are now feeling a sense of urgency to fully embrace technology to help drive productivity. With 33% of time spent on non-optimal activities like conflict resolution, dealing with rework and looking for project data—the costs are quickly stacking up. The most striking example of this unnecessary spending is the cost of rework caused by poor data and communication, which will be \$8.4 billion in Australia / New Zealand in 2018 alone.

The industry is thinking about technology for the right reasons. Top firms are providing funding for technology research to find the most effective ways to help their teams build well. While waste on the construction site will never be fully eliminated, there is great hope for a dramatic increase in construction productivity on the horizon.





PlanGrid is the first construction productivity software that allows contractors and owners in commercial, heavy civil and other industries to collaborate, collect and share project information from any desktop or mobile device through the entire project lifecycle. PlanGrid increases project efficiency by streamlining document management, providing construction teams with easy access to all project information from any device and enabling seamless collaboration within teams.

PlanGrid is used on more than one million projects across commercial, heavy civil and other industries in 90 countries. Headquartered in San Francisco and founded in 2011, PlanGrid has \$69 million in funding from Sequoia Capital, Tenaya Capital and other top venture capital firms.

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