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SmartMarket Brief

DODGE DATA & ANALYTICS | THE BLUE BOOK NETWORK

The Construction Cost Management Report

Introduction

ABOUT THIS SMARTMARKET BRIEF

Cost management is critically important for construction projects. A recent study of contractors by Dodge Data & Analytics (Dodge) shows that 33% of typical projects come in over budget, and even among projects identified by contractors as their best performing, over one in five fails to meet budget.

THE GLOBAL COST MANAGEMENT REPORT

This report is based on a survey by Dodge of 243 owners (122 public, 121 private), 240 general contractors and 241 specialty trade contractors. These respondents are equally divided across the USA, Canada, the United Kingdom and Australia/New Zealand. It specifically addresses cost management capabilities, challenges, solutions, internal processes, and needs for future improvement.

By establishing a baseline of current practices and experiences around the world this study is intended to enhance mutual awareness of cost management challenges and needs between owners and contractors with the goal of improving cost management performance for everyone.

Dodge wishes to thank Procore Technologies, Inc. for sponsoring this research.

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MESSAGE FROM PROCORE

In the last two decades we've seen a rapid evolution in construction technology and the pace of change is increasing. 30 years ago, we were living in an analog world. Today, we live in a world where nearly every tool used to manage a job is in some way digitized. Until now, construction's digital transformation has focused on digitizing drawing and documentation management, while largely ignoring cost management. Today we have drones taking progress project photos, robots surveying job sites, and contracts being executed on iPads, yet we still use the same 25-year-old forecast spreadsheets. Advancements in cost management technology are powering the next wave of construction's digital evolution and only a fraction of the industry is currently taking advantage of them.

Procore is excited about the opportunity to partner with Dodge Data & Analytics to better understand the state of cost management, as well as where the industry is headed. We surveyed professionals throughout the construction industry on the capabilities, challenges, and current solutions associated with cost management.

Procore is thrilled to be at the forefront of construction cost management's digital transformation as our goal is to provide the people in construction with technology that makes their lives easier, safer, and more productive.

Tooey Courtemanche
CEO and Founder
Procore Technologies Inc.

Current State of Cost Management Capabilities

INTRODUCTION

This section of the report focuses on determining the current cost management capability levels of owners and contractors in the four regions surveyed. The findings are intended to:

- Provide a baseline to understand where the industry has relative strengths and what gaps might identify needs for improvement.
- Establish a context for the later sections that study specific challenges, the use of and satisfaction with current solutions, approaches to several cost management processes and the greatest needs for future improvement.

To determine this, survey respondents were asked how much they agree with each of the eight statements shown at right about their organization's current cost management capabilities. Response options were:

- Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree

MOST CAPABLE RESPONDENTS

165 (23%) of the 724 respondents agree or strongly agree with at least seven of the eight capabilities studied. They are referred to for analysis purposes in later sections of this report as the most capable respondents.

VARIATIONS AMONG SUBGROUPS

The following pages show highlights of the findings and identify notable differences between some of the subgroups within the overall respondent pool.

Cost Management Capabilities Studied in This Research

In Alphabetical Order

1. I can accurately assess risk related to any changes, billing or performance issues.
2. I can dynamically track every dollar in my budget and forecast critical costs with real time data from the field, while staying in sync with the accounting system.
3. I can easily uncover cost details and create comprehensive financial reports from a single source of truth.
4. I can leverage data from previous projects to benchmark cost performance and improve future cost estimates.
5. I can manage collaborative workflows and centralize communication across our office, field, clients, contractors and/or vendors to reduce project/payment delays.
6. I know where we are making or losing money on a project or across my portfolio, at any given moment.
7. My company's cost management capabilities create a competitive advantage for us.
8. My company's change management process is streamlined from start to finish.

Current State of Cost Management Capabilities (CONTINUED)

COST MANAGEMENT CAPABILITIES

All respondents were asked how much they agree with each of eight statements about their organization's current cost management capabilities shown in the table at right. The percentages shown are a combination of those who agree and those who strongly agree with each individual capability.

OVERALL FINDINGS

62% is the average across all respondents, and less than a quarter (24%) strongly agree across all eight capabilities, clearly indicating there is room for improvement in cost management globally.

REGIONAL VARIATIONS

The table at right shows the combined percentages agreeing and strongly agreeing with each statement in the four regions studied. The shading highlights variances from the 62% overall average across all regions studied:

- **Darker**: 5% or more above average
- **Medium**: Within 5% of average
- **Lighter**: 5% or more below average

Regional trends in the findings include:

- The US (68%) and UK (67%) show higher overall average cost management capability than Canada (61%) or ANZ (52%).
- The UK leads (or is tied for the lead) in four capabilities, most notably in leveraging past project data (71%) and efficient change management (69%).
- Canada (68%) leads in knowing the real-time profit/loss status of projects/portfolio.
- The US leads in dynamic tracking, collaborative process management and leveraging cost management capability as a competitive advantage (73%).

Cost Management Capabilities (by Region)

Percentage of All Respondents Agreeing or Strongly Agreeing With Each Statement, by Region

	USA	CAN	UK	ANZ
I can dynamically track every dollar in my budget and forecast critical costs with real-time data from the field, while staying in sync with the accounting system.	73%	63%	66%	55%
I know where we are making or losing money on a project or across my portfolio, at any given moment.	66%	68%	66%	52%
I can accurately assess risk related to any changes, billing or performance issues.	68%	62%	69%	52%
I can manage collaborative workflows and centralize communication across our office, field, clients, contractors and/or vendors to reduce project/payment delays.	73%	57%	65%	54%
I can leverage data from previous projects to benchmark cost performance and improve future estimates.	65%	59%	71%	54%
I can easily uncover cost details and create comprehensive financial reports from a single source of truth.	66%	58%	69%	53%
My company's cost management capabilities create a competitive advantage for us.	73%	60%	62%	50%
My company's change-management process is streamlined from start to finish.	62%	63%	69%	48%
Regional Averages:	68%	61%	67%	52%

5% or More Above Average Within 5% of Average 5% or More Below Average

Current State of Cost Management Capabilities (CONTINUED)

COST MANAGEMENT CAPABILITIES

VARIATION BY TYPE OF ORGANIZATION

The chart at upper right shows the average percentages of contractors and owners, by type, who agree or strongly agree with all eight statements (see page 2) about cost management capabilities.

OWNERS

Owners express more confidence in their overall cost management capabilities than contractors, and each type of owner studied (public and private) is more confident than either type of contractor (general and trade). Variations between the two owner types include:

- Private owners are lowest (62%) for accurately assessing risk related to any changes, billing or performance issues.
- Public owners are highest (74%) for real-time knowledge about project/portfolio cost performance.

CONTRACTORS

General contractors (65%) are more confident in their cost management capabilities than specialty trades (53%). This gap is particularly notable for two of the capabilities:

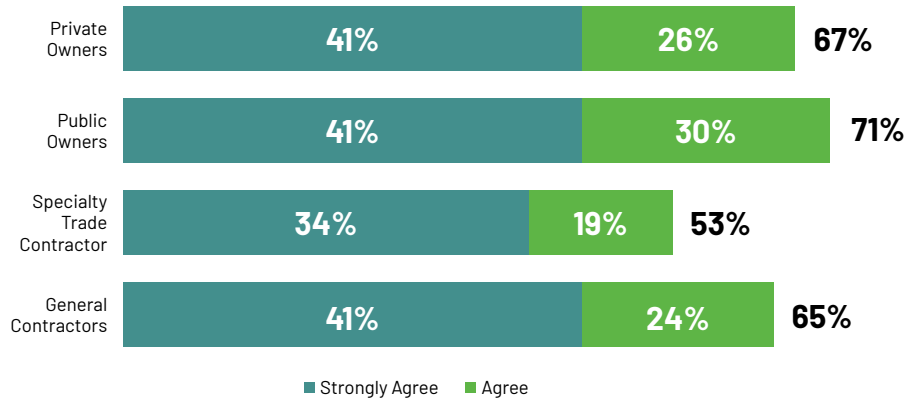
- **Dynamic tracking**: 69% vs. 54% total agreement, and among those 28% vs. 17% strongly agreeing.
- **Managing collaborative workflows**: 67% vs. 52% total agreement, and among those 25% vs. 18% strongly agreeing.

VARIATION BY ROLE

The chart at lower right shows that more respondents in roles that are primarily project-focused (37%) express a high cost management capability level (i.e., agree or strongly agree) than those with more departmental or organization-wide roles (28%). This finding is encouraging for the important trend of driving more cost responsibility from the office to the field.

Cost Management Capabilities (by Organization)

Percentages of Contractors and Owners Agreeing or Strongly Agreeing With Each Statement About Their Cost Management Capabilities



Cost Management Capabilities (by Role)

Percentages of Project-Focused Respondents Citing Good Cost Management Capabilities

Cost Management Challenges

INTRODUCTION

Cost management for construction projects involves a wide variety of needs and activities, and companies face varying levels of difficulty with each.

To capture the current dynamics of this situation survey respondents were:

- Presented with the list of 15 cost management challenges in the table at right.
- Asked to select the ones (as many as five) that present the greatest challenge to their organization.

OVERALL FINDINGS

The table shows the overall ranking among the 15 challenges, in the order of how many of the 722 respondents to this question included each among their most difficult.

- While allowed to select as many as five, the average number selected across all respondents was 3.2.

DIFFICULTY INDEX

To compare the relative difficulty among the 15 challenges they are shown indexed on a 1–10 scale based on the frequency each was selected. It is important to note that:

- Each challenge was selected by a relatively large number of respondents, ranging from 127 to 177.
- Therefore, even though a challenge may have a relatively low index, that does not mean it is insignificant.

VARIATIONS AMONG SUBGROUPS

The following pages in this section of the report highlight variations among some of the subgroups within the overall respondent pool.

Top Cost Management Challenges

In Order of Reported Difficulty

Cost Management Challenges	Difficulty Index
Converting a final cost estimate into a project budget compatible with cost accounts	10.0
Tracking costs for every aspect of the job to determine how they impact overall project cost	10.0
Accurately estimating total cost to complete for activities in the work breakdown structure	9.1
Determining appropriate contingency amounts	8.4
Assessing risk related to potential changes	6.8
Tracking units of work completed in the field	6.2
Understanding in real time where we are making or losing money	6.2
Managing variations and documentation through the whole approval process	6.0
Status reporting during the project	5.5
Maintaining accurate, up-to-date cost information between office and field	5.5
Effectively integrating cost and schedule information	5.1
Establishing a system of cost accounts	4.4
Control of project cash flows	4.4
Managing multiple contracts and/or purchase orders (POs)	4.1
Understanding in real time which areas of the project need more attention	1.0

Cost Management Challenges (CONTINUED)

TOP COST MANAGEMENT CHALLENGES

VARIATIONS BETWEEN OWNERS AND CONTRACTORS

For many of the 15 activities studied, similar percentages of owners and contractors identify each cost challenge as one of their most difficult (i.e., within 2% of each other). This suggests that these are universally problematic in the industry.

The chart at right shows the challenges where there are greater differences. Higher percentages of owners select four of these challenges.

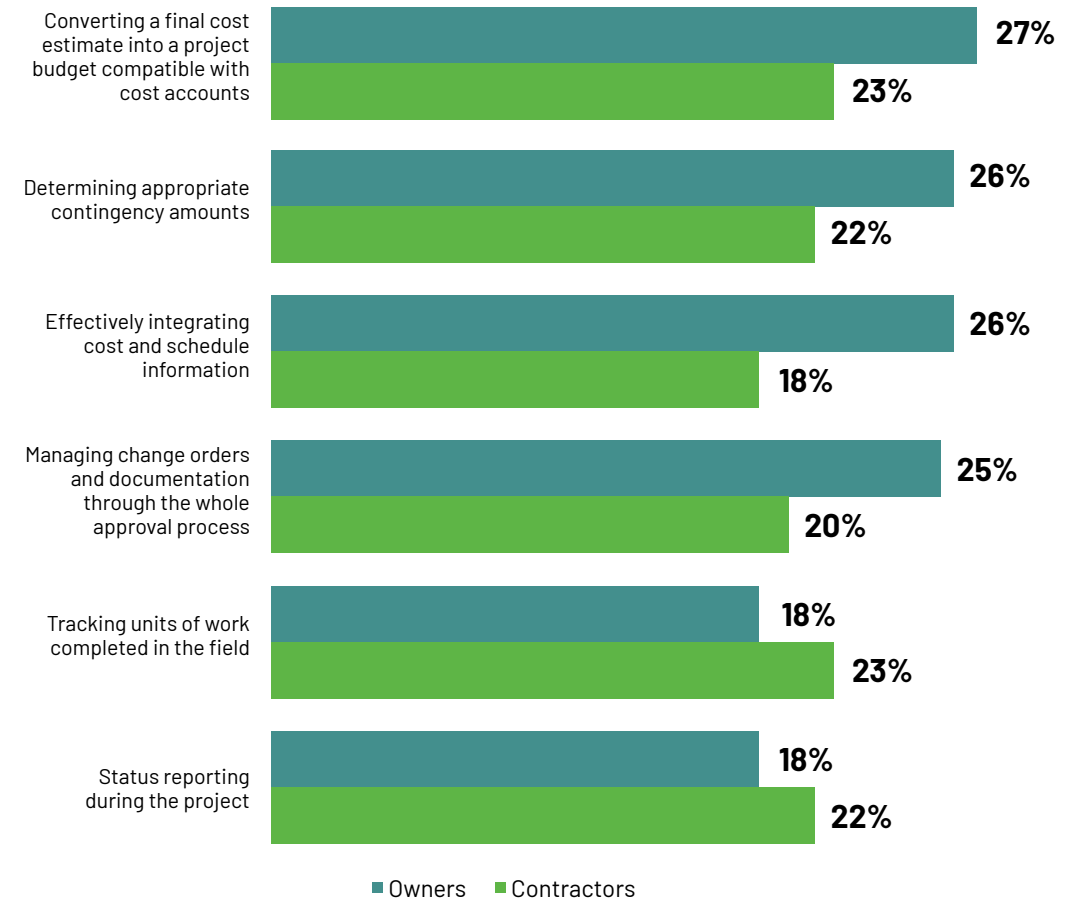
- Among those, they are particularly challenged integrating cost and schedule.
- The chart on the next page will show how there are significant differences between public and private owners on two of these challenges (converting an estimate to a budget and determining appropriate contingencies).

Contractors lead on two challenges.

- Not surprisingly, tracking work completed in the field is more frequently identified, owing to the core nature of that activity to a contractor's responsibilities.
- The difference related to status reporting is more of a surprise because owners arguably need that information as much, if not more, than contractors.

Top Cost Management Challenges: Owners and Contractors

Major Differences Between Owners and Contractors



Cost Management Challenges (CONTINUED)

VARIATIONS BY OWNER TYPE

Significantly higher percentages of private owners identify the four cost management challenges shown in the chart at right than their public-entity peers.

- Most notable is the 33% of private companies vs. just 21% of public owners that identify converting an estimate to a budget compatible with cost accounts. This is a critical function for effective cost management.
- The number of private owners struggling to establish appropriate contingency amounts (30%) is potentially problematic for the entire project team as changes and unforeseen conditions emerge on projects.

Public owners are more concerned than are private organizations about only two of the 15 challenges, and by much smaller margins:

- 27% of public owners identify managing change orders and documentation through the whole approval process as a top challenge, compared with just 23% of private companies.
- 20% include status reporting during the project among their top five challenges whereas just 16% of private companies do so.

The differences are relatively minor (within four percentage points) between public and private owners for the other nine challenges studied.

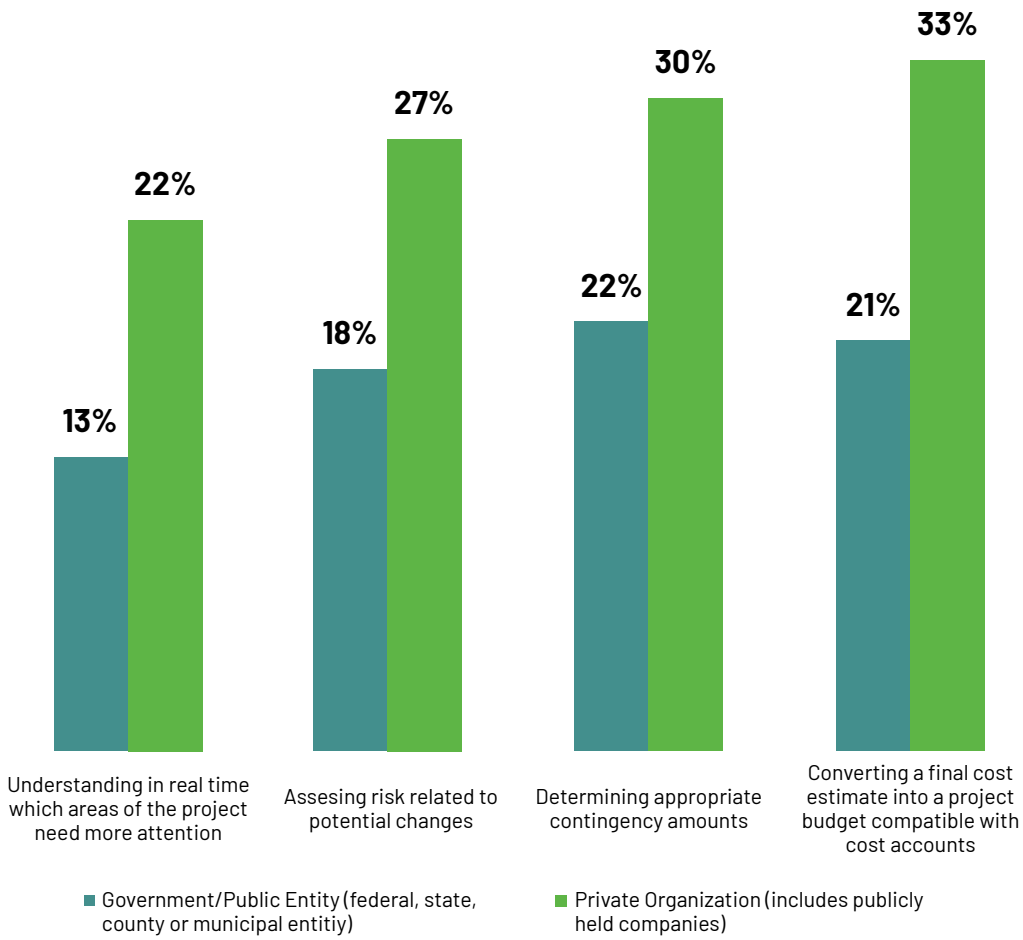
VARIATIONS BY CONTRACTOR TYPE

General and specialty trade contractors are far more closely aligned. The only significant variation is for assessing risk related to potential changes:

- General contractors: 17%
- Specialty trade contractors: 27%

Top Cost Management Challenges: Types of Owners

Major Differences Between Public and Private Owners



Cost Management Challenges (CONTINUED)

VARIATIONS BY ROLE

This page examines the differences between respondents who are primarily involved with project-specific cost management activities and those more departmental or organization-wide in their role. For simplicity these are referred to below as project- and office-related roles.

A key trend revealed in the detailed findings is that:

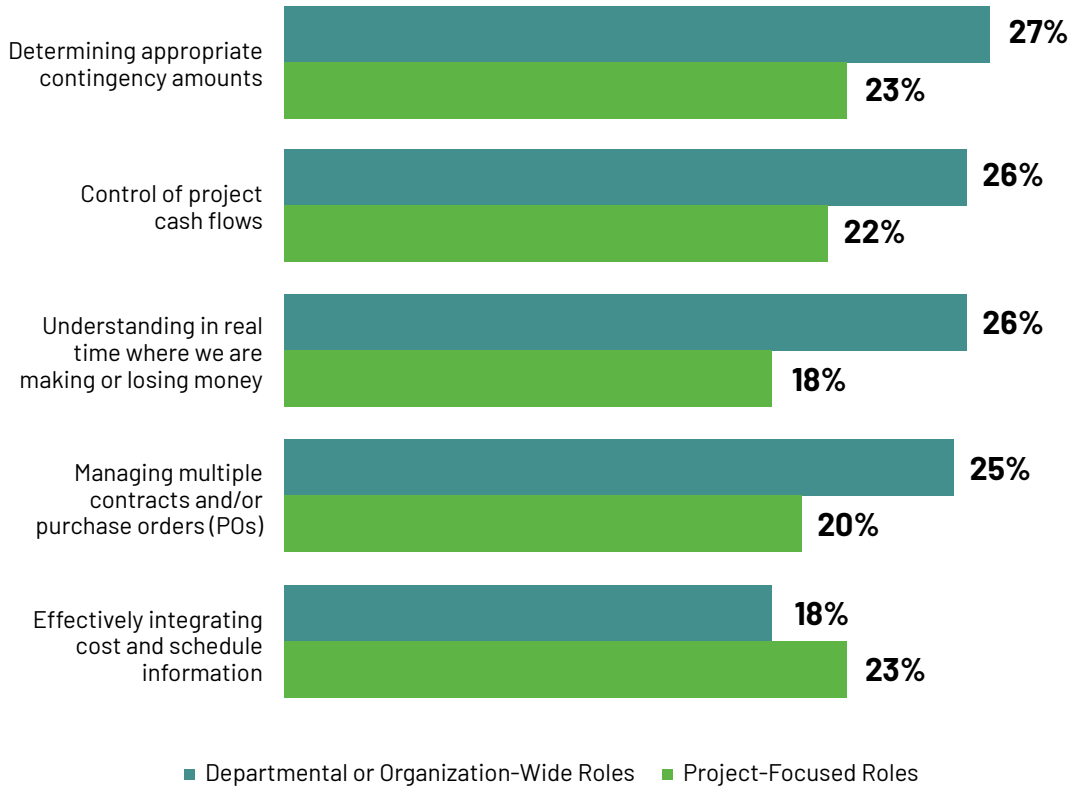
- Higher percentages of office-related staff select 10 of the 15 challenges as among their top five most difficult.
- The other five are within 2% of each other, so not meaningfully different.

This correlates to the earlier finding (see page 4) that project-related staff report feeling more capable of successfully conducting cost management activities.

The chart at right shows the five challenges with the greatest differences (7% or more) between project-related and office-related respondents.

Top Cost Management Challenges (Variation Between Roles)

Challenges With the Greatest Differences Reported Between Employees With Project-Related Roles and Departmental or Organization-Wide Roles



Cost Management Challenges (CONTINUED)

VARIATIONS BY REGION

Comparing cost management challenges reported by regions reveals several trends. The charts at right show specific challenges where 10 percentage points or more separate the most and least-challenged regions.

CANADA

- Canada leads in three of the challenges shown and reports the highest degree of challenge overall among the regions.
- Many more Canadians (31%) report that tracking costs for every aspect of the job to determine how they impact overall project cost is very difficult, compared with the other three regions (22% or 23%, respectively).

USA

- The USA is second highest overall, though lowest for some (e.g., contingencies and estimating cost to complete).
- Effectively integrating cost and schedule information is a somewhat greater challenge (24% compared with 19% in ANZ, and 20% in CAN and UK).

ANZ

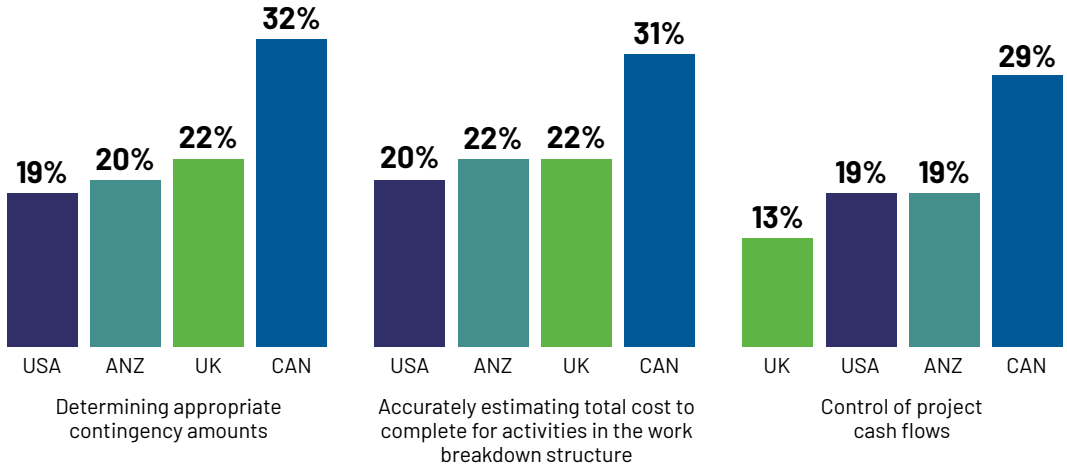
- This region shows the greatest range, from 29% for converting a final cost estimate into a project budget compatible with cost accounts, to just 12% for understanding in real time which areas of the project need more attention.

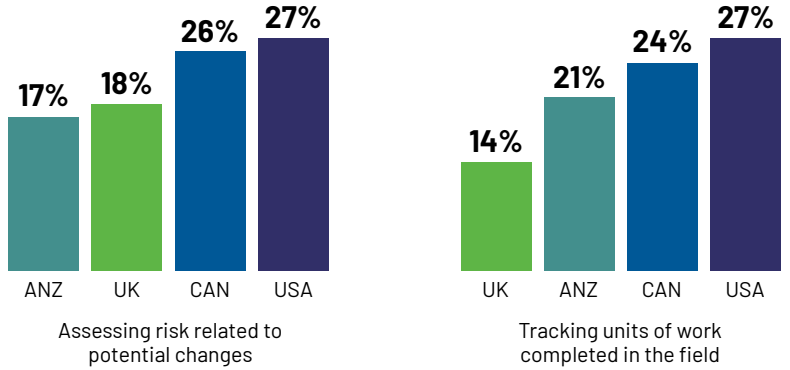
UK

- The UK is generally at or below average for each of the challenges studied. The contingency and cost to complete charts at right represent their greatest concerns.

Top Cost Management Challenges: By Region

Major Differences Between Regions





Cost Management Solutions

INTRODUCTION

Owners and contractors are using a wide variety of technology solutions to address their top cost management challenges. In the survey for this research, each respondent was shown the top challenges they had identified in the previous section and asked about two aspects of the solutions they use to address each one:

- **NUMBER OF SOLUTIONS**: How many tools they use for each of their top challenges and if more than one, if there is a primary tool they rely on. The options are shown in the list at right.
- **TYPE(S) OF SOLUTION(S)**: What type(s) of tool(s) they use. The options are shown in the list at right.

The following pages in this section of the report show the findings and highlight variations among some of the subgroups within the overall respondent pool.

The next section of this report explores users' relative satisfaction with the technology tools they are currently using for each of their top challenges.

Aspects of Cost Management Technology Studied in This Research

NUMBER OF TECHNOLOGY SOLUTIONS USED FOR TOP CHALLENGES

PRIMARY TOOL APPROACH

- One technology tool exclusively
- More than one technology tool but one of them is the primary tool

MULTI-TOOL APPROACH

- Two to five technology tools are used frequently and there is no primary tool
- More than five technology tools are used frequently and there is no primary tool

TYPES OF TECHNOLOGY SOLUTIONS USED FOR TOP CHALLENGES

THIRD-PARTY TOOLS

- Third-party cloud-based software
- Third-party desktop (on-premise) software

OTHER TYPES OF TOOLS

- Internally developed software
- Spreadsheets (e.g., Excel)
- Mostly manual processes (e.g., paper, email, server files, etc.)

Cost Management Solutions (CONTINUED)

NUMBER OF TECHNOLOGY TOOLS USED

To determine what solutions respondents are applying to their most important tasks, they were asked about the number of technology tools they currently use for each of the five top challenges they identified. The options were:

- One tool exclusively
- More than one tool, but with one as primary
- Two to five tools with none as primary
- More than five tools with none as primary

OVERALL FINDINGS

As shown in the chart at upper right, on average, almost two thirds (65%) report using one software tool exclusively or having a primary tool even if they use more than one. These are referred to as using primarily a single technology tool.

OWNERS AND CONTRACTORS

Within the 65% average, more owners (68%) primarily use a single tool than contractors (63%).

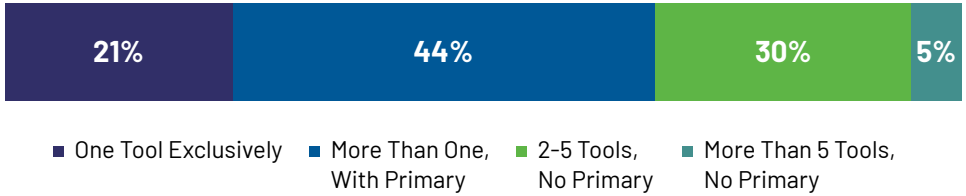
The table at lower left shows the top challenges for which contractors and owners report significantly above average (more than 5%) reliance on primarily one technology tool. These clear preferences suggest that technology users may find benefit from focusing on a primary tool for these cost management challenges if they are currently using more than one.

VARIATION BY REGION

There are generally minor variations in the detailed findings between the four regions studied regarding the numbers of tools used for the top challenges.

Number of Technology Tools Used for Top Challenges

Percentage of All Respondents Reporting Each Type



Above-Average Uses of Primarily a Single Technology Tool

Percentage of Contractors and Owners Who Primarily Use a Single Technology Tool

Contractors

Establishing a system of cost accounts	73%
Managing change orders and documentation through the whole approval process	70%

Owners

Managing change orders and documentation through the whole approval process	79%
Maintaining accurate, up-to-date cost information between office and field	75%
Effectively integrating cost and schedule information	73%
Assessing risk related to potential changes	71%

Cost Management Solutions (CONTINUED)

NUMBER OF TECHNOLOGY TOOLS USED

The table at right shows the overall percentages selecting each type for 11 of the 15 challenges that were rated by respondents as most difficult (i.e., Difficulty Index of five or more on a scale of 10. See page 5 for more information on the Difficulty Index.)

VARIATIONS FROM AVERAGE

Averages for each type are at the bottom of the table. Cells are shaded to show variations above and below the averages:

- **Darker**: 3% or more above average
- **Medium**: Within 3% of average
- **Lighter**: 3% or more below average

While the total percentage in each cell is the leading metric for this analysis, variations from average indicate concentrations of user preferences.

- Except for determining appropriate contingency amounts, the above-average ratings for other challenges are either in the first two columns (third-party tools) or in the last three columns (other types of solutions).
- Managing change orders is the most frequent for those using a primary tool.
- Tracking units of work completed in the field is the most frequent for those with no primary tool.

Number of Tools Used to Address the Most Difficult Challenges

Average Percentages Using Each Type of Tool for Their Most Difficult Challenges

Most Difficult Cost Management Challenges (Index of 5 or higher)	One Tool	More Than One Tool, With Primary	2-5 Tools, No Primary	More Than 5 Tools, No Primary
Converting a final cost estimate into a project budget compatible with cost accounts	19%	45%	32%	3%
Tracking costs for every aspect of the job to determine how they impact overall project cost	17%	46%	32%	5%
Accurately estimating total cost to complete for activities in the work breakdown structure	26%	42%	31%	1%
Determining appropriate contingency amounts	26%	35%	33%	7%
Assessing risk related to potential changes	18%	44%	33%	6%
Tracking units of work completed in the field	13%	46%	34%	8%
Understanding in real time where we are making or losing money	19%	43%	28%	10%
Managing change orders and documentation through the whole approval process	25%	48%	20%	6%
Status reporting during the project	19%	48%	29%	4%
Maintaining accurate, up-to-date cost information between office and field	26%	45%	22%	7%
Effectively integrating cost and schedule information	20%	47%	27%	6%
Average Percentages:	21%	44%	30%	5%

■ 3% or More Above Average ■ Within 3% of Average ■ 3% or More Below Average

Cost Management Solutions (CONTINUED)

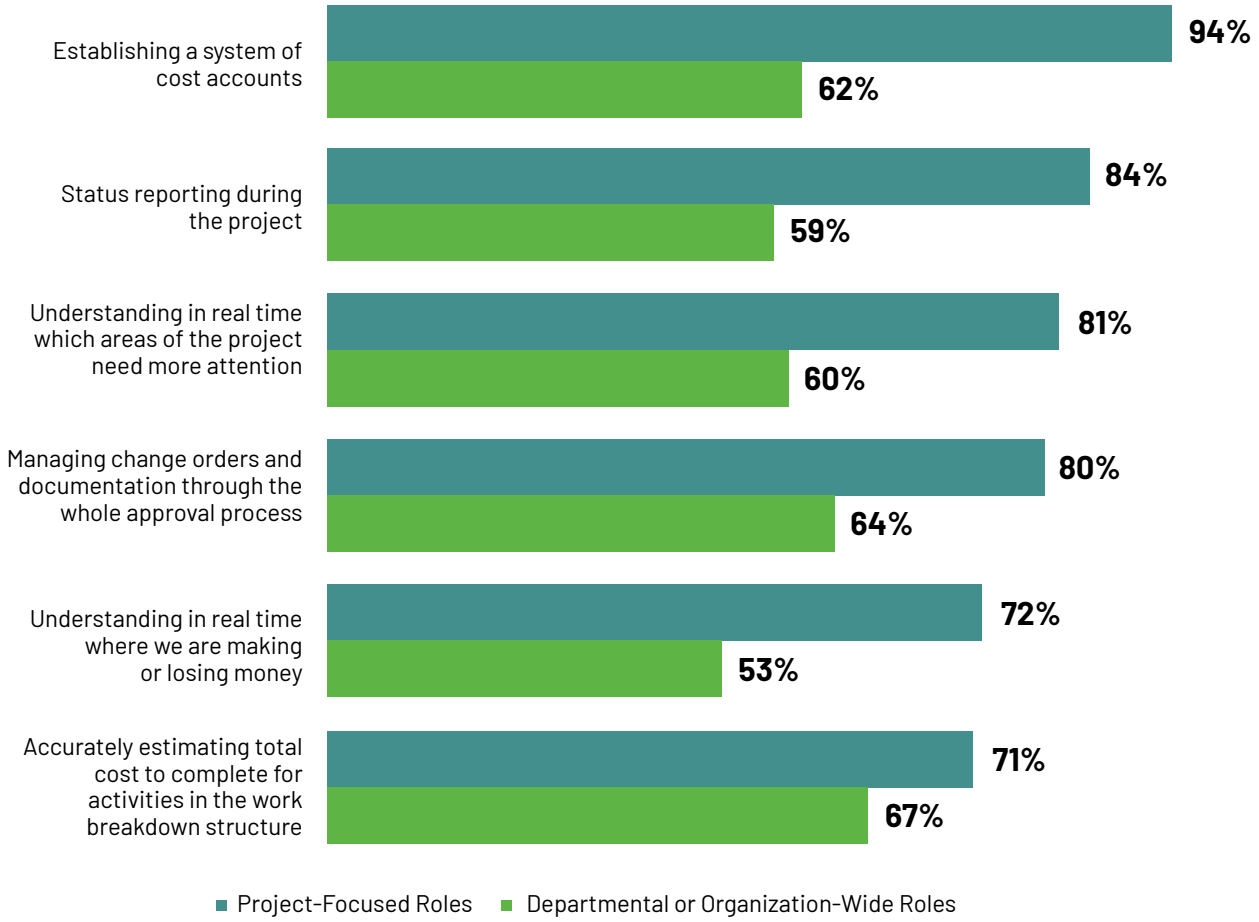
USE OF A SINGLE TECHNOLOGY TOOL BY PROJECT-RELATED ROLES COMPARED WITH DEPARTMENTAL OR ORGANIZATION-WIDE ROLES

The chart at right shows the top six identified challenges for which respondents with project-related roles report significantly above the 65% average use of primarily one technology tool. The percentages are compared with those reported by respondents in office-related roles.

This strong preference by project-related employees for using a primary technology tool for these cost management challenges suggests that concentration on a single tool should be seriously considered by anyone currently using more than one tool.

Above-Average Uses of Primarily a Single Technology Tool

Percentage of Respondents In Project-Related Roles Who Primarily Use a Single Technology Tool Compared With Those In Departmental or Organization-Wide Roles



Cost Management Solutions (CONTINUED)

REGIONAL VARIATIONS IN USE OF PRIMARILY A SINGLE TECHNOLOGY TOOL

The most frequently reported (65%) approach by all respondents to addressing their top challenges is by using either a single tool exclusively or relying on a primary tool even if many are used.

The table at right shows both the overall responses by challenge and variations between regions. Cells are shaded to show variations above and below the averages:

- **Green**: The average across all regions
- **Darker**: 5% or more above average
- **Medium**: At or near average
- **Lighter**: 5% or more below average

The average percentages for each region are within 2% of the overall average (65%). But the responses for individual challenges vary more widely across the regions (49% to 82%). Even with those variances, the findings clearly establish that there is a widespread preference for using a single or primary tool on difficult cost management challenges.

Regional Variations in Use of Primarily a Single Technology Tool

Percentage of Respondents by Region That Exclusively or Primarily Use a Single Technology Tool

	All	USA	CAN	UK	ANZ
Managing change orders and documentation through the whole approval process	74%	81%	70%	66%	78%
Maintaining accurate, up-to-date cost information between office and field	71%	69%	71%	65%	79%
Establishing a system of cost accounts	71%	82%	64%	61%	76%
Accurately estimating total cost to complete for activities in the work breakdown schedule	69%	54%	70%	78%	72%
Understanding in real time which areas of the project need more attention	68%	76%	63%	67%	64%
Status reporting during the project	67%	70%	64%	65%	69%
Effectively integrating cost and schedule information	67%	60%	81%	59%	68%
Converting a final cost estimate into a project budget compatible with cost accounts	64%	60%	67%	64%	66%
Tracking costs for every aspect of the job to determine how they impact overall project cost	63%	69%	58%	56%	71%
Assessing risk related to potential changes	62%	60%	61%	61%	67%
Understanding in real time where we are making or losing money	62%	66%	64%	60%	56%
Determining appropriate contingency amounts	61%	79%	57%	55%	56%
Managing multiple contracts	58%	50%	55%	71%	58%
Tracking units of work completed in the field	58%	65%	49%	50%	66%
Control of project cash flows	58%	57%	52%	67%	63%

Average | 5% or More Above Average | Within 5% of Average | 5% or More Below Average

Cost Management Solutions (CONTINUED)

IMPACT OF COST MANAGEMENT CAPABILITY ON USE OF A PRIMARY TECHNOLOGY TOOL FOR TOP CHALLENGES

The survey asked respondents to assess their current capability related to eight aspects of cost management (see page 2 for more detail). For analysis purposes, those that report good cost management capability with at least seven of the eight are characterized as being the most capable at cost management.

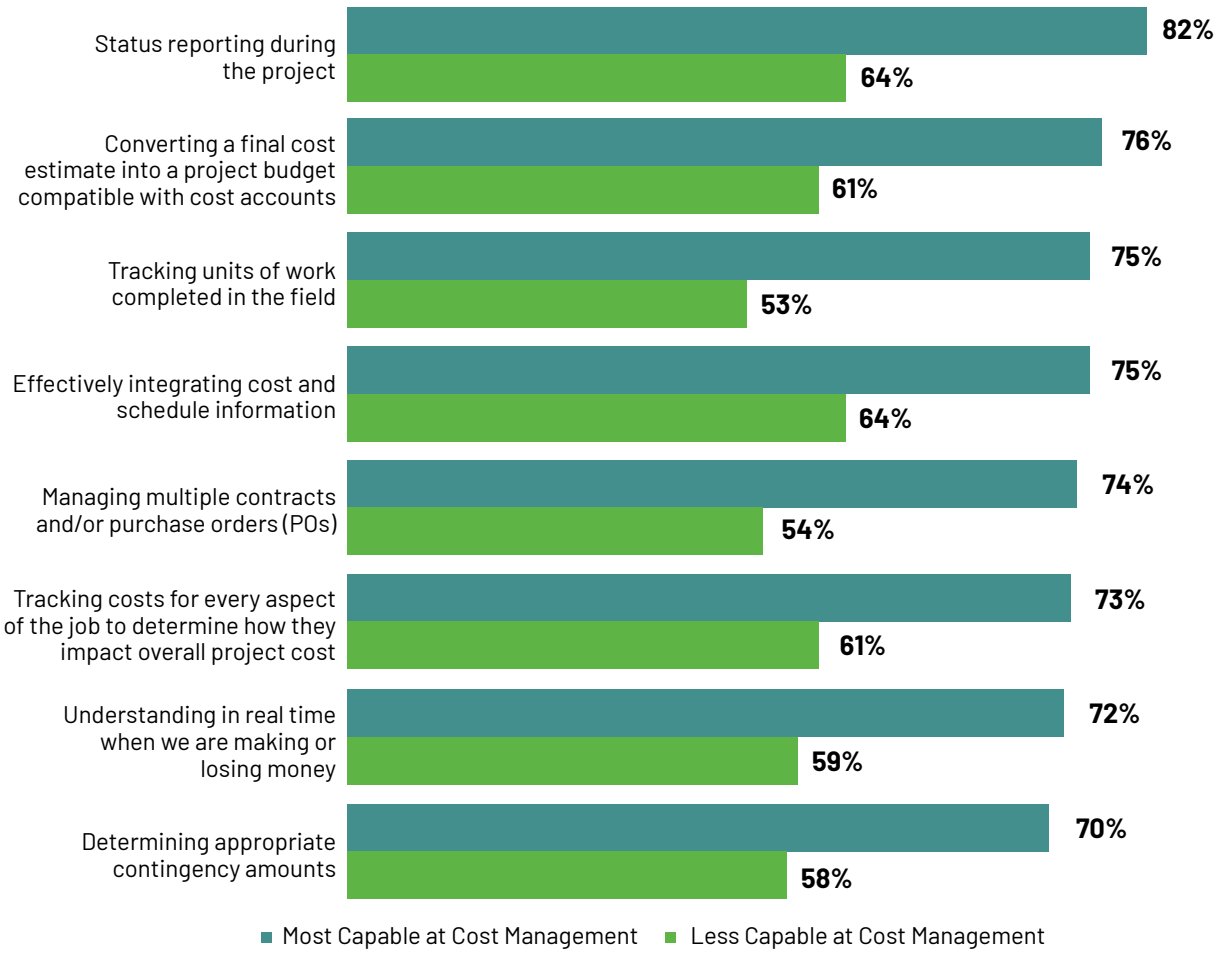
Analysis shows a correlation between respondents' cost management capability and a preference for using a primary tool for their top cost management challenges.

- On average, 71% of the most capable use a primary tool compared with just 63% of the others.
- There is a 10% or greater difference on eight of the 15 top challenges studied. The chart at right shows those eight challenges.

This correlation further substantiates an industry preference for concentrating on a primary tool to address the most difficult cost management challenges.

Share Primarily Using a Single Technology Tool for Challenges

Respondents With High Cost Management Capability Vs. Those With Lower Capability



Cost Management Solutions (CONTINUED)

TYPES OF TECHNOLOGY TOOLS USED

In addition to examining the number of technology tools respondents currently use, they were also asked what types of tools they are deploying for each of the top challenges they selected. The five options were:

- Two types of third-party commercially available software products:
  1. Desktop (on-premise)
  2. Cloud-based
- Other types of solutions, including:
  3. Internally developed tools
  4. Spreadsheets (e.g., Excel)
  5. Mostly manual processes (e.g., email, server files)

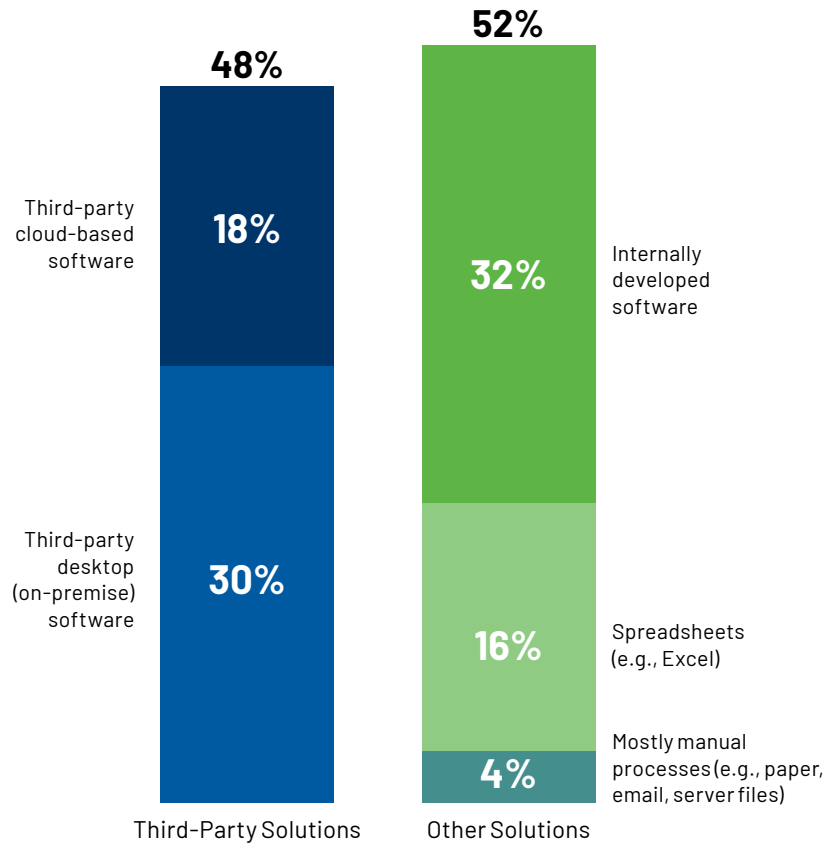
FREQUENCY OF USING VARIOUS TYPES OF TECHNOLOGY

The chart at right shows the average percentages among all respondents who report using each of the five types of solutions studied for their top challenges.

- On average, about half (47%) are using third-party tools, divided about 60/40 between traditional desktop applications and newer cloud-accessible ones. This proportion can be expected to continue to shift toward the cloud as available functionality increases.
- Among the other types:
  - Internally developed tools (32%) may decrease as third-party tools improve customization capabilities and users face the ongoing costs of maintaining and improving their home-grown solutions.
  - At 16%, spreadsheets maintain a foothold, but can also be expected to decline in frequency as third-party solutions become more widely adopted.
  - A small handful of users (4%) report very limited use of technology and still rely mainly on many manual processes. But again, this should decline as more digital natives enter the workforce and both the functionality, ubiquity and security of commercial software improves.

Types of Technology Tools Used for Top Challenges

Average Percentage Using Each Type for Their Top Challenges



Cost Management Solutions (CONTINUED)

TYPES OF TECHNOLOGY TOOLS USED FOR MOST DIFFICULT CHALLENGES

The table at right shows the percentages selecting each type for 11 of the 15 challenges that were rated by respondents as most difficult (i.e., Difficulty Index of 5 or more on a scale of 1-10. See page 5 for more information on the Difficulty Index.)

VARIATIONS FROM AVERAGES

Averages for each of the five types are at the bottom of the table. Cells are shaded to show variations above and below those averages:

- **Darker**: 3% or more above average
- **Medium**: Within 3% of average
- **Lighter**: 3% or more below average

While the total percentage in each cell is the leading metric for this analysis, variations from average indicate concentrations of user preferences.

- Except for assessing risk related to potential changes, the above-average ratings for any particular challenge are either in the first two columns (third- party tools) or in the last three columns (other types of solutions).
- Understanding where money is being made or lost has the greatest range, from 39% for third-party desktop to 24% for internally developed.

Types of Tools Used to Address Most Difficult Challenges

Average Percentages Using Each Type of Tool for Their Most Difficult Challenges

Most Difficult Cost Management Challenges (Index of 5 or higher)	Third-Party Cloud-Based	Third-Party Desktop	Internally Developed	Spread Sheets	Mostly Manual Processes
Converting a final cost estimate into a project budget compatible with cost accounts	17%	32%	29%	17%	5%
Tracking costs for every aspect of the job to determine how they impact overall project cost	18%	26%	36%	16%	4%
Accurately estimating total cost to complete for activities in the work breakdown structure	18%	25%	33%	19%	6%
Determining appropriate contingency amounts	21%	26%	34%	15%	4%
Assessing risk related to potential changes	16%	34%	36%	11%	2%
Tracking units of work completed in the field	23%	25%	32%	14%	5%
Understanding in real time where we are making or losing money	19%	39%	24%	15%	4%
Managing change orders and documentation through the whole approval process	13%	32%	37%	15%	2%
Status reporting during the project	19%	31%	27%	15%	7%
Maintaining accurate, up-to-date cost information between office and field	18%	35%	30%	14%	4%
Effectively integrating cost and schedule information	16%	30%	36%	12%	6%
Average Percentages:	18%	30%	32%	16%	4%

■ 3% or More Above Average ■ Within 3% of Average ■ 3% or More Below Average

Cost Management Solutions (CONTINUED)

IMPACT OF COST MANAGEMENT CAPABILITY ON USE OF THIRD-PARTY TOOLS FOR TOP CHALLENGES

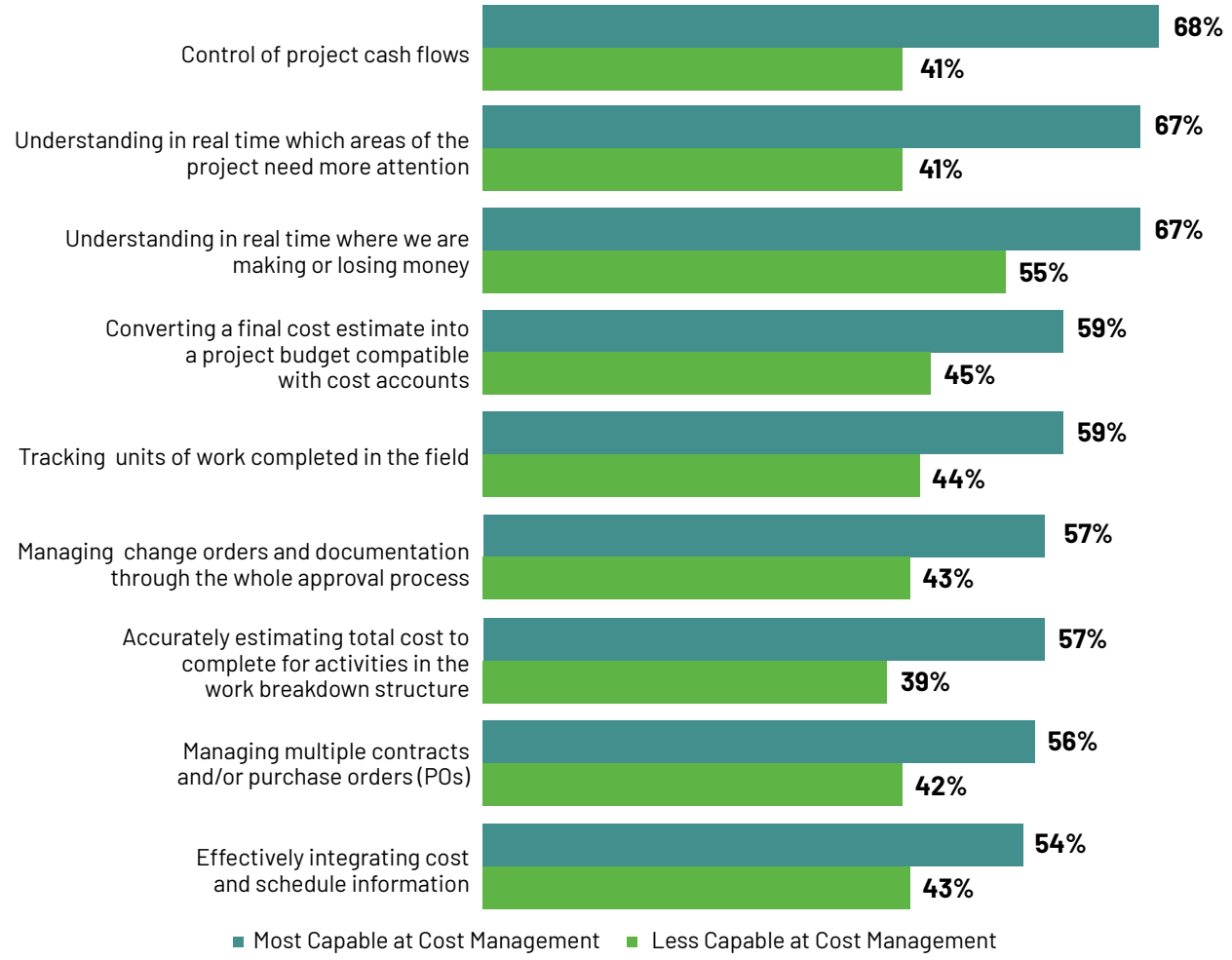
Like the analysis conducted to determine the correlation between cost management capability and use of a primary technology tool (see page 15), the same correlation was examined for use of third-party tools when addressing top challenges.

- On average 57% of those with high capability use a third-party tool compared with just 45% of the others.
- There is a 10% or greater difference on nine of the 15 top challenges studied, shown in the chart at right.

This correlation aligns with other findings in this study that show an industry preference for relying on third-party tools to address the most difficult cost management challenges.

Use of Third-Party Technology Tools for Top Challenges

Respondents With High Cost Management Capability Vs. Those With Lower Capability



Cost Management Solutions (CONTINUED)

USE OF THIRD-PARTY TECHNOLOGY TOOLS, BY REGION

While about half (49%) of all respondents report that they prefer to use a third-party tool for their most challenging cost management activities, the percentages vary significantly for specific challenges across the regions studied.

The table at right shows the averages for each challenge in the left-hand column. Other cells are shaded to show variations above and below the averages in each region:

- **Darker**: 5% or more above average
- **Medium**: Within 5% of average
- **Lighter**: 5% or more below average

Total averages per region are in a close range (USA: 49%; CAN: 51%; UK: 43%; ANZ: 50%). But most challenges display wide variation between regions.

- The average difference between highest and lowest percentage for each challenge is 21%
- The greatest gap is 39% for establishing a system of cost accounts (82% in ANZ, 44% in CAN)

These findings show that while the use of third-party technology for cost management is relatively consistent globally, there is significant variation in how it is applied to different challenges regionally.

Use of Third-Party Technology Tools to Address Top Challenges, by Region

Average Percentages Using Third-Party Tools for Their Most Difficult Challenges

	All	USA	CAN	UK	ANZ
Establishing a system of cost accounts	59%	54%	44%	55%	82%
Understanding in real time where we are making or losing money	57%	68%	60%	43%	55%
Maintaining accurate, up-to-date cost information between office and field	53%	71%	45%	50%	48%
Assessing risk related to potential changes	50%	50%	50%	50%	50%
Status reporting during the project	50%	46%	69%	36%	44%
Converting a final cost estimate into a project budget compatible with cost accounts	49%	42%	50%	39%	60%
Tracking units of work completed in the field	48%	59%	33%	31%	56%
Determining appropriate contingency amounts	47%	44%	52%	45%	45%
Control of project cash flows	47%	45%	56%	38%	45%
Managing multiple contracts	46%	45%	50%	41%	53%
Effectively integrating cost and schedule information	46%	46%	48%	50%	39%
Managing change orders and documentation through the whole approval process	46%	50%	57%	40%	35%
Understanding in real time which areas of the project need more attention	45%	36%	50%	41%	64%
Tracking costs for every aspect of the job to determine how they impact overall project cost	44%	38%	53%	41%	41%
Accurately estimating total cost to complete for activities in the work breakdown schedule	42%	45%	44%	48%	32%

Average | 5% or More Above Average | Within 5% of Average | 5% or More Below Average

Satisfaction With Cost Management Solutions

SATISFACTION WITH TECHNOLOGY TOOLS

Respondents were asked about their relative level of satisfaction with the technology tools they are using to address their top identified cost management challenges. Options were none, low, medium, high and very high.

OVERALL FINDINGS

The table at right shows the 15 challenges studied in the order of how many respondents express either high or very high satisfaction with the technology (ies) they currently use.

- On average, 43% rate their satisfaction as either high or very high.
- Medium is the most frequent rating in every case, ranging from 31% to 56%.
- The low or none ratings are least frequent, ranging from 9% to 19%, with only seven having any nones.

SATISFACTION INDEX

To compare relative satisfaction, the 15 top challenges are shown indexed on a 1-10 scale based on the percentages expressing satisfaction (high or very high) for each.

- The very high ratings ranged from 2% to 14%.
- The high satisfaction ratings ranged from 26% to 44%.
- So, even though a challenge may have a relatively low overall satisfaction index, there are a significant number of users who express either high or very high satisfaction for technology usage on each one.

VARIATIONS IN SATISFACTION

The following pages highlight how satisfaction varies among subgroups of respondents.

Satisfaction With Technology to Address Top Challenges

In Order of Reported High/Very High Satisfaction

Cost Management Challenges	Satisfaction Index
Converting a final cost estimate into a project budget compatible with cost accounts	10.0
Managing change orders and documentation through the whole approval process	8.6
Assessing risk related to potential changes	7.8
Status reporting during the project	7.8
Accurately estimating total cost to complete for activities in the work breakdown schedule	7.2
Maintaining accurate, up-to-date cost information between office and field	6.0
Effectively integrating cost and schedule information	5.6
Control of project cash flows	5.4
Tracking costs for every aspect of the job to determine how they impact overall project cost	5.4
Determining appropriate contingency amounts	5.2
Managing multiple contracts	4.8
Tracking units of work completed in the field.	4.4
Understanding in real time where we are making or losing money	4.4
Establishing a system of cost accounts	2.8
Understanding in real time which areas of the project need more attention	1.0

Satisfaction With Cost Management Solutions (CONTINUED)

VARIANCE IN SATISFACTION BY REGION

The table at right shows the regional variations for percentages expressing high or very high satisfaction with their current technology tools for their top cost management challenges. Cells are shaded to show variations above and below the averages reported by all respondents for each challenge:

- **Green**: Average for all respondents
- **Darker**: 5% or more above average
- **Medium**: Within 5% of average
- **Lighter**: 5% or more below average

Although about half (29 out of 60) of the ratings are within 5% of the averages, there is a wide variation among the rest.

- 15 are below average. The lowest is 21% for **managing multiple contracts** in ANZ
- 16 are above average. The highest is 66% for **status reporting during the project** in CAN.

The overall rating of under 50% and the wide range of reported satisfaction levels for specific top challenges shows that the use of technology for cost management is still an evolving practice everywhere in the world.

Satisfaction Differences (by Region)

Percentages Reporting High or Very High Satisfaction With Their Technology Solutions in Each Region

	All	USA	CAN	UK	ANZ
Converting a final cost estimate into a project budget compatible with cost accounts	54%	58%	63%	63%	35%
Managing change orders and documentation through the whole approval process	50%	50%	46%	55%	48%
Assessing risk related to potential changes	48%	50%	46%	45%	50%
Status reporting during the project	48%	50%	66%	47%	29%
Accurately estimating total cost to complete for activities in the work breakdown schedule	47%	36%	49%	48%	51%
Maintaining accurate, up-to-date cost information between office and field	44%	43%	47%	50%	40%
Effectively integrating cost and schedule information	43%	54%	42%	36%	36%
Control of project cash flows	42%	26%	54%	58%	27%
Tracking costs for every aspect of the job to determine how they impact overall project cost	42%	36%	44%	40%	49%
Determining appropriate contingency amounts	42%	25%	60%	27%	45%
Managing multiple contracts	41%	54%	50%	37%	21%
Tracking units of work completed in the field	40%	39%	57%	42%	30%
Understanding in real time where we are making or losing money	40%	28%	49%	43%	38%
Establishing a system of cost accounts	36%	43%	40%	32%	27%
Understanding in real time which areas of the project need more attention	30%	29%	41%	25%	26%

Average | 5% or More Above Average | At or Near Average | 5% or More Below Average

Satisfaction With Cost Management Solutions (CONTINUED)

DIFFERENCES IN SATISFACTION BETWEEN GENERAL CONTRACTORS AND SPECIALTY TRADE CONTRACTORS

The effective use of technology across the whole project team should be an industrywide goal. But general contractors and specialty trade contractors currently report notably different levels of satisfaction with their use of software for cost management.

The chart at right shows the 11 aspects with the greatest differences (at least 12 percentage points) between the members of each group that express high or very high satisfaction, regardless of the type of software they use (i.e., third-party vs. other types).

- In eight of the 11 cases, general contractors are far more satisfied, in some cases more than double the percentage of their specialty peers.
- One of the largest gaps is found in status reporting during the project, where conversely, 30% more specialty trades report high/very high satisfaction.

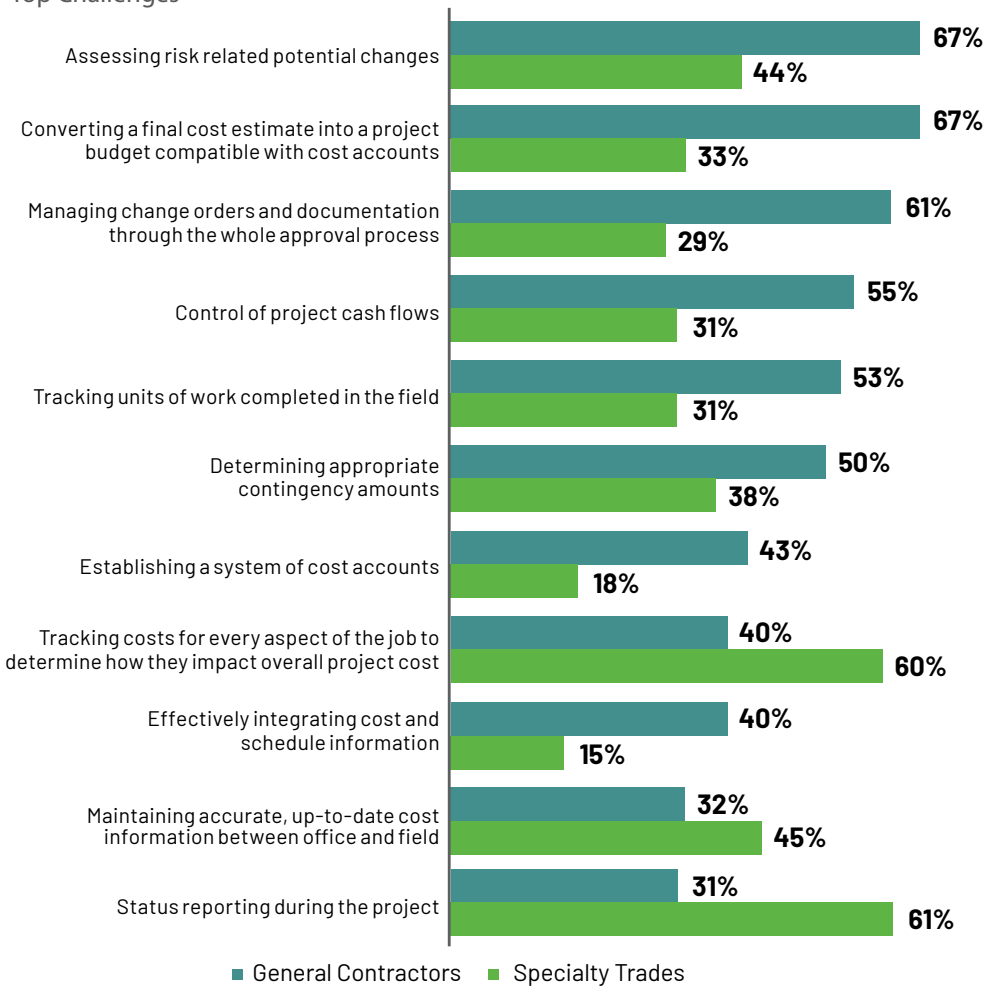
Interestingly, the two groups' high/very high satisfaction percentages are very close (within three percentage points) for the other four aspects studied.

- Understanding in real time where we are making or losing money
- Understanding in real time which areas of the project need more attention
- Managing multiple contracts
- Accurately estimating total cost to complete for activities in the work breakdown schedule (WBS)

This overall trend of disparity sends an important message to the industry that technology needs to effectively support the workflows of every team member in order to advance the entire industry.

Greatest Satisfaction Differences (by Contractor Types)

Percentage of Contractors, by Type Reporting High or Very High Satisfaction for Top Challenges



Satisfaction With Cost Management Solutions (CONTINUED)

DIFFERENCES IN SATISFACTION BETWEEN PUBLIC AND PRIVATE OWNERS

The chart at bottom shows the eight challenges with the biggest differences between public and private owners regarding their level of satisfaction with the technology tool(s) they currently deploy for each challenge.

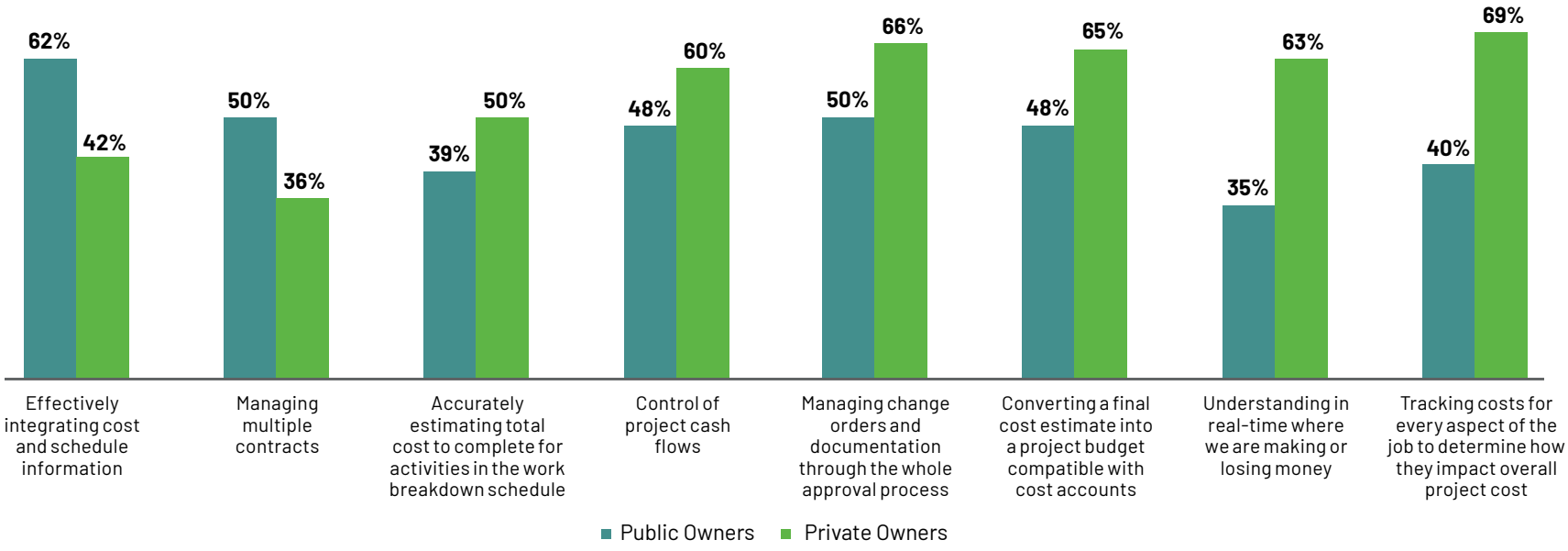
Private owners are generally far more satisfied than their public peers. This is interesting in that:

- Smaller percentages of public owners cite experiencing their top challenges than do private ones (see page 6).
- A somewhat higher percentage of public owners claim very strong cost management capabilities than private ones (see page 4).

This relative dissatisfaction may be due to multiple factors on publicly funded projects that frustrate their ability to manage costs and not exclusively the fault of technology tools.

Top Challenges With Greatest Satisfaction Differences (by Owner Types)

Percentage of Owners, by Type, Reporting High or Very High Satisfaction for Use of Their Current Technology Solution(s) to Address Their Top Challenges



Satisfaction With Cost Management Solutions (CONTINUED)

DIFFERENCES IN SATISFACTION BETWEEN ROLES

Respondents who have primarily project-related roles express higher satisfaction for the use of technology for cost management than their peers who have primarily departmental or organization-wide roles.

The averages from each group reporting high or very high satisfaction differ by 20 percentage points:

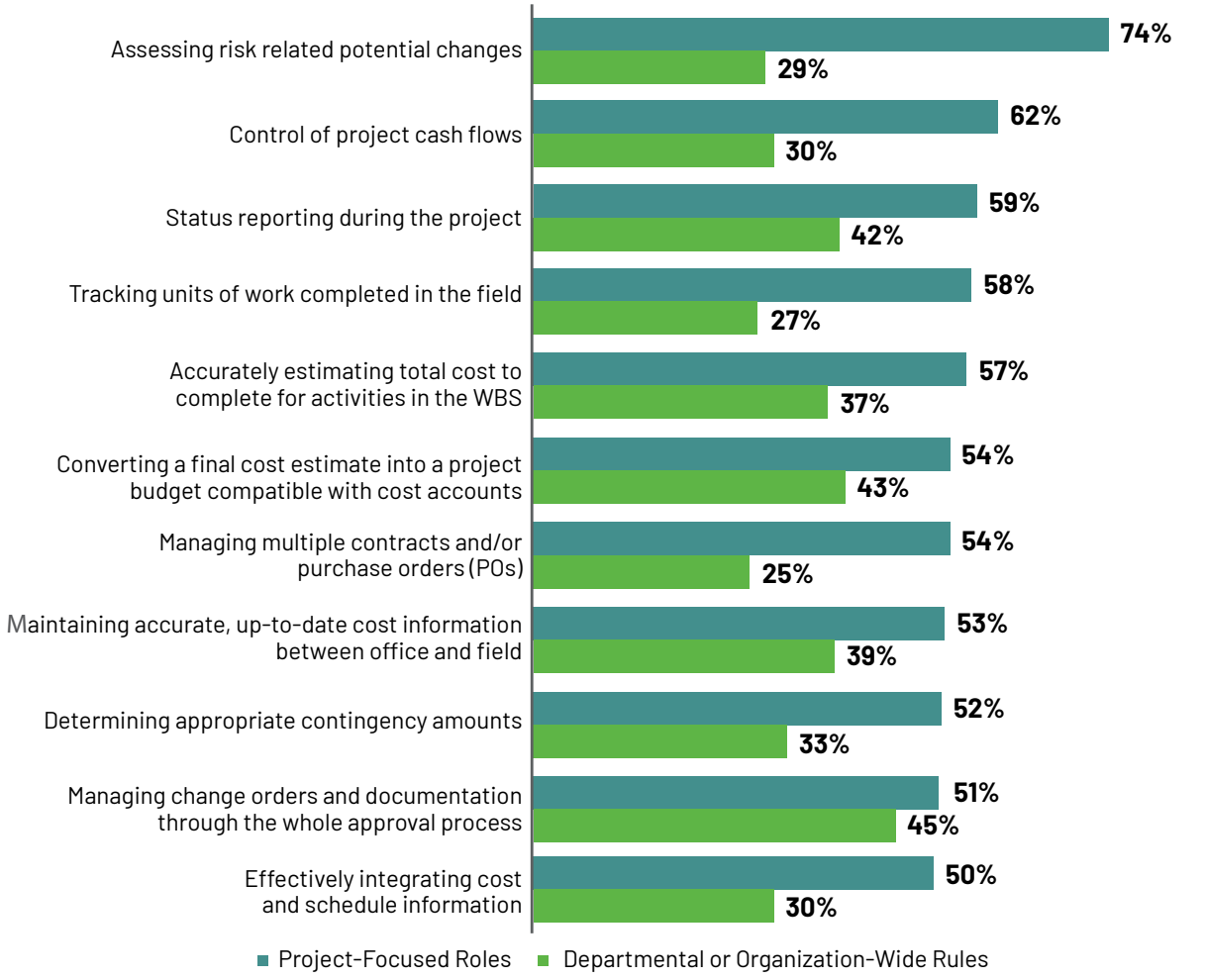
- Project-focused roles: 51%
- Departmental or organization-wide roles: 31%

The chart at right shows the differences among the 11 challenges for which at least 50% of project-focused users give a high or very high satisfaction rating.

This is a powerful signal that cost management technology is successfully enabling project-focused individuals to be effective.

Greatest Satisfaction Differences (by Role)

Percentages Reporting High or Very High Satisfaction Levels



Satisfaction With Cost Management Solutions (CONTINUED)

DIFFERENCES IN SATISFACTION BETWEEN USERS OF THIRD-PARTY AND OTHER TECHNOLOGY TOOLS

For each top challenge identified by respondents, the findings show satisfaction variances between:

- Those using third-party tools (desktop or cloud)
- Those using other tools (e.g., internally developed, spreadsheets, mostly manual processes like email attachments, file servers, etc.)

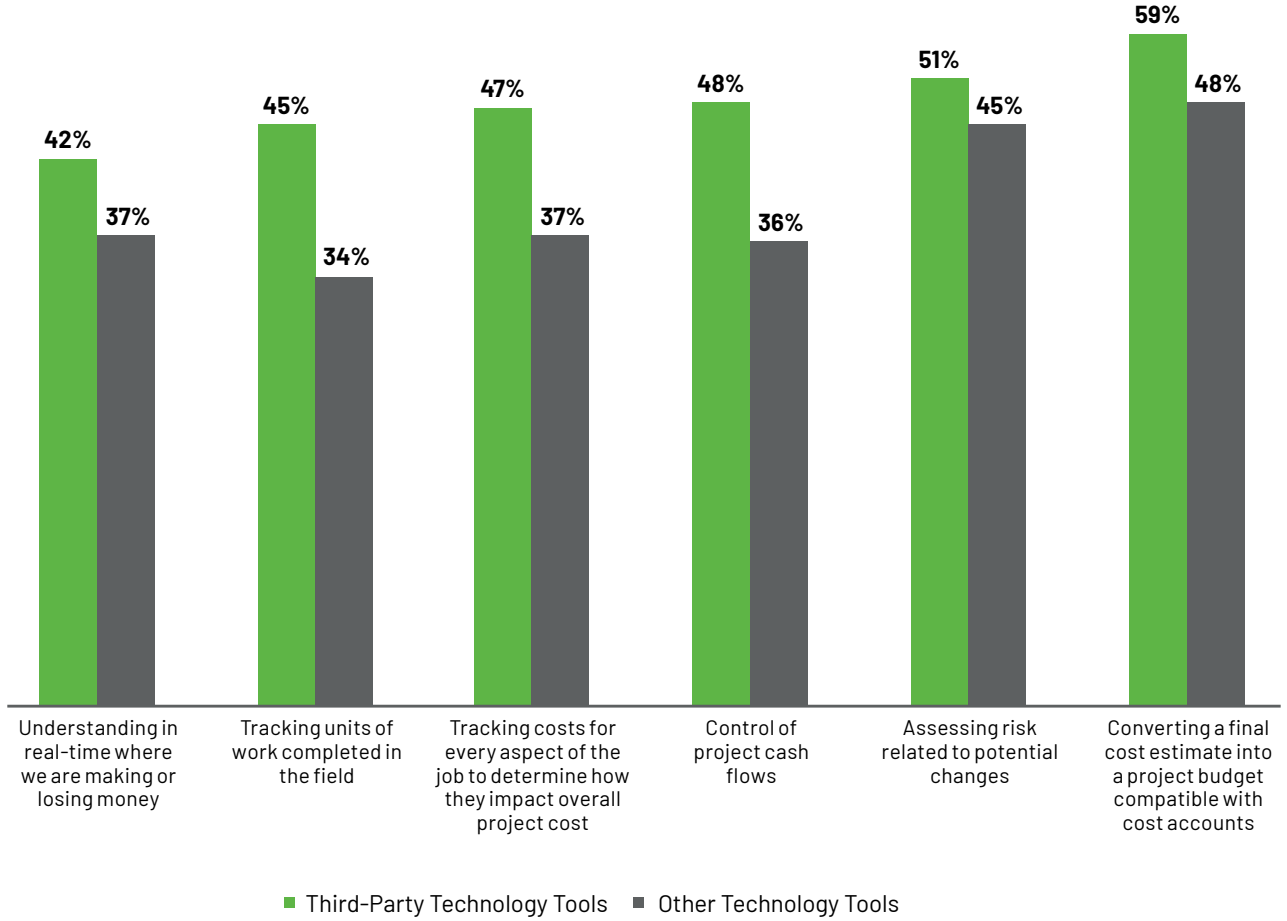
PREFERENCE FOR THIRD-PARTY TOOLS TO ADDRESS TOP CHALLENGES

Users of third-party tools express high or very high satisfaction for the majority of the 15 challenges studied. The chart at right shows the six with the greatest differences (at least 5%).

The next page examines owners' preferences for third-party tools.

Greatest Satisfaction Differences (by Types of Tools Used)

Percentages Reporting High or Very High Satisfaction With Third-Party and Other Technology Tools



Satisfaction With Cost Management Solutions (CONTINUED)

DIFFERENCES IN OWNERS' SATISFACTION BETWEEN USERS OF THIRD-PARTY AND OTHER TECHNOLOGY TOOLS

About half (45%) of owners express high or very high satisfaction with their current technology solutions for their top cost management challenges. But within that overall average there are meaningful variations.

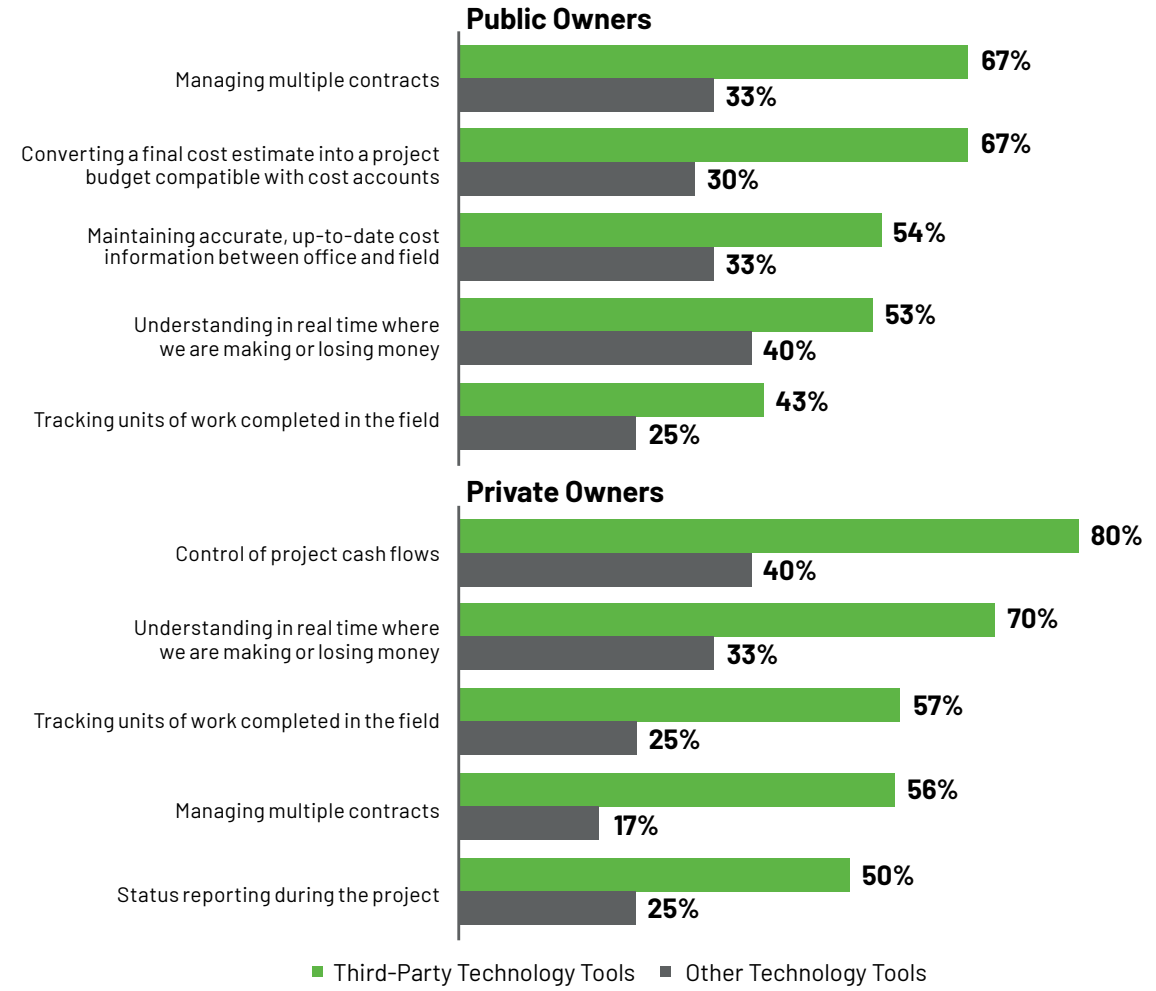
The charts at right show the five challenges for public and private owners where they express the greatest differences (13% or more) in high/very high satisfaction between third-party tools and the other types studied (i.e., internally developed, spreadsheets, email, servers, etc.)

- In over half the cases, twice as many or more owners express a preference for third-party tools.
- Three of the top five are the same for both types of owners, indicating a clear preference across the group.

The data on the next page looks into contractors' satisfaction with the types of tools used.

Greatest Satisfaction Differences (by Types of Owners)

Percentages of Owners Reporting High or Very High Satisfaction With Third-Party and Other Technology Tools



Satisfaction With Cost Management Solutions (CONTINUED)

DIFFERENCES IN CONTRACTORS' SATISFACTION BETWEEN USERS OF THIRD-PARTY AND OTHER TECHNOLOGY TOOLS

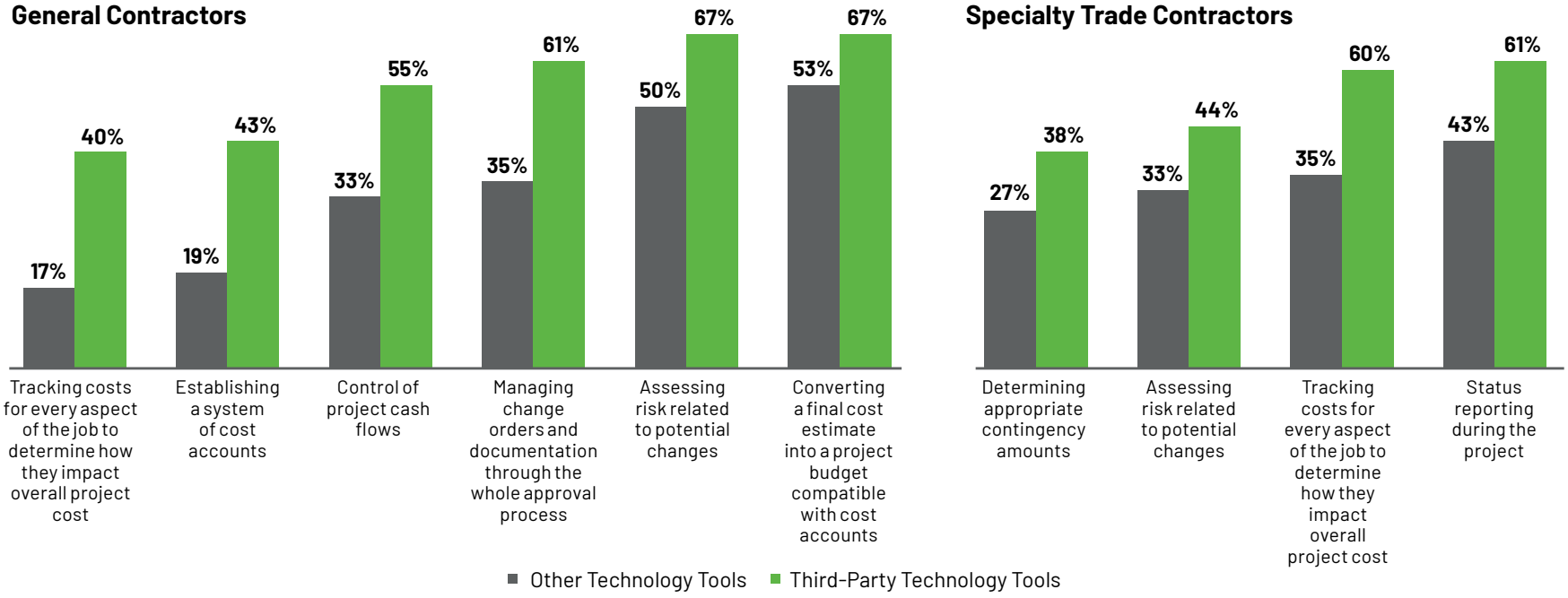
Overall, general contractors express a higher satisfaction with technology for cost management than specialty contractors.

That pattern holds true when comparing each subgroup's preferences for third-party and other types of technology tools. The chart below shows the challenges for which there is 10% or more difference in preference for a third-party tool over other types by general and specialty trade contractors.

- General contractors express a particularly strong preference for using third-party tools when managing change orders (35% vs. 61%).
- Trade contractors feel similarly strongly about using third-party tools for tracking all aspects of projects to determine their cost impacts (35% vs. 60%).

Greatest Satisfaction Differences (by Types of Contractors)

Percentages of Owners Reporting High or Very High Satisfaction With Third-Party and Other Technology Tools



Satisfaction With Cost Management Solutions (CONTINUED)

DIFFERENCES IN SATISFACTION BETWEEN USERS OF A SINGLE EXCLUSIVE AND MULTIPLE THIRD-PARTY TOOLS

A deeper analysis of the responses from those who are using third-party technology solutions to address their top cost management challenges shows variances between two subgroups:

- Those using one third-party tool exclusively
- Those using multiple third-party tools, either with a primary tool or without a primary tool

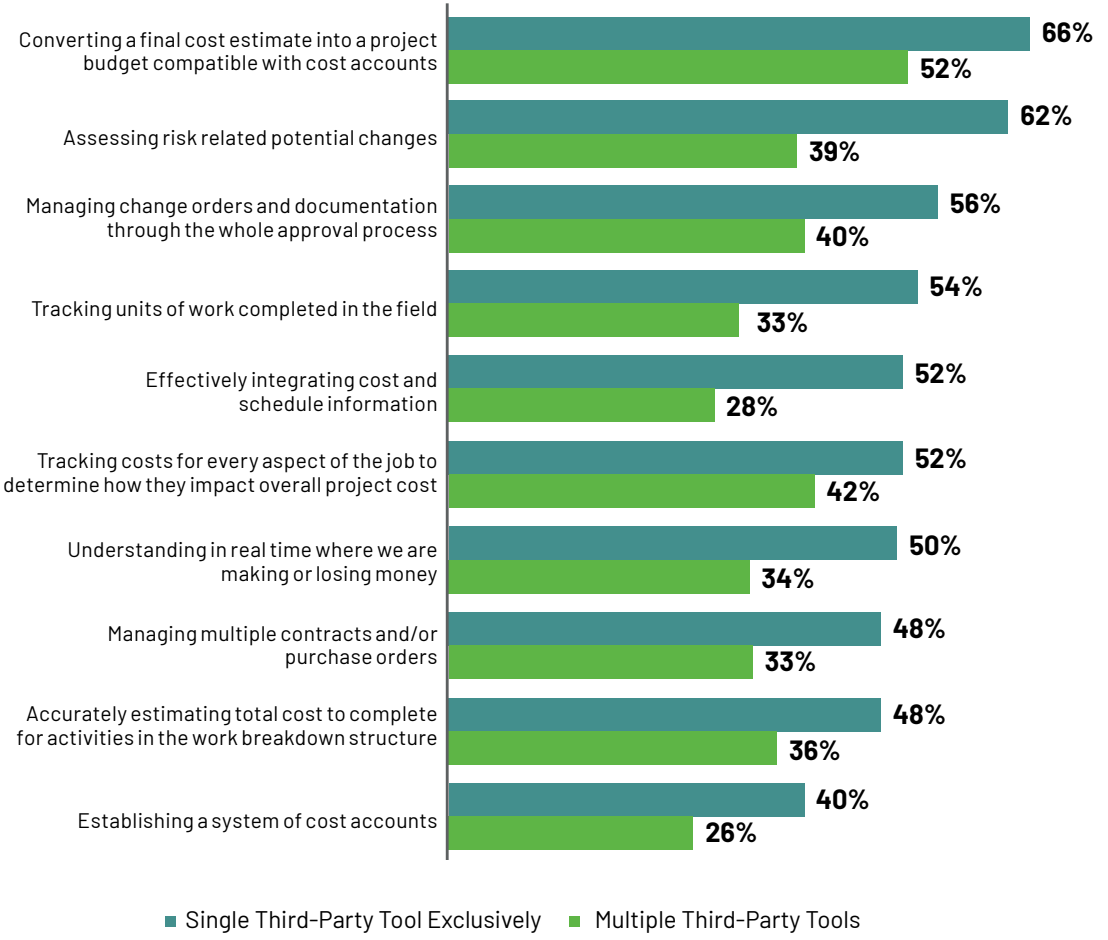
PREFERENCE FOR EXCLUSIVE USE OF A SINGLE THIRD-PARTY TOOL

The chart at right shows that for 10 of the 15 challenges studied, at least 10% more respondents who exclusively use a single third-party technology tool express high or very high satisfaction than those using multiple third-party tools.

This is strong evidence of the value of concentrating on an exclusive single third-party solution for challenging cost management activities.

Greatest Satisfaction Differences (by Number of Third-Party Tools Used)

Percentages Reporting High or Very High Satisfaction With Exclusive Use of a Single Third-Party Tool Compared With Using Multiple Third-Party Tools (With or Without Having a Primary)



Cost Management Processes

INTRODUCTION

Respondents were asked about three aspects of their cost management program.

METRICS FOR SUCCESS

- How they measure the success of their cost management initiatives.
- The list of options is shown at right in the order they are most frequently reported being used.

COST OF THEIR PROGRAM

- Their perception of how much they are spending on staff time, training and technology for cost management relative to how much they believe they should be spending.
- Options were: Much More, Somewhat More, The Right Amount, Somewhat Less, and Much Less

COLLABORATION FOR COST MANAGEMENT WORKFLOWS

- Since cost management involves multiple parties, what means they use to exchange information while conducting cost management workflows.
- The options are shown in the list at right.

The following pages examine differences between subgroups in the survey.

Cost Management Success Metrics and Collaboration Methods

COST MANAGEMENT SUCCESS METRICS STUDIED

In order of frequency used

1. Turnaround time on processing change orders variations
2. Achieving expected profit margin
3. Final cost compared with budgeted cost
4. Improved and/or predictable cash flow
5. Accuracy of estimate
6. Minimal unplanned changes
7. Your ability to predict costs accurately in advance
8. Your ability to actively monitor costs during a project
9. Generating useful data to benchmark for future projects
10. Duration compared to estimated schedule

COST MANAGEMENT COLLABORATION METHODS STUDIED

Non-Technology-Based Methods for Collaboration

- Manual processes relying on printed paper
- Telephone and personal communication

Low-Level Technology for Collaboration

- Email and attachments

Medium-Level Technology for Collaboration

- Internally developed software solution
- FTP server managed by a project team member

Advanced Technology for Collaboration

- Generic cloud-based collaboration software
- Third-party cloud-based collaboration software

Cost Management Processes (CONTINUED)

MEASURING SUCCESS

Respondents were asked about the metrics they use to determine success of their cost management initiatives. While the findings show that there is wide use globally of all 10 of the metrics studied, there are some variations between subgroups of respondents.

OWNER AND CONTRACTOR VARIATIONS

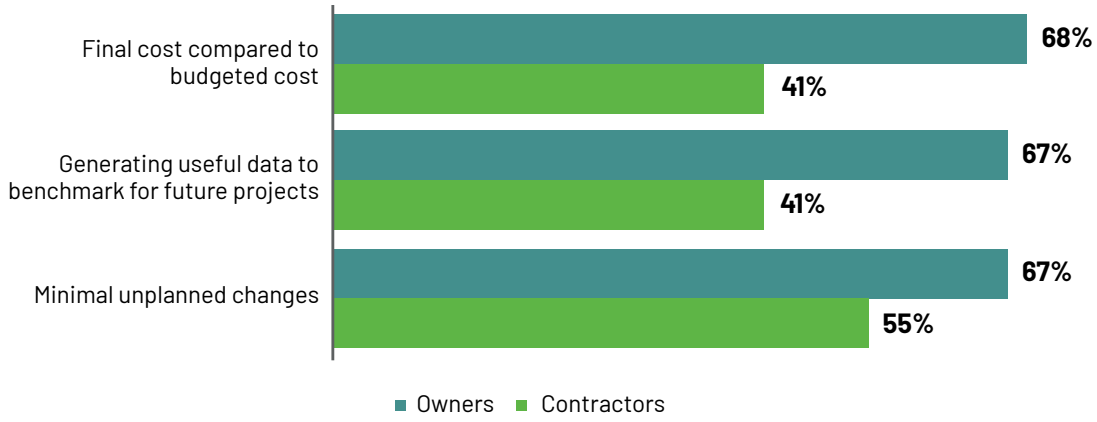
The chart at upper right highlights the challenges that reveal differences between owners and contactors of at least 5%.

Responses are relatively well aligned between general and specialty contractors, and between public and private owners. The chart at lower right shows those with differences of 7% or more.

Interestingly, minimal unplanned changes is a more important metric to contractors (27%) than it is to owners (21%) in the top chart, but a major difference is revealed between owner types themselves in the lower chart, with public owners (24%) expressing much greater focus on it than private ones (17%).

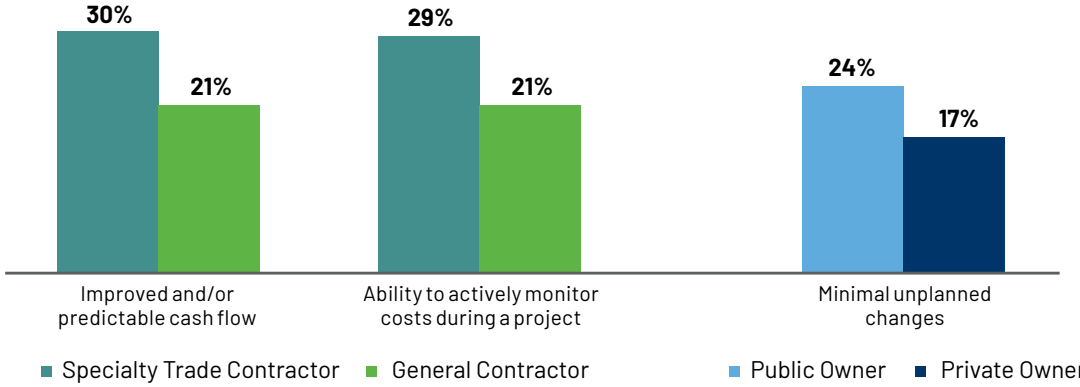
Top Metrics for Cost Management Success

Comparing Top Three for Owners and Top Three for Contractors



Variations in Metrics (by Company Type)

Notable Differences in Metrics Identified by Company Types



Cost Management Processes (CONTINUED)

SPENDING ON COST MANAGEMENT

Respondents were asked to select one of the five descriptions shown in the chart at upper right that best characterizes the amount they are currently spending on cost management (staff time, training and technology) relative to the amount they believe they should be spending.

OVERALL FINDINGS

The chart at upper right shows the totals for all respondents.

- While 39% believe they are spending more than they should, only 14% feel it is much more.
- And interestingly, almost 30% believe they are not spending enough.

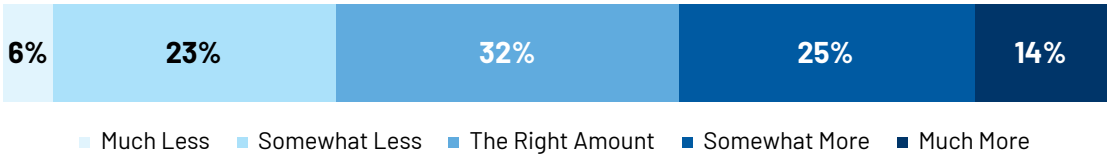
VARIANCES

The chart at lower right shows some variances between the percentages in certain subgroups that believe they are spending more than they should.

- North America is above average.
- Owners significantly outnumber contractors. Among those, public owners feel most strongly, and trade contractors are least concerned.
- Small and midsize organizations are much less concerned than larger ones.

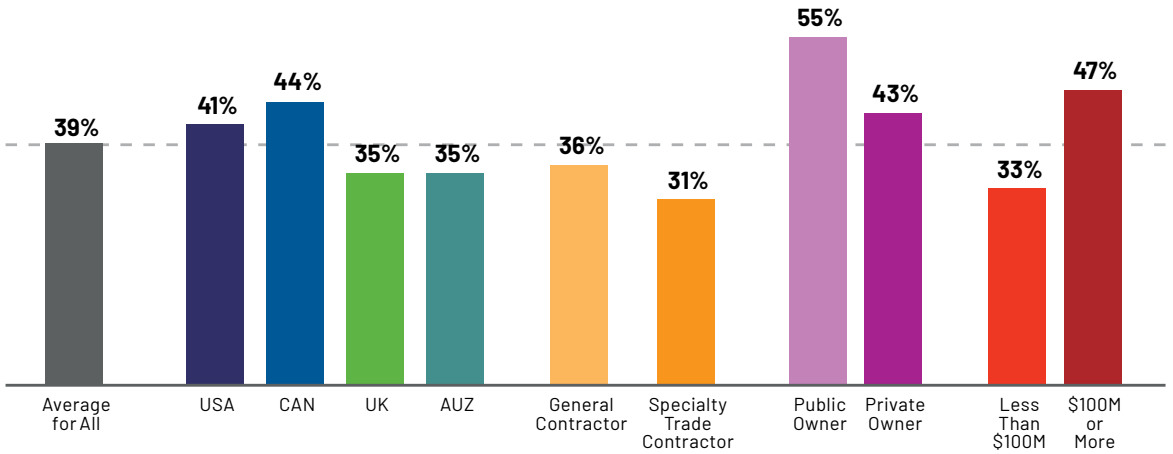
Current Spending on Cost Management vs. Ideal Amount

Comparing All Respondents' Current Spending With What They Believe They Should Be Spending for All Categories (Staff Time, Training and Technology)



Variances in Percentages Spending More Than Ideal Amount

Notable Variances Above and Below Average for Percentages Believing They Are Spending More Than They Should on Cost Management



Cost Management Processes (CONTINUED)

METHODS USED FOR COLLABORATION

Respondents were asked how they most frequently collaborate on cost management workflows, both internally and externally. The seven options represent a scale of technological engagement:

- Non-Technology-Based Methods for Collaboration
  - Manual processes relying on printed paper
  - Telephone and personal communication
- Low-Level Technology for Collaboration
  - Email and attachments
- Medium-Level Technology for Collaboration
  - Internally developed software solution
  - FTP server managed by a project team member
- Advanced Technology for Collaboration
  - Generic cloud-based collaboration software
  - Third-party cloud-based collaboration software

About a quarter of respondents (27%) report that they are still frequently using the non-technology-based methods for collaboration. The chart at right shows the breakdown of reported frequent usage of technology-based methods among the other 73% of respondents.

VARIATIONS BY SUBGROUP

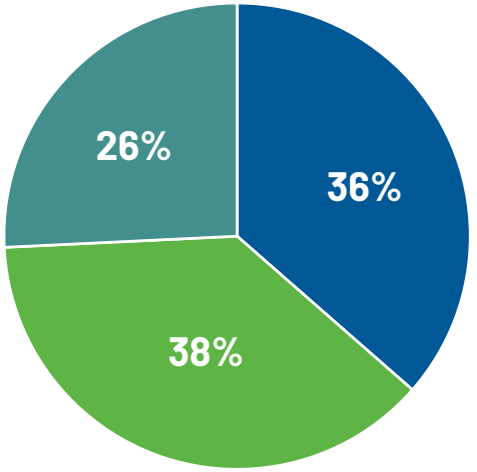
All the subgroups studied for this research are in relatively close alignment with the findings for all respondents shown in the chart. Exceptions related to the use of advanced collaboration technology include:

- An above-average percentage of owners, particularly the private companies report using advanced collaboration methods compared with contractors.
- Organizations doing more than $100M in annual construction are also above average for advanced collaboration methods. (See Methodology on page 41.)
- An above-average number of respondents with a high level of cost management capability report using advanced collaboration methods.

There are only minor variations between regions, so this general pattern can be considered to apply globally.

Technology Used for Cost Management Collaboration

Percentage of Respondents Reporting Frequent Use Each Type (Among Those Who Frequently Use Some Form of Technology-Based Collaboration)



Future Needs for Cost Management

INTRODUCTION

Respondents were presented with a list of 14 cost management practices and asked to select all that will be important for their company to improve over the next three to five years. The table at right shows the order of importance in which these needs rank across all respondents.

The following pages show variations among subgroups within the overall respondent pool.

Future Cost Management Needs Studied

In Order of Frequency by All Respondents

1. Forecasting critical costs with real-time data from the field
2. Dynamically tracking every dollar in my budget
3. Managing collaborative workflows
4. Keeping cost management practices in sync with the accounting system
5. Centralizing communication across office, field, clients (contractors), and/or vendors
6. Reducing payment delays
7. Reducing project delays
8. Streamlining the change management process from start to finish
9. Leveraging data from previous projects to benchmark cost performance
10. Accurately assessing risk related to any changes or performance issues
11. Ability to confidently compare original estimates to actuals to improve future estimates
12. Creating comprehensive financial reports
13. Connecting budget to schedule
14. Improving cash flow

Future Needs for Cost Management (CONTINUED)

FUTURE COST MANAGEMENT NEEDS
VARIATIONS BY REGION

The table at right shows the 14 future needs in the order of total responses. Cells are shaded to show regional variances from the average for each need.

- **Green**: Average of all respondents
- **Darker**: 4% or more higher than average
- **Medium**: Within 4% of the average
- **Lighter**: 4% or more below the average

Canadians show a higher overall average (26%) than US (21%), UK and ANZ (both 19%). Notable variations (10% or more) relative to individual needs include:

- **Managing collaborative workflows**
  - 31% in the US compared with only 19% in ANZ
- **Reducing payment delays**
  - 27% in CAN compared with only 17% in ANZ
- **Streamlining the change-management process from start to finish**
  - 27% in CAN compared with only 15% in UK
- **Leveraging data from previous projects to benchmark cost performance**
  - 29% in the CAN compared with only 16% in UK and 17% in ANZ
- **Accurately assessing risk related to any changes or performance issues**
  - 29% in CAN compared with only 14% or 15% elsewhere
- **Creating comprehensive financial reports**
  - 26% in CAN compared with only 13% in UK, 14% in ANZ
- **Connecting budget to schedule**
  - 26% in CAN compared with only 10% to 13% elsewhere

Top Future Needs for Cost Management by Region

Percentage in Each Region Selecting Each Future Need as Important Over the Next 3-5 years

	All	USA	CAN	UK	ANZ
Forecasting critical costs with real-time data from the field	30%	31%	26%	32%	29%
Dynamically tracking every dollar in my budget	29%	30%	30%	24%	30%
Managing collaborative workflows	26%	31%	28%	24%	19%
Keeping cost-management practices in sync with the accounting system	25%	25%	27%	27%	20%
Centralizing communication across office, field, clients (contractors), and/or vendors	23%	24%	24%	24%	21%
Reducing payment delays	21%	20%	27%	22%	17%
Reducing project delays	21%	20%	29%	18%	19%
Streamlining the change-management process from start to finish	21%	21%	27%	15%	19%
Leveraging data from previous projects to benchmark cost performance	20%	19%	29%	16%	17%
Ability to confidently compare original estimates to actuals to improve future estimates	19%	14%	29%	15%	15%
Accurately assessing risk related to any changes or performance issues	18%	19%	22%	14%	17%
Creating comprehensive financial reports	18%	18%	26%	13%	14%
Connecting budget to schedule	16%	10%	26%	13%	15%
Improving cash flow	15%	13%	19%	14%	12%

Average ■ 4% or More Above Average ■ Within 4% of Average ■ 4% or More Below Average

Future Needs for Cost Management (CONTINUED)

LARGEST VARIANCES BETWEEN OWNERS AND CONTRACTORS

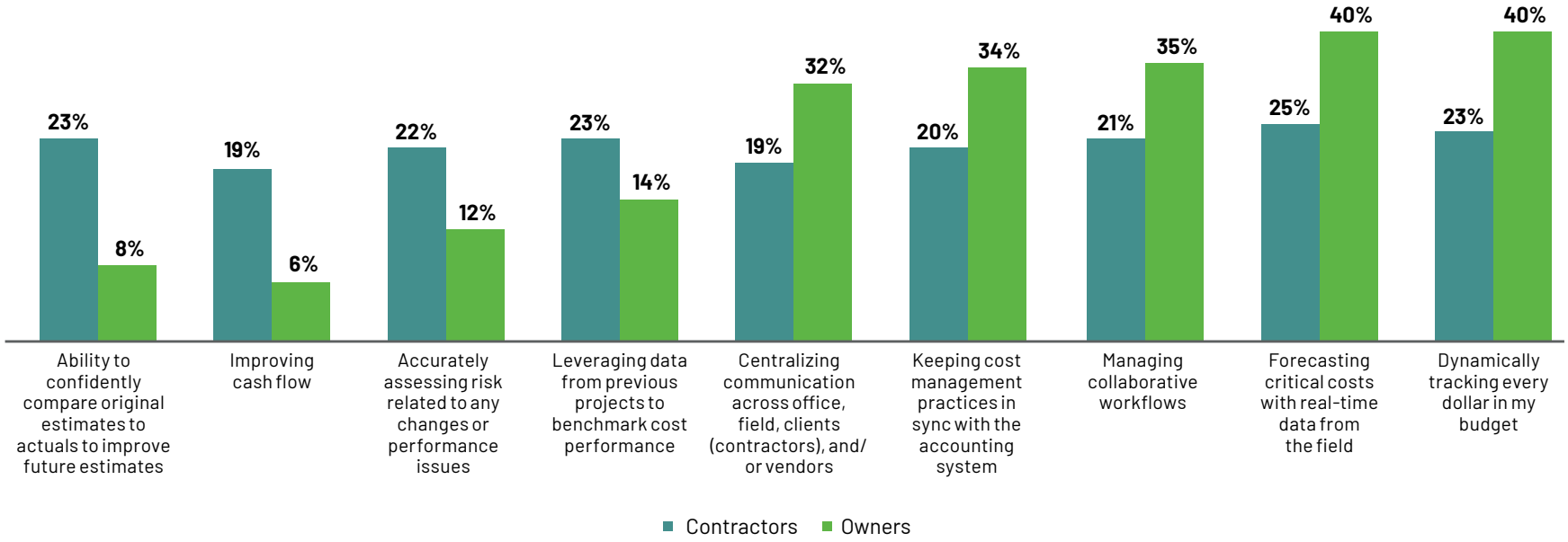
The chart at bottom shows the biggest differences (9% or more) between future cost needs identified by owners and by contractors. It demonstrates that their perspectives differ significantly on many important cost management issues.

Notable differences include:

- Over three times as many contractors want to improve future estimates, and twice as many want to benchmark cost performance, both of which would also greatly benefit owners.
- A 3x margin of contractors also stress improving cash flow, an important signal to owners of how critical this is.
- Surprisingly, owners are significantly more interested in dynamically tracking budgets and using field data for real-time forecasting, both of which should also appeal to contractors.
- More owners also want centralized communications and better-managed collaborative workflows, which point to a single platform for projects as a solution.

Biggest Differences Between Owners and Contractors About Top Future Needs for Cost Management

Percentages of Owners and Contractors Identifying Each Need as Important to Improve Over the Next 3-5 Years



Future Needs for Cost Management (CONTINUED)

LARGEST VARIANCES BETWEEN PUBLIC AND PRIVATE OWNERS

The chart at bottom shows the biggest differences between future cost needs identified by public and private owners compared with the averages for all respondents surveyed.

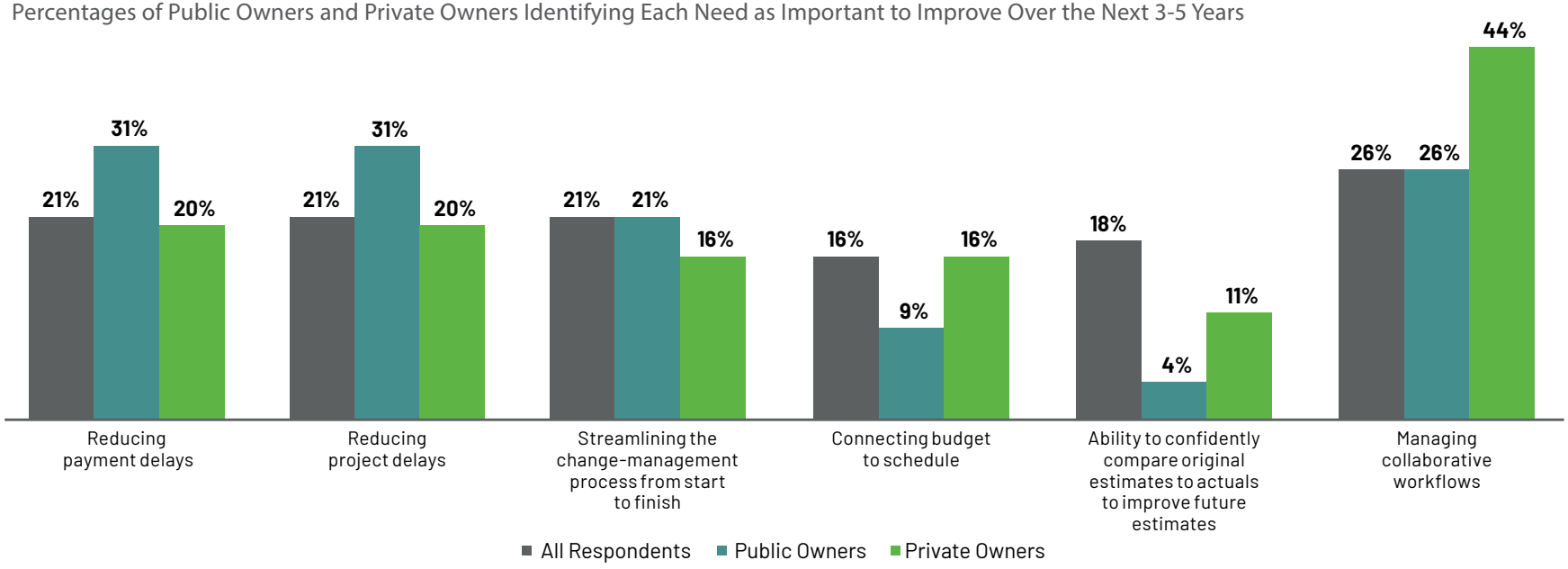
Though generally less than the gaps between the perspectives of all owners and contractors (see previous page), it is still meaningful to understand the aspects of cost management that are thought to be most in need of improvement for each

Notable differences include:

- Private owners (44%) are far above public owners and the average of all respondents (both 26%) in their focus on the importance of improving management of collaborative workflows. This is an encouraging sign that they value this activity.
- Public owners are above average in their citing of both reducing payment and project delays. The former is also good news for contractors that work on public projects
- Public owners are notably less concerned than other respondents about connecting budget to schedule and comparing budgets to actuals to improve future estimates. It may be that they see these as contractor activities, and do not yet appreciate the benefit to owners.

Biggest Differences Between Public and Private Owners About Top Future Needs for Cost Management

Percentages of Public Owners and Private Owners Identifying Each Need as Important to Improve Over the Next 3-5 Years



Future Needs for Cost Management (CONTINUED)

LARGEST VARIANCES BETWEEN GENERAL AND SPECIALTY TRADE CONTRACTORS

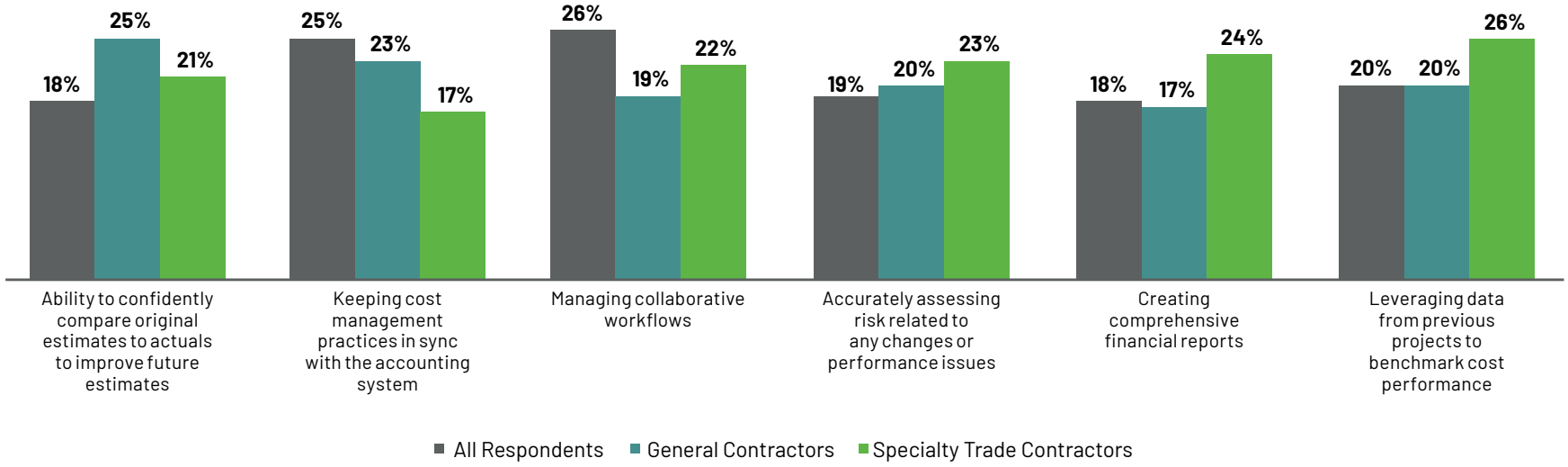
The chart at bottom shows the challenges with at least 3% variation between the percentages of general and specialty trade contractors that identify each as important future cost management needs for their company. For reference they are also compared with the averages for all respondents.

Though more subtle than the gaps identified between other subgroups, the differences still reveal interesting variances in perspective.

- Comparing actual costs to estimate to improve future estimating and keeping cost management practices in sync with accounting systems both show greater concern by general contractors, although improving each would greatly benefit both company types.
- Trades' greatest needs (benchmarking cost performance against previous projects and creating comprehensive financial reports) are both notably higher ranked than by contractors, or by the average of all respondents. This points to a clear need for help in these areas.

Biggest Differences Between General and Trade Contractors About Top Future Needs for Cost Management

Percentages of General and Specialty Trade Contractors Identifying Each Need as Important to Improve Over the Next 3-5 Years



Key Trends From the Research

COST MANAGEMENT CAPABILITIES

All respondents believe they have good cost management capabilities for at least some of the eight studied (see page 2). The overall average claiming that level across all the individual challenges is 62%. But less than a quarter (23%) say they have good capabilities for at least seven out of the eight, so there is a lot of room for improvement globally.

On average, across all eight cost management capabilities:

- Owners are generally more confident in their capabilities than contractors.
- And among those groups, general contractors exceed specialty trades, and public owners exceed private ones.
- Regionally, the USA and UK have more respondents who believe they have good cost management capabilities than CAN or ANZ.

COST MANAGEMENT CHALLENGES

Respondents identified as many as five of their most difficult cost management challenges from a list of 15 possible ones. The three reported most frequently among the most difficult are:

- Converting a final cost estimate into a project budget compatible with cost accounts
- Tracking costs for every aspect of the job to determine how they impact overall project cost
- Accurately estimating total cost to complete for activities in the work breakdown structure

Variations among subgroups include:

- Private owners generally express more difficulty with cost management than public entities.
- So do the respondents with departmental or organization-wide roles compared with those with field/project-related roles, which is a positive sign for shifting more cost management responsibility to the project staff.
- Assessing risk related to potential changes has the greatest difference between general (17%) and trade (27%) contractors, highlighting a potential opportunity to help advance this skill among specialty trades.
- Among regions, Canadian respondents express the most difficulty, varying by as much as 16% from the least troubled region.

COST MANAGEMENT SOLUTIONS

NUMBER OF TOOLS

Respondents identified how many technology tools they use for their most difficult cost management challenges. On average:

- 21% use one tool exclusively
- 44% use more than one tool, but with one as primary
- 33% use two to five tools with none as primary
- 5% use more than five tools with none as primary

This usage pattern varies somewhat by subgroup, but there is a consistent pattern of preference for using a single or primary tool on the most difficult cost management challenges.

TYPE(S) OF TOOL(S)

Respondents also identified what kinds of technology tools they use for their most difficult cost management challenges. The average responses are divided about equally between third-party tools and other types:

- Two types of third-party commercially available software products:
  - 30% desktop (on-premise)
  - 18% cloud-based
- Other types of technology solutions, including:
  - 32% internally developed tools
  - 16% spreadsheets (e.g., Excel)
  - 4% mostly manual processes (e.g., email, server files, etc.)

Although the usage pattern also varies by subgroup, some key trends emerge, such as:

- A strong preference for using third-party tools by the most capable cost managers.
- Above-average preference for third-party tools for these top challenges:
  - Establishing a system of cost accounts
  - Understanding in real time where we are making or losing money
  - Maintaining accurate, up-to-date cost information between office and field

Overall, technology users prefer fewer tools and also express a preference for third-party solutions for cost management activities.

Key Trends From The Research (CONTINUED)

SATISFACTION WITH COST MANAGEMENT SOLUTIONS

All respondents were asked to assess their satisfaction with the current tools they are using for their identified top challenges. Overall, about 42% of users express high or very high satisfaction with their current technology tools. The challenges that rated highest for current satisfaction are (in descending order of satisfaction):

- Converting a final cost estimate into a project budget compatible with cost accounts
- Managing change orders and documentation through the whole approval process
- Assessing risk related to potential changes
- Status reporting during the project
- Accurately estimating total cost to complete for activities in the work breakdown schedule

The five where users are least satisfied with their current technology solutions are (in descending order of dissatisfaction):

- Understanding in real time which areas of the project need more attention.
- Establishing a system of cost accounts
- Understanding in real time where we are making or losing money
- Tracking units of work completed in the field
- Managing multiple contracts

VARIATIONS BY ORGANIZATION AND ROLE

Notable variations include:

- In general, more private owners report high/very high satisfaction with their current technology for cost management challenges than public entities.
- In contrast, the reported satisfaction levels of general and trade contractors are closely aligned.
- Respondents with project-focused roles tend to be less challenged than their peers in departmental or organization-wide roles, reinforcing the trend toward shifting cost management responsibilities to the field.

SATISFACTION WITH THIRD-PARTY COST MANAGEMENT TOOLS COMPARED WITH OTHER TYPES

In general, both owners and contractors more frequently express high/very high satisfaction with using third-party cost management tools for their top challenges than with other types (e.g., internally developed, spreadsheets, email with attachments, etc.).

REGIONAL VARIATIONS

- Users in Canada are the most satisfied with third-party tools, while users in Australia/New Zealand are the least satisfied with the other types of tools.
- The greatest variation on a single challenge is among US users about converting a final cost estimate into a project budget compatible with cost accounts. 82% are satisfied with third-party tools and only 33% with other tools.

SATISFACTION WITH USING A PRIMARY TECHNOLOGY TOOL FOR COST MANAGEMENT COMPARED WITH MULTIPLE TOOLS

Satisfaction varies according to the number of technology tools used. A pattern in the findings shows that more users express high/very high satisfaction when they are using either a single tool exclusively or have a primary tool even if they are using multiple ones.

- There is as much as a 40% difference between percentages preferring either a single tool or at least a focus on a primary tool among several, compared with those using multiple tools.
- For 10 of the 15 challenges studied, more of those respondents prefer a single tool rather than even having a primary tool among several, suggesting a trend towards centralizing technology selection on fewer, more functional tools.

COST MANAGEMENT PROCESSES

MEASURING COST MANAGEMENT SUCCESS

Respondents were asked to select among 10 metrics to identify ones they frequently use to determine success in cost management. The top three are:

- Turnaround time on processing change orders/ variations
- Achieving expected profit margin
- Final cost compared to budgeted cost

Owners' most frequent metrics are:

- Final cost compared to budgeted cost (30%), one of the top three overall.
- But the other top metric is generating useful data to benchmark for future projects (26%), which is only ninth most frequent overall, Indicating a much higher importance to owners.

Contractors most frequently report minimal unplanned changes as their top success metric.

Key Trends From The Research (CONTINUED)

SPENDING LEVELS ON COST MANAGEMENT
Owners and contractors are about evenly split between:

- 39% who believe they are spending more than they should have to
- 32% who think are spending the right amount
- 29% who say they are spending less than they should

Several variations appear between subgroups.

- Owners are more likely to believe they are spending too much, especially public entities (55%).
- Conversely, contractors are least likely, especially trades (31%).
- Large organizations (over $500M annual project volume) are also much more likely to believe they are spending too much (47%) than their smaller peers (33%).

METHODS OF COLLABORATION
Most respondents are using some type of technology for collaboration, both internally and with other parties. They are divided between:

- 26%: Low-Level Technology (i.e., email and attachments)
- 38%: Medium-Level Technology (i.e., internally developed technology or an ftp server managed by a project team member)
- 36%: Advanced Technology (i.e., either generic or third-party cloud-based collaboration software)

There are only minor variations between any of the subgroups studied.

MOST IMPORTANT FUTURE NEEDS FOR IMPROVING COST MANAGEMENT

From a list of 14 options, respondents selected the most important cost management improvements their organization needs to make over the next three to five years. The top five are (in descending order of selection frequency):

- Forecasting critical costs with real-time data from the field
- Dynamically tracking every dollar in my budget.
- Managing collaborative workflows
- Keeping cost management practices in sync with the accounting system
- Centralizing communication across office, field, clients (contractors) and/or vendors

The findings show significant diversity between the needs identified by owners and contractors. Within those two groups there is much closer alignment between general contractors and specialty trades, and between public and private owners. Future needs are also relatively closely aligned across the four regions studied.

TOP TAKEAWAYS FOR OWNERS AND CONTRACTORS

CLOSER ALIGNMENT BETWEEN OWNERS AND CONTRACTORS
The variation identified above between the most important future needs of contractors and owners represents an opportunity to adopt a new perspective on cost management as an integrated project team-wide practice. For example:

- Improving cash flow is a top need for contractors. So, owners need to prioritize improving that, which will importantly contribute to overall project health.
- Conversely, owners are far more focused on improving their ability to forecast critical costs with real-time data from the field. But this requires active cooperation from contractors, who need to appreciate and support its importance to their owners.

ENGAGING PROJECT-FOCUSED STAFF MORE ACTIVELY IN COST MANAGEMENT
Supporting the theme of cost management as a team-wide practice, many of the findings in this report indicate that project-focused staff are ready and able to participate in a more holistic and integrated approach instead of the traditional office-based function with just discrete, periodic inputs from the field. For example, on average, project-based staff report:

- Higher levels of cost management capabilities
- Lower levels of difficulty with their most challenging cost management activities
- Greater satisfaction using technology to address them

CONCLUSION
Focusing on using fewer, more comprehensive technology tools, engaging all key stakeholders in a shared approach to cost management and driving responsibility for it deeper into both owner and contractor organizations will generate better cost-related outcomes for all parties.

Methodology

THE SURVEY

This report is based on findings from an online survey of 724 owners and contractors conducted by Dodge Data & Analytics (Dodge) during June and July of 2021. Respondents include:

- 243 Owners (122 public, 121 private)
- 240 General Contractors
- 241 Specialty Trade Contractors

Respondents are equally divided across four regions:

- United States (USA)
- Canada (CAN)
- United Kingdom (UK)
- Australia and New Zealand (ANZ)

RESPONDENTS' PROJECT EXPERIENCE

Owners were asked to identify one building type that represents the majority of their portfolio. (Single family residential were excluded from the survey.) Contractors were asked to identify all project types they have recent experience with. (Any who selected only single family residential were excluded.)

Project Experience	Owners	Contractors
Commercial (e.g., office, retail, hotels)	46%	62%
Institutional (e.g., education, healthcare, government)	19%	38%
Multi-family Residential	10%	31%
Single-family Residential	0%	7%
Industrial (e.g., manufacturing facilities)	12%	32%
Transportation*	8%	23%
Energy/Power	2%	19%
Water/Wastewater	2%	9%

(*e.g., highway/roads, bridges, rail, tunnels, dams, airports)

SIZE OF RESPONDENT ORGANIZATIONS

Owners were asked to identify the range that best represents their annual capital spending on construction. Contractors were asked to identify the range that best represents their annual revenue. (Ranges were converted to native currencies for the survey but are shown here converted to US dollars.)

Size of Organizations	Owners	Contractors
$10 Million or Less	10%	8%
$11-$50 Million	16%	26%
$51-$100 Million	23%	26%
$101-$200 Million	28%	22%
$201 -$500 Million	13%	13%
More than $500 Million	10%	5%

ROLES OF RESPONDENTS IN THEIR ORGANIZATIONS

Respondents were screened to make sure they have cost management responsibility. Then each was asked to select among 16 role descriptions to identify which one best fits their current responsibilities related to construction. These break down into two broad categories:

- **61% have departmental or organization-wide roles**, e.g., CEO, COO, finance or accounting, director of construction, CIO, CTO or other technology-specific roles, etc.
- **39% have project-related roles**, e.g., project director, project engineer, project manager, field superintendent or foreman, site manager, etc.

This distinction is used frequently for analysis throughout the report to highlight variations in their relative perspectives on cost management.

Contacts & Resources

DD&A EDITORIAL TEAM

Stephen A. Jones leads DD&A's Industry Insights Research division and is the primary author of this report. He is active in numerous industry organizations and frequently speaks at industry events around the world. Before DD&A, Jones was a vice president with Primavera Systems (now part of Oracle). Prior to that, he was principal and a Board of Directors member with Burt Hill, a major A/E firm (now Stantec). He holds a BA from Johns Hopkins and an MBA from Wharton.
steve.jones@construction.com

Donna Laquidara-Carr currently provides editorial direction, analysis and content to DD&A's SmartMarket Reports. Prior to this position, she worked for nearly 20 years with DD&A's Dodge editorial team, where she gained detailed insight into the construction industry. She holds a Ph.D. from Tulane University, an MA from Boston University and a BA from Middlebury College.
donna.laquidara@construction.com.

Stephen A. Jones
Senior Director
Industry Insights

Donna Laquidara-Carr Ph.D., LEED AP
Research Director
Industry Insights

ADDITIONAL RESOURCES

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Procore is committed to advancing the construction industry by improving the lives of people working in construction, driving technology innovation, and building a global community of groundbreakers. Our connected global construction platform unites all stakeholders working on a project with unlimited access to support and a business model designed for the construction industry.

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