



SmartMarket Brief



Optimizing Digital Project Management for General Contractors

Introduction

ABOUT THIS SMARTMARKET BRIEF

This SmartMarket Brief examines the current state of digital project delivery in the US construction industry through a survey of more than 200 general contractors, construction managers and design-builders.* The findings quantify the use of technology for 11 project management and construction-related processes, in two categories.

PROJECT MANAGEMENT-RELATED PROCESSES

- Scheduling
- Document Management
- Cost Management
- Bid Management
- Payment Management
- Business Intelligence and Analysis

CONSTRUCTION-RELATED PROCESSES

- Scheduling
- Document Management
- Cost Management
- Bid Management
- Payment Management
- Business Intelligence and Analysis

**The term "general contractor" in this report refers to all three of these company-types.*

FINDINGS REVEAL IMPORTANT WAYS TO IMPROVE THE VALUE OF TECHNOLOGY

Although the construction industry has come far in implementing digital solutions, most contractors believe that much more value is available from their technology stack. The findings demonstrate that:

- Deeper engagement on several fronts improves general contractors' experience of value from technology.
- Effective data integration is both a top challenge and a great opportunity for increasing the value of technology.
- Despite the challenges that some face, most contractors are actively planning to adopt more technology for their project processes in the near future (i.e., next three years).

GOAL OF THIS REPORT

Dodge and Smartapp.com™ hope to inform, guide and inspire every general contractor as they continue to make valuable progress on their digital journey.

Dodge wishes to thank Smartapp.com for helping us to bring this valuable data to the industry.

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Message From Smartapp.com™

Smartapp.com™ is a company of industry experts who have first-hand experience with the challenges that the construction industry continues to face every day on the jobsite. Only through continued and focused deep-dive research into the US construction industry, are we able to better understand the problems and challenges our peers are facing across the country and reimagine the ways we can help overcome them. Our goal is to make our industry more efficient, productive and safe by understanding the macro level issues of labor shortage, quality of workmanship, an aging workforce, high risk work conditions, burnout and profit erosion. The research and findings in this paper help us all stay on the pulse of the industry, so we can build a sustainable forward-thinking strategy that uses data and technology-based solutions to solve every-day jobsite problems.

This report delves into the US construction industry and analyzes the market in a meaningful way by surveying a broad spectrum of over 200 general contractors, construction managers and design-builders to better understand how they use construction technology, what value they're getting out of technology, what challenges they've encountered in adopting those technologies, and ultimately to better understand the current trend and movement towards easy-to-use and unifying platforms that help bring together or provide all your project automation needs in one place. The results of this paper should help you and your company on its journey to leveraging technology that creates a positive impact both on the common day-to-day challenges as well as the macro-level challenges that every stakeholder throughout the process can benefit from. With the convergence of modern unifying technologies, there's a new transformational opportunity to reimagine the industry and the jobsites of the future.

Michael R. Colapietro
CEO & Co-founder, Smartapp.com™



Summary of Key Findings

Technology Adoption Trends

TECHNOLOGY ADOPTION IS INCONSISTENT

Although solutions to automate project and construction management processes have been available to general contractors for many years, adoption varies widely across processes and among companies.

DIGITAL MATURITY OF PROCESSES

The percentage of general contractors currently automating a given process is referred to in this report as the digital maturity of that process. While 64% of companies is the average across all 11 processes studied, the findings vary considerably.

- The average is higher (69%) among the six project management-related processes than the five construction management-related ones (58%).
- Only three of the 11 processes show greater than 80% average technology use, with the highest being 85%.
- Four of the processes are currently automated by just half or less of general contractors, with the least being a mere 17%.

Five Most Frequently Automated Processes	Percent
Construction Process Management (e.g., RFIs)	85%
Scheduling	84%
Document Management	81%
Cost Management	79%
Bid Management	75%

DIGITAL ENGAGEMENT OF GENERAL CONTRACTORS

The number of processes a given general contractor is currently automating is referred to in this study as its level of digital engagement.

The chart below divides all survey respondents* into two categories of digital engagement across the 11 processes studied.



■ High Digital Engagement

- Using technology for eight or more processes.
- The majority (28%) are automating just eight or nine processes.
- Only 7% are automating all 11 processes.

■ Lower Digital Engagement

- Using technology for one to seven processes.
- The majority (31%) are just automating five or fewer of the 11 processes studied.

IMPACT OF DIGITAL ENGAGEMENT

These two categories are used later in this report to analyze the impact of digital engagement on the benefits and value of technology. (See pages 14 and 15.)

**NOTE: Technology use for at least one of the 11 processes studied was a requirement for respondents to qualify for this survey. Therefore, the findings do not address general contractors that are not using technology for any of the processes.*

Summary of Key Findings

Types of Technology Solutions Being Used by General Contractors

TECHNOLOGY SOLUTION TYPES

General contractors have choices for the type of technology solution they can use to automate a project or construction management process. Findings for the four solution types studied in this report are shown in the chart below.

COMMERCIAL SOLUTION INTENSITY

On average, 73% currently use a commercial technology solution. However, that varies widely across companies.

- Only 28% of general contractors have what is referred to in this report as high commercial solution intensity (i.e., use for eight or more of the 11 processes studied).
- The advantages of high commercial solution intensity are examined later in this report. (See pages 16 and 17.)

USE OF PLATFORMS WITHIN THE COMMERCIAL SOLUTIONS CATEGORY

Only 39% (on average) are taking advantage of the multiple pre-integrated functions and API capabilities of platform solutions.

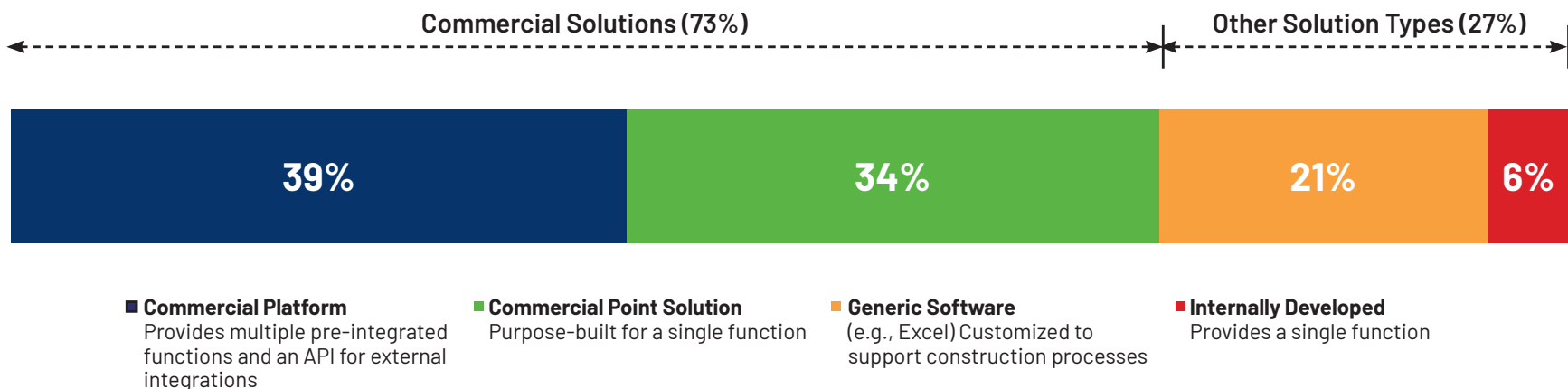
- Platform usage by process ranges from a high of 60% for document management, where multifunction solutions are plentiful, to just 14% for scheduling, where point solutions are entrenched.
- Just 15% of general contractors are high frequency platform users (six or more processes). Pages 19 and 20 examine the benefits of frequent platform use.

OTHER SOLUTION TYPES

Often developed before commercial solutions were available, these can be deeply embedded in company workflows, making them challenging to replace with commercial offerings.

Types of Technology Solutions Used by General Contractors (Across the 11 Processes Studied)

Average Among the Companies That Report Using Technology



Summary of Key Findings

Improvements and Value Generated by Technology Usage

TOP IMPROVEMENTS FROM TECHNOLOGY

The table below shows the ranking of general contractors' responses when asked to identify the top improvements their company experiences from its use of technology.

Top Improvements From Technology Usage
1. Schedule performance
2. Cost performance
3. Overall data collection from the jobsite
4. Profitability
5. Labor productivity
6. Quality of completed work
7. Safety performance

COMPANIES WITH HIGH DIGITAL ENGAGEMENT, HIGH COMMERCIAL SOLUTION INTENSITY AND FREQUENT PLATFORM USAGE REPORT MORE IMPROVEMENTS

As shown in detail on pages 14, 16 and 19, more of those companies report experiencing improvements.

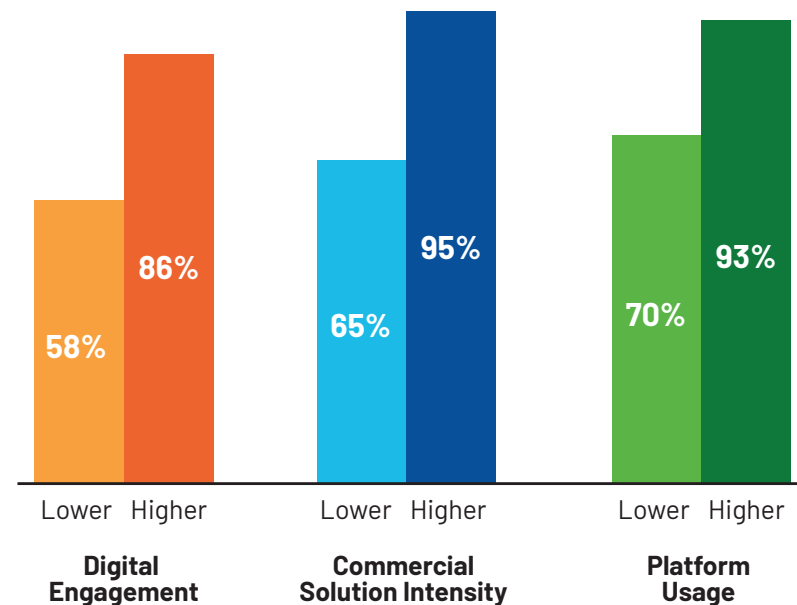
Schedule performance, profitability and labor productivity are the most positively impacted by these factors, suggesting that all general contractors can expect improvements in them from deeper involvement with technology.

DEGREE OF VALUE FROM TECHNOLOGY

Contractors were asked to rate the degree to which their company is optimizing the full potential value of its technology stack for data collection and analysis. The chart below clearly shows that, like the findings for improvements, higher digital engagement, commercial solution intensity and platform usage have a direct positive impact. See pages 15, 17 and 20 for more detail on value optimization.

Percentage Reporting Moderate, High or Very High Value From Their Technology Stack

By Digital Engagement, Commercial Solution Intensity and Platform Usage



Summary of Key Findings

Data Integration Challenges, Impacts and Solutions

MOST GENERAL CONTRACTORS FACE DATA INTEGRATION CHALLENGES

76% of general contractors report experiencing data integration challenges. The three most frequent are:

- Data migration (i.e., moving data from one solution to another)
- Difficulty exchanging data effectively with other team members' solutions
- Difficulty integrating the solutions in our technology stack

POOR DATA INTEGRATION GENERATES NEGATIVE IMPACTS

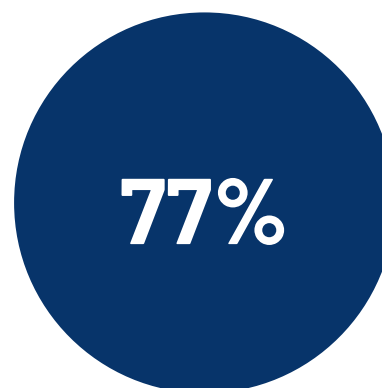
The table below shows the most frequently reported negative impacts of poor data integration during construction and on final project outcomes.

Top Negative Impacts During Construction	Top Negative Impacts on Project Outcomes
Accurate reporting/analytics	General contractor's profitability
Budget control	Slippage of final delivery date
Effective coordination with other project team members	Exceeding original construction budget
Cost predictability	Poor quality of turnover documentation

CONSOLIDATION AND IMPROVED INTEGRATIONS WOULD MOST EFFECTIVELY IMPROVE THE VALUE OF TECHNOLOGY

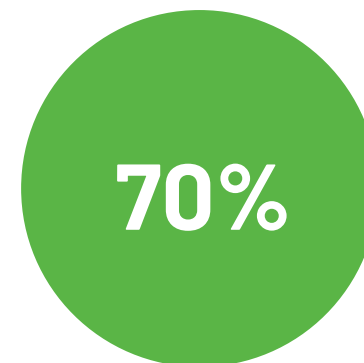
General contractors were asked to identify what strategies they believe would be most effective at improving the value of their technology stack over the next three years.

Underscoring the critical importance of data integration, the chart below shows the two most frequently selected strategies, each of which would help companies to addresses their data integration challenges.



CONSOLIDATE

Consolidate functionality into more comprehensive solutions that reduce the number of point solutions.



INTEGRATE

Invest in improved integrations between our existing solutions.

Summary of Key Findings

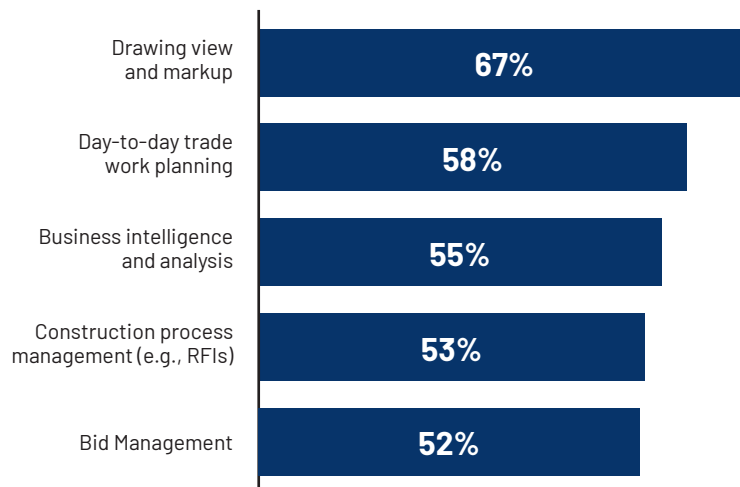
Increasing Technology Adoption and Value

INCREASING ADOPTION AND VALUE

General contractors identify several key factors that would encourage more adoption and improve technology value.

ELIMINATING REDUNDANT TECHNOLOGY SOLUTIONS

Using multiple technology solutions for similar functions creates numerous inefficiencies. Over half of general contractors report using redundant solutions for the five processes shown below.



GREATER ORGANIZATIONAL SUPPORT AND COMMITMENT

General contractors also cite internal needs for:

- More qualified technology users in their companies
- Improved training resources to support effective usage
- Improved internal processes for technology implementation

BEST PRACTICES FOR TECHNOLOGY OPTIMIZATION

The companies already optimizing their technology stack were asked to identify the factors and practices that most effectively contribute to their success. The table below shows the top response in three categories.

Success Factors for Technology Optimization

TOP ORGANIZATIONAL FACTOR

- We have senior management buy-in on the strategic importance of technology.

TOP TECHNOLOGY MANAGEMENT PRACTICE

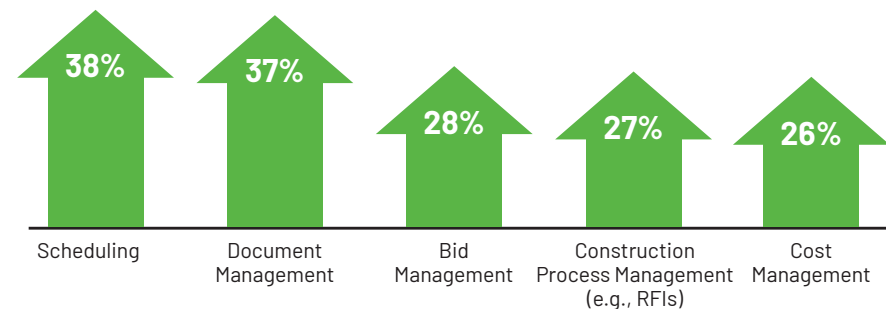
- We have a well-developed process for adopting, piloting and implementing construction technology.

TOP EXTERNAL FACTOR

- We receive good vendor support.

TOP FIVE PROCESSES TARGETED FOR TECHNOLOGY ADOPTION

The chart below shows the percentage of companies not currently automating each process that say they are actively planning to adopt technology for it in the next three years.



Overview of Current Technology Use and Value for Project and Construction Management

INTRODUCTION

Every general contractor is on a unique digital journey, influenced by its market environment, internal needs and technology capabilities. And it is difficult for any one company to know how its progress compares with other similar organizations.

INDUSTRY BASELINE METRICS

To allow general contractors to evaluate how they compare with their peers, this section of the report provides an overview of the four technology-related metrics, shown at right, across all respondents.

Because they are based on the total responses from all 203 companies surveyed, they are a statistically valid set of benchmarks representing all general contractors in the US market.

DETAILS ON HOW VARIATIONS IN THESE METRICS INFLUENCE TECHNOLOGY BENEFITS AND VALUE

The section of the report following this one examines how variances in the second and third metrics (digital engagement and technology type) influence the fourth one (value of technology).

1

Digital Maturity of the 11 Processes Studied

By determining the percentage of general contractors currently using a technology solution to conduct each process, this analysis establishes three categories of digital maturity for processes:

- **Established Processes**—More than 75% use technology
- **Maturing Processes**—50% to 75% use technology
- **Emerging Processes**—Less than 50% use technology

2

General Contractors' Digital Engagement Level

By determining how many of the 11 processes each company uses technology to conduct, this analysis creates a spectrum of digital engagement for general contractors.

3

Types of Technology Solution Being Used

By determining which of four types of technology each company primarily uses for each process, this analysis baselines the current overall usage for each type.

4

Value of Technology

This analysis includes two separate but complementary aspects of value.

- **Improvements Generated by Technology**—The percentage of companies reporting each of seven process or outcome improvements resulting from the use of their current technology stack.
- **Level of Value From Current Technology Stack**—The degree that each company believes it is taking advantage of the full potential capabilities of its current technology stack to collect and analyze project data.

Overview of Current Technology Use and Value

Percentage Using a Technology Solution for Each of the 11 Processes Studied

PROCESSES VARY IN RELATIVE LEVEL OF DIGITAL MATURITY AMONG GENERAL CONTRACTORS

The chart shows the percentage of companies using technology for each process, color-coded by the type of process. In this study, that usage percentage is referred to as the digital maturity of each process. The chart organizes the 11 processes into three categories of digital maturity.

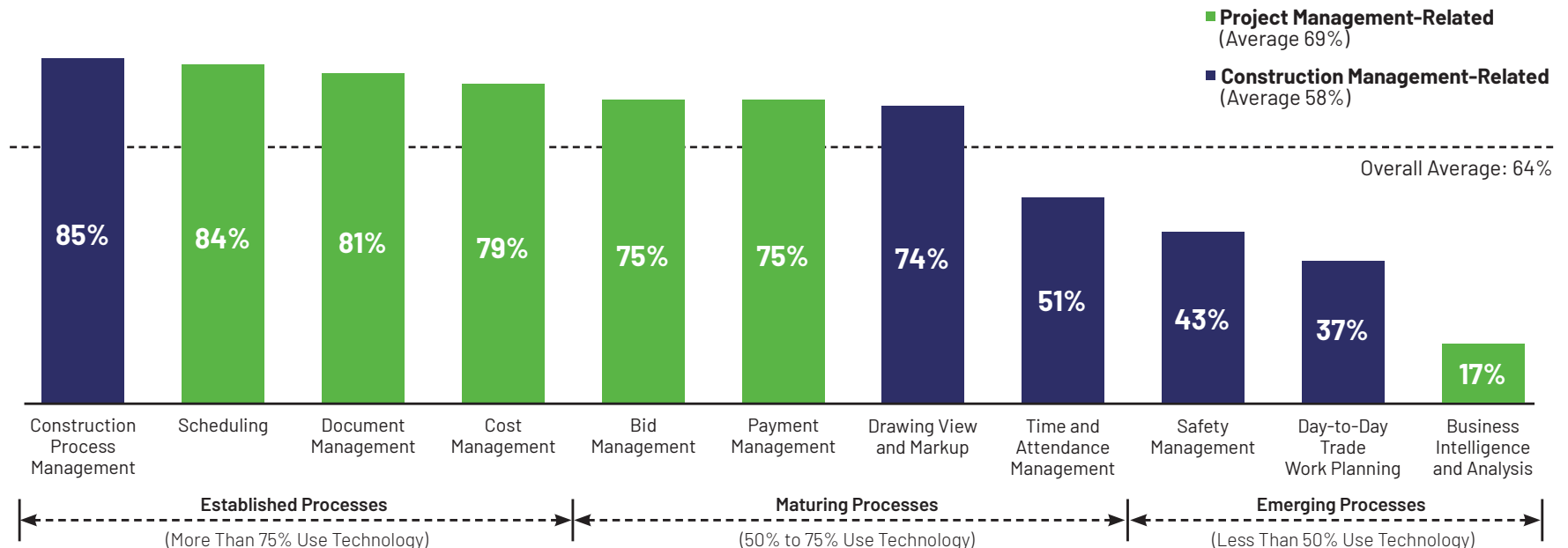
- Four of the processes are considered established because over 75% of general contractors use technology to conduct them. Another four are designated as maturing (50–75% of GCs) with three still emerging (less than 50%).

TECHNOLOGY USE VARIES BY PROCESS TYPE AND COMPANY SIZE

- While an average of 64% are using technology across all 11 processes, the six project management-related ones average 69% compared with just 58% for the five construction management-related ones.
- Larger companies (over \$50M annual revenue) average 71% technology usage across all 11 processes versus only 56% for smaller ones (\$50M or less).

The final section of this report (starting on page 27) addresses challenges to and plans for further adoption of technology for these processes.

Percentage of General Contractors Currently Using a Technology Solution to Conduct Each Process, by Type



Overview of Current Technology Use and Value

General Contractors' Current Level of Digital Engagement

COMPANIES VARY WIDELY IN THE NUMBER OF PROCESSES THEY CONDUCT WITH TECHNOLOGY

As shown on the previous page, the 11 processes studied vary greatly in the percentage of general contractors that have adopted technology to conduct each of them (from 17% to 85%).

Similarly, there is a wide variance among general contractors in the number of processes that each company currently conducts with a technology solution. In this study, that number of automated processes is referred to as a general contractor's level of digital engagement.

DIGITAL ENGAGEMENT VARIES SIGNIFICANTLY

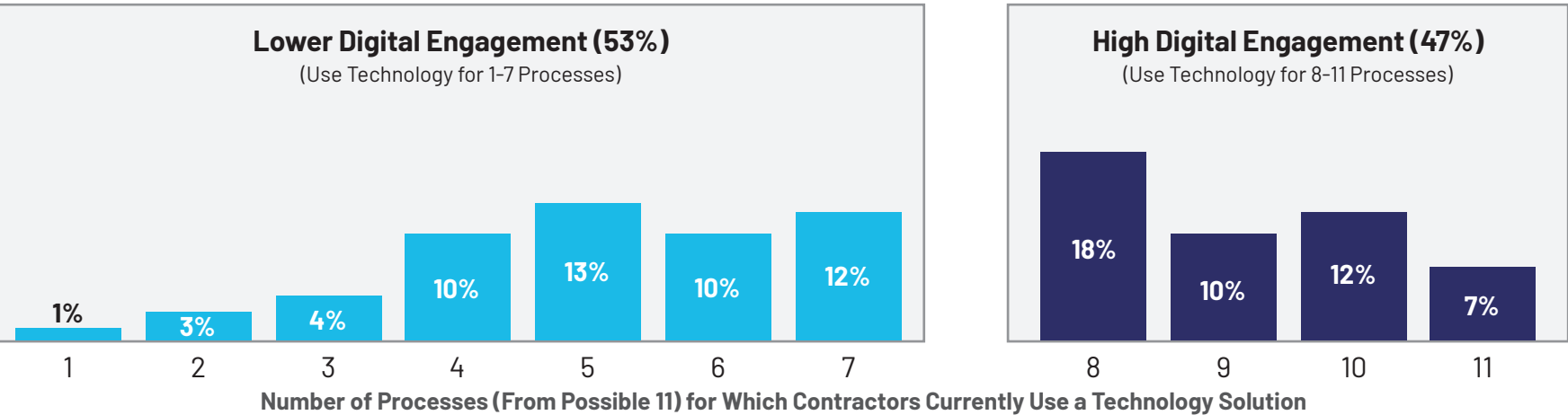
The chart below shows the range of how many processes general contractors currently use technology to conduct. For analysis purposes in this report, the full range is divided into two broad categories of digital engagement.

- **High Digital Engagement:** Use technology for 8–11 processes
- **Lower Digital Engagement:** Use technology for 1–7 processes

Pages 14 and 15 show the direct relationship between a general contractor's level of digital engagement and the degree of value they experience from technology.

Percentage of General Contractors at Each Level of Digital Engagement

Based on the Number of Processes (From a Total of 11 Studied) for Which They Currently Use a Technology Solution



Overview of Current Technology Use and Value

Types of Technology Currently Used for Project and Construction Management

GENERAL CONTRACTORS MOST FREQUENTLY USE COMMERCIAL TECHNOLOGY SOLUTIONS

Respondents were asked to identify which type of technology solution their company currently deploys (from the four shown in the chart at right) for each process they are automating.

IMPACT OF COMPANY SIZE ON TECHNOLOGY TYPE

The chart compares the average of responses of larger (\$50M or more) and smaller (less than \$50M) companies.

- Commercial solutions dominate across all companies.
- Within that category, the larger companies more frequently use platforms that provide multiple pre-integrated functions and built-in external integration capabilities instead of point solutions.
- By contrast, the largest proportion (34%) of the smaller companies reports using a customized generic solution. While these are frequently entrenched in company workflows, their value is limited since data integration is likely to be difficult.
- Few in either group rely on internally developed software.

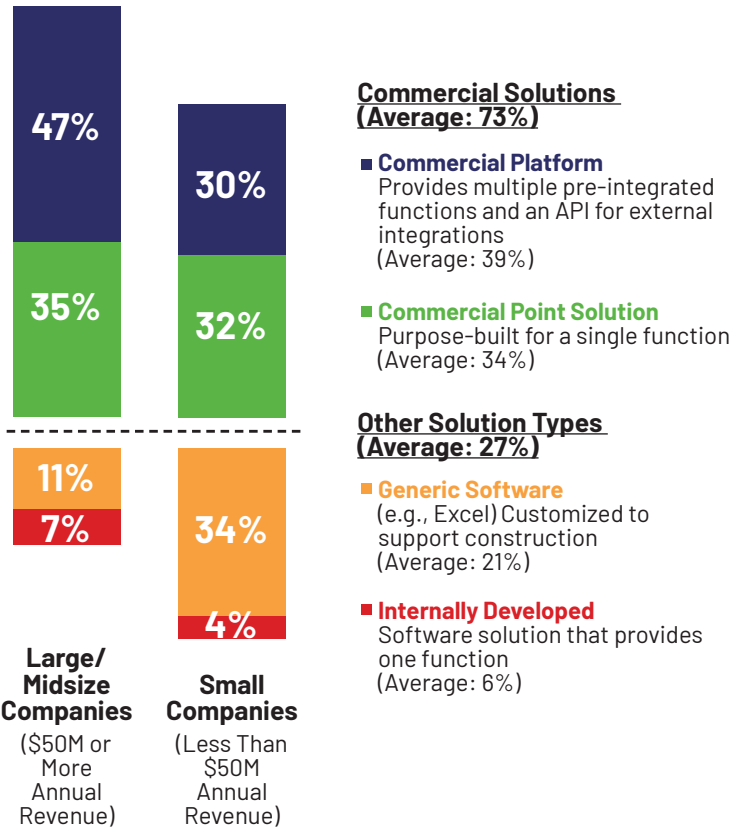
IMPACT OF SOLUTION TYPE ON THE VALUE OF TECHNOLOGY

Later sections of this report include findings on:

- The greater value reported by general contractors who use commercial solutions for 8-11 processes (see pages 16 and 17).
- Within the commercial solutions category, the enhanced benefits of platform solutions (see pages 19 and 20).
- Challenges companies face related to their technology solutions (see pages 23, 28 and 30).
- How general contractors' plans to improve data integrations will impact their decisions about technology solutions (starting on page 22).

Type of Technology Used by General Contractors

Average Across the 11 Processes, by Company Size



Overview of Current Technology Use and Value

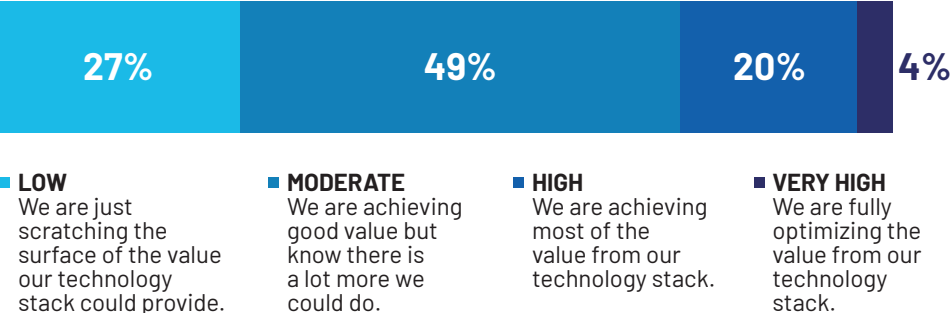
Value Experienced by General Contractors From Their Use of Technology

GENERAL CONTRACTORS CITE IMPORTANT IMPROVEMENTS BECAUSE OF TECHNOLOGY USE

From the seven shown in the chart at right, respondents selected the top three improvements that their company experiences because of technology use.

- Each of the seven earned some top-three designations, suggesting that technology is generating a wide variety of benefits.
- Improved schedule, cost, data collection and profitability appear in one third to one half of general contractors' lists of top three benefits from technology.

Degree That Companies Are Optimizing Their Current Technology Stack for Data Gathering and Analysis



MOST COMPANIES BELIEVE MORE VALUE CAN BE ACHIEVED FROM THEIR TECHNOLOGY STACK

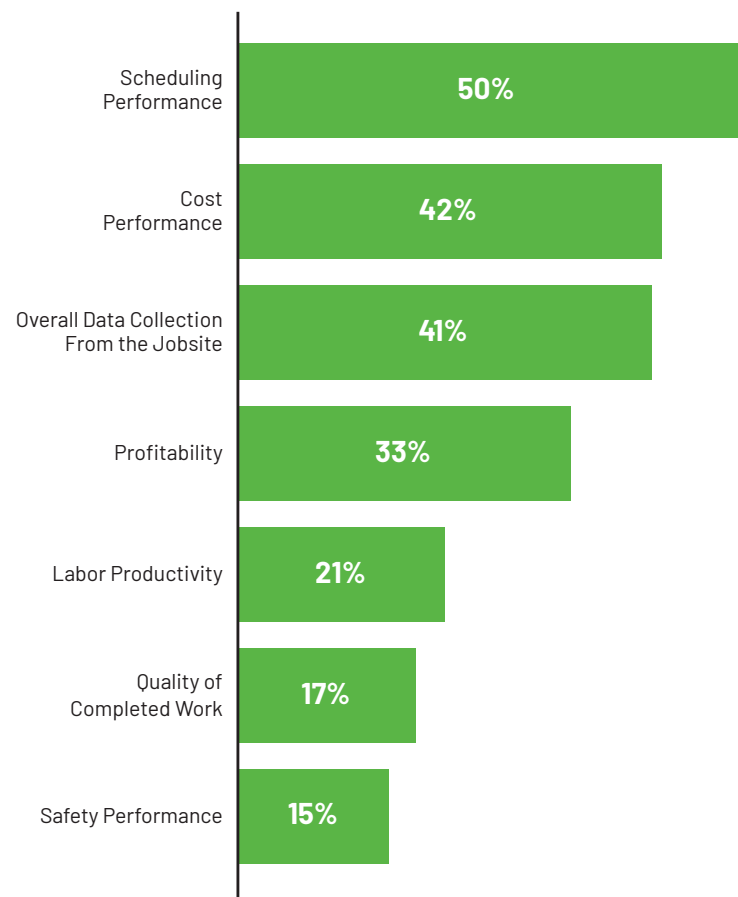
The chart at bottom left shows the degree to which general contractors believe they are currently receiving the full potential value from their technology stack for data gathering and analysis. With only 4% at a very high level, nearly every general contractor can greatly improve the value generated by its technology.

WAYS TO INCREASE IMPROVEMENTS AND ENHANCE VALUE

The next section of this report shows the influence of several factors on both improvements and value.

Percentage Citing Each Improvement as One of Their Company's Top Three

Selected as One of the Top Three Most Important Improvements From the Seven Shown



Improving the Value of Technology for Project and Construction Management

INTRODUCTION

This section of the report shares findings on how contractors can generate greater value from their technology stack.

THE VALUE OF USING TECHNOLOGY FOR MORE PROCESSES

The previous section of this report establishes the range of general contractors' digital engagement. This section examines the greater benefits accruing to those with a high level of digital engagement.

THE VALUE OF USING COMMERCIAL SOLUTIONS MORE FREQUENTLY

This section also examines the positive impact of greater use of commercial solutions versus generic or internally developed ones.

THE VALUE OF USING PLATFORM SOLUTIONS MORE FREQUENTLY

Among the general contractors using commercial solutions, the data shows even greater benefits reported by companies that more frequently use multifunctional platforms instead of single-purpose point solutions.

THE TOP FACTORS THAT CONTRIBUTE TO OPTIMIZING TECHNOLOGY VALUE

The general contractors who report that their organization is fully optimizing the value of its technology stack share the factors they believe most effectively contribute to that level of success.



Improving the Value of Technology

Impact of Digital Engagement on Improvements From Technology

GENERAL CONTRACTORS WITH A HIGH LEVEL OF DIGITAL ENGAGEMENT REPORT MORE IMPROVEMENTS FROM THEIR USE OF TECHNOLOGY

From the seven improvements shown in the chart at right, general contractors were asked to select the top three that they most frequently experience due to their use of technology.

POSITIVE IMPACT OF HIGHER DIGITAL ENGAGEMENT

The chart compares findings between companies at two levels of digital engagement.

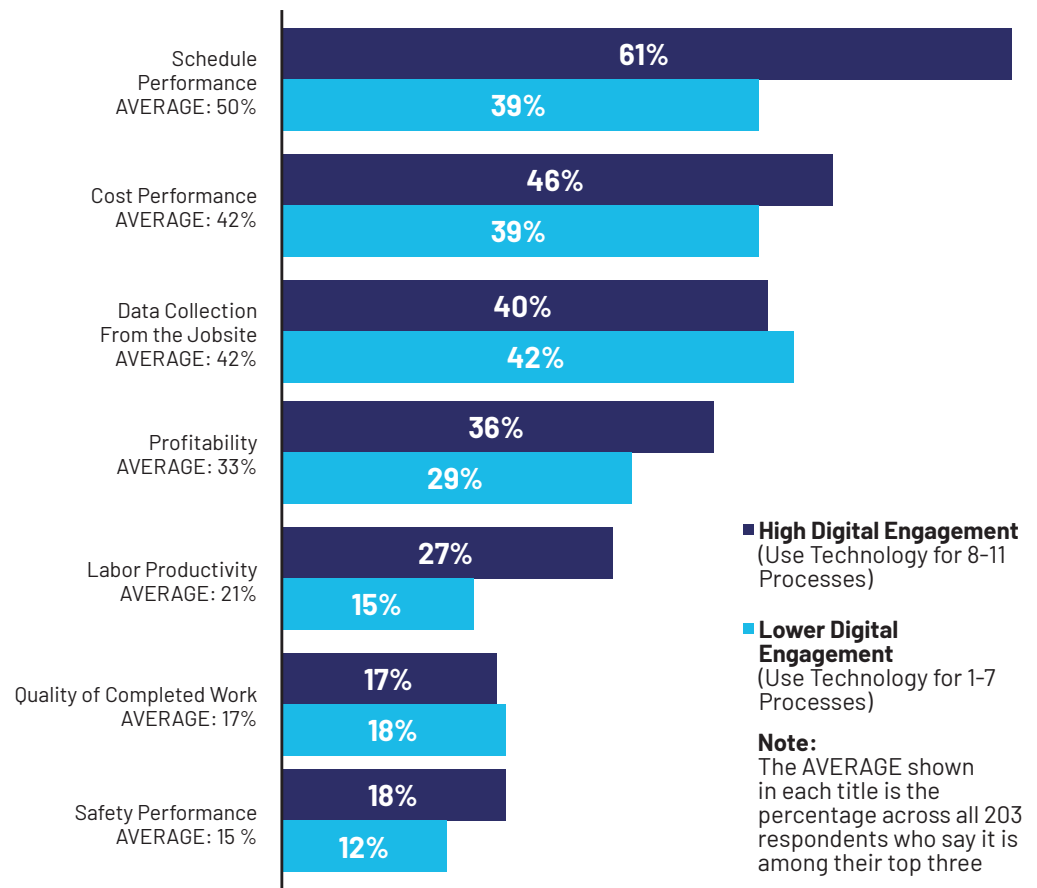
In most cases, more companies with high digital engagement report receiving these improvements.

- Schedule performance shows the biggest differential (22 percentage points).
- The key metrics of cost performance, profitability and productivity also each show notable differentials.
- Two improvements (quality and collection of jobsite data) show negligible differences, suggesting that even moderate technology use can have a positive effect.

The dramatic impact on schedule is particularly meaningful because many previous research studies by Dodge show schedule compliance to be a widespread and complex challenge that can be difficult to improve.

General Contractors' Top Three Improvements Due to Technology, by Level of Digital Engagement

Percentage Selecting Each Improvement as One of Their Top Three (Among the Seven Shown)



Improving the Value of Technology

Impact of Digital Engagement on Experience of Value From Technology

GENERAL CONTRACTORS WITH A HIGH LEVEL OF DIGITAL ENGAGEMENT BELIEVE THEY ARE RECEIVING MORE VALUE FROM THEIR TECHNOLOGY STACK

Technology can provide enormous value, but most users acknowledge they are not yet optimizing the full potential of the solutions they use.

General contractors were asked to rate the degree to which they believe their organization is optimizing the value of their current project and construction management technology stack to collect and analyze project data.

POSITIVE IMPACT OF HIGHER DIGITAL ENGAGEMENT

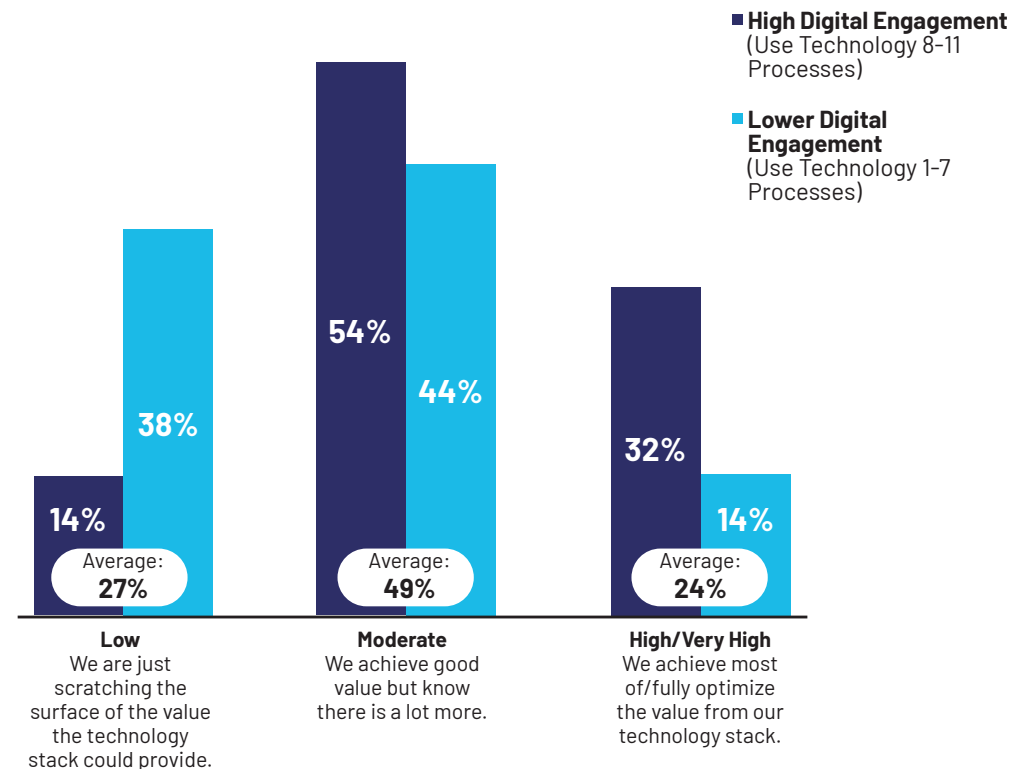
The chart shows both the averages and the variations by digital engagement for increasing degrees of value.

- Less than one quarter (24%) report high or very high degrees of value, clearly demonstrating that general contractors have much more value available from their current technology.
- The positive impact of greater digital engagement is strikingly apparent with 86% of the highly engaged companies reporting moderate or better value versus just 58% of lesser engaged companies.
- Further reinforcing this point, only 14% of highly engaged companies report low value compared with 38% of lesser engaged contractors.

The findings on this and the previous page establish a compelling argument for the value of increasing digital engagement. The following pages in this section provide a similar analysis of the positive impact of commercial solutions, particularly platforms.

Impact of Digital Engagement on Value of Technology Stack to Collect and Analyze Data

Percentage at Each Level of Digital Engagement



Improving the Value of Technology

Value of Using More Commercial Solutions

THE USE OF COMMERCIAL SOLUTIONS IS WIDESPREAD BUT NOT CONSISTENT

Although commercial solutions are used more frequently than generic or internal ones (see page 4), companies vary widely in the number of processes for which they use one. As the chart at bottom left indicates, only 28% are at a high intensity of commercial solution usage (i.e., use one for eight or more of the 11 processes studied).

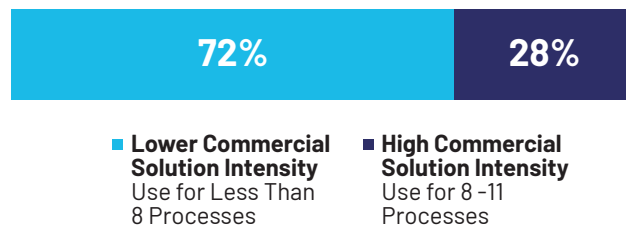
BENEFITS OF HIGH COMMERCIAL SOLUTION INTENSITY

The chart at right compares the percentage of those high intensity companies that report each improvement with other, lower intensity companies.

- High intensity ones outperform the others in every category.
- The difference is particularly evident in improved schedule performance, profitability and productivity.

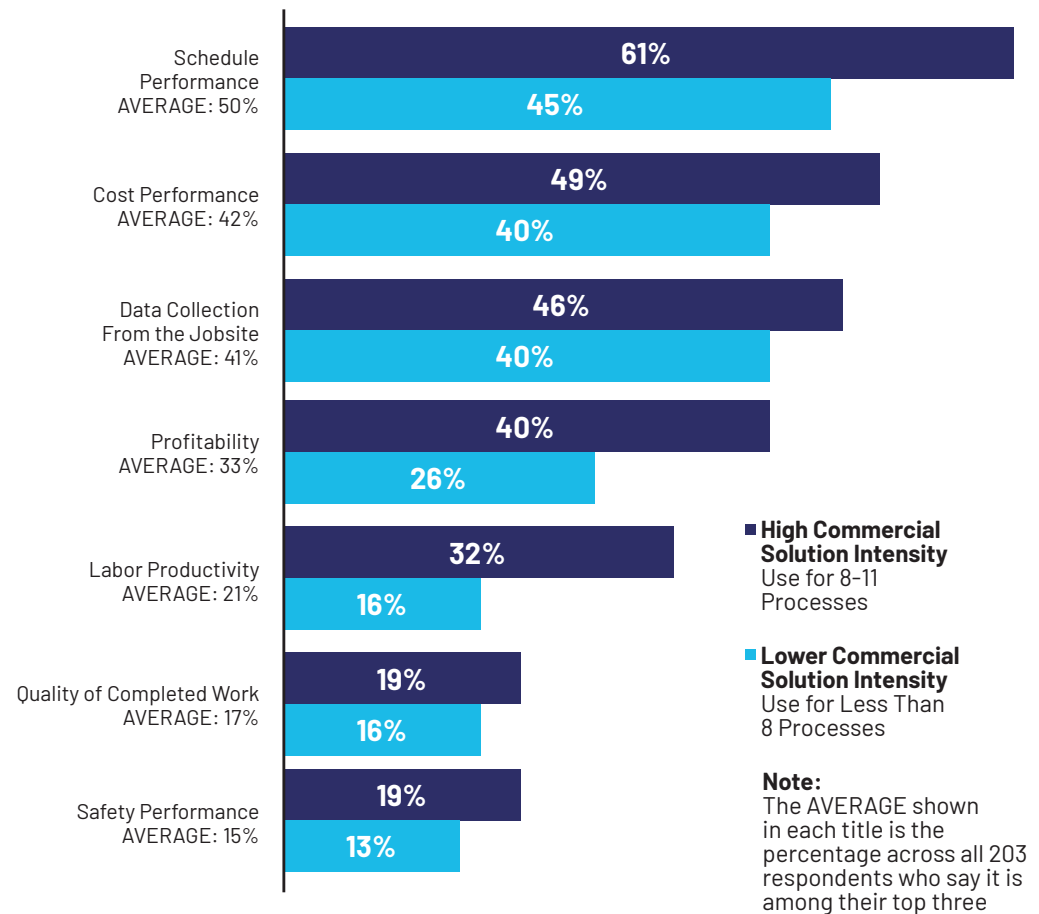
Intensity of Commercial Solution Usage

Percentage of Companies at Each of Two Intensity Levels



Percentage Reporting Each as a Top Improvement From Their Use of Technology, by Level of Commercial Solution Intensity

Percentage Selecting Each as One of Their Top Three (Among the Seven Shown)



Improving the Value of Technology

Impact on Value of Using More Commercial Solutions

GENERAL CONTRACTORS USING MORE COMMERCIAL SOLUTIONS BELIEVE THEY ARE GETTING GREATER VALUE FROM TECHNOLOGY

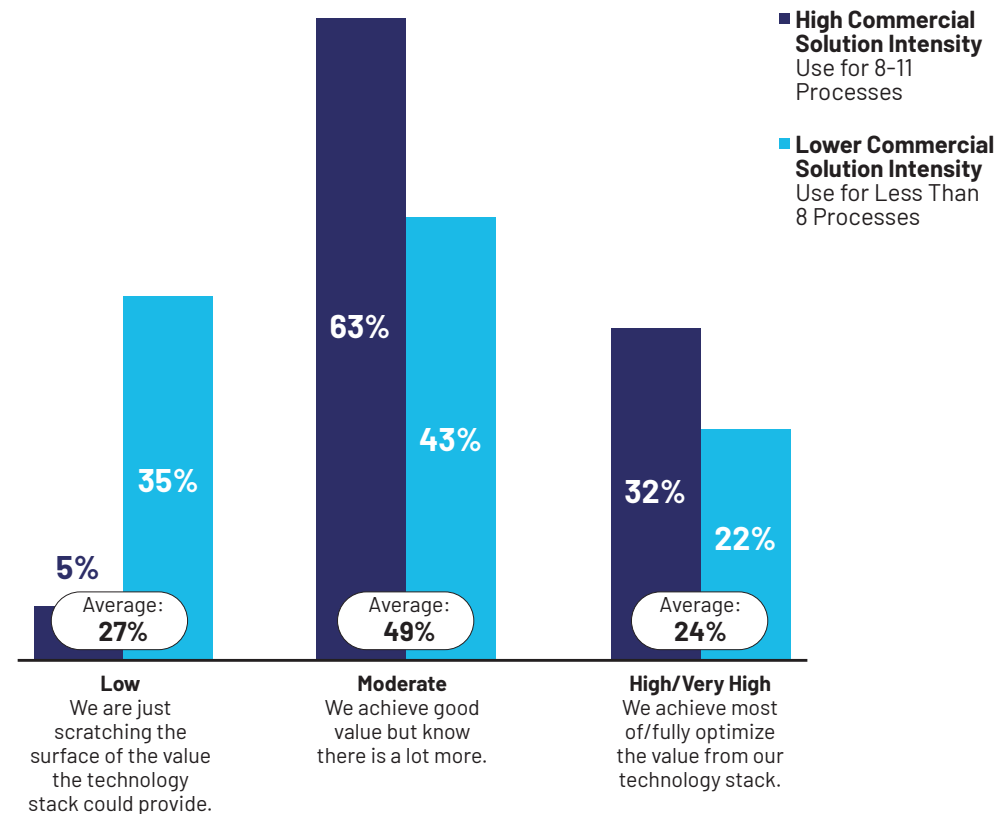
As shown at right, frequent use of commercial solutions has an even greater positive impact on value than high digital engagement.

- Nearly all (95%) general contractors with high commercial solution intensity report good value (i.e., moderate or better). This significantly exceeds the 65% average for those with lower commercial solution intensity.
- Also, the 5% of high commercial intensity companies reporting low value compares very favorably with the 35% that have low commercial intensity.

This finding, combined with those on the previous pages about digital engagement strongly suggest that general contractors will benefit from applying technology to more project and construction management processes and using commercial solutions to do so.

Impact of Commercial Solution Intensity on Value of Technology Stack to Collect and Analyze Data

Percentage at Each Level of Commercial Solution Intensity



Improving the Value of Technology

Value of Using Platform Solutions

AMONG COMMERCIAL SOLUTION USERS, MULTI-FUNCTIONAL PLATFORMS DOMINATE FOR EIGHT OF THE 11 PROCESSES STUDIED

The category of commercial solutions includes both point solutions and platform solutions (see page 4). The chart below shows the share using each type within the total percentage who report that their company uses a commercial solution for each process.

- The widespread use of traditional CPM point solutions for scheduling probably accounts for their unusually high share of that category.

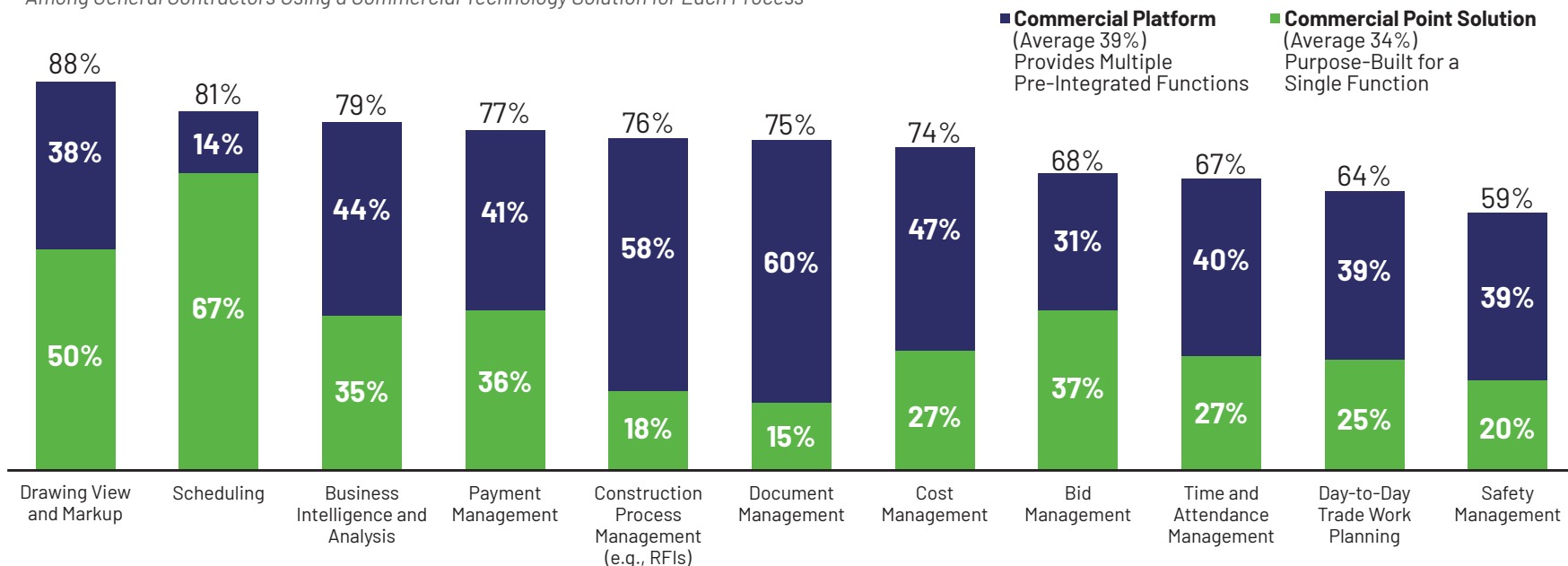
- The rapid growth in platform solutions offering both document and process management as core functionalities likely correlates to their notably strong position in those two processes.

VALUE OF PLATFORM USE

Platform solutions enable more effective data integration, an important topic that is addressed in greater detail later in this report (see pages 22-26). The following pages show that frequent platform users report both a higher degree of improvements and greater value.

Percentage Using Platform Solutions and Point Solutions, by Process

Among General Contractors Using a Commercial Technology Solution for Each Process



Improving the Value of Technology

Value of Using Platform Solutions

GENERAL CONTRACTORS WITH A HIGHER FREQUENCY OF PLATFORM USAGE REPORT MORE IMPROVEMENTS FROM THEIR TECHNOLOGY STACK

As shown in the chart at bottom, only 15% of companies are high frequency platform users (i.e., currently use a platform solution for eight or more processes).

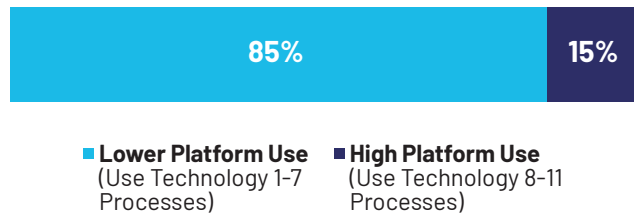
POSITIVE IMPACT OF MORE FREQUENT PLATFORM USAGE

The chart at right compares the improvement findings from the high frequency platform users with those from companies using a platform less frequently.

- In every case, more contractors with high platform use report receiving these improvements.
- Profitability and data collection from the jobsite show the greatest differentials (18 and 16 percentage points respectively).

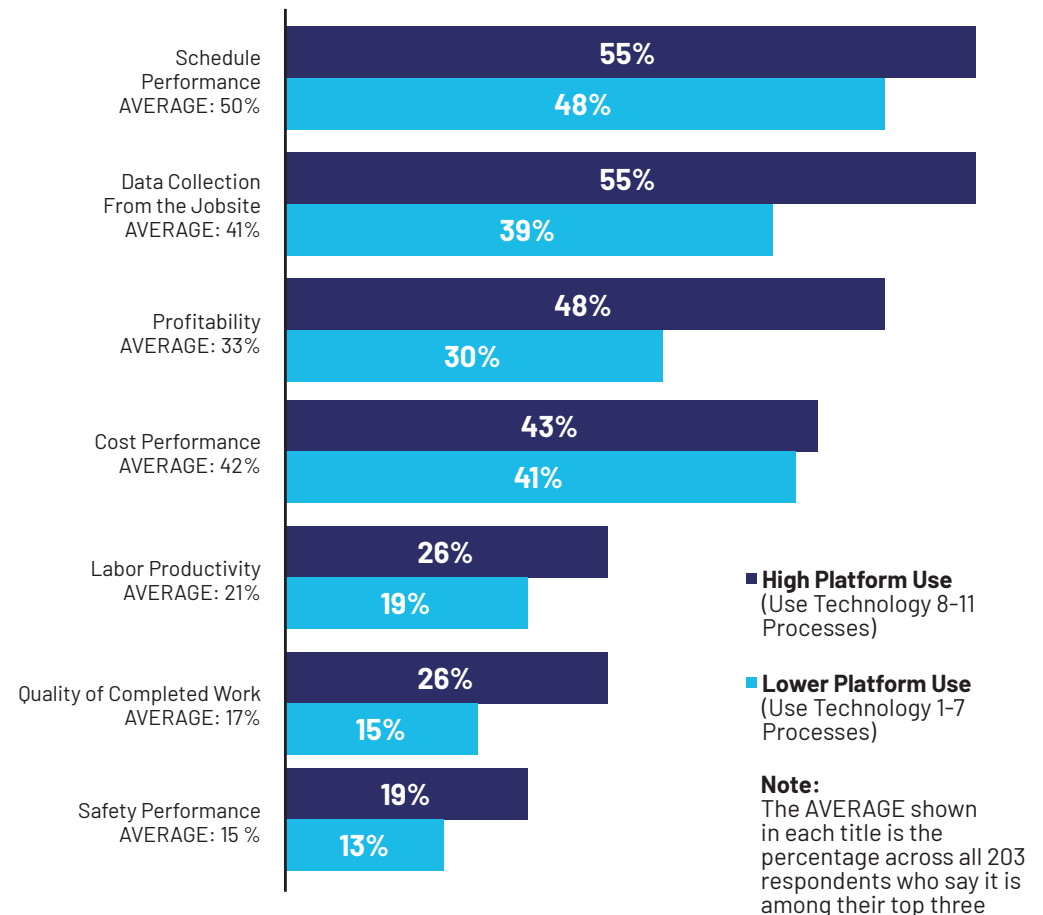
Frequency of Platform Usage

Percentage of Companies at Each of Two Frequency Levels



Percentage Reporting Each as a Top Improvement From Their Use of Technology, by Extent of Platform Solution Usage

Percentage Selecting Each as One of Their Top Three (Among the Seven Shown)



Improving the Value of Technology

Value of Using Platform Solutions

GENERAL CONTRACTORS WHO MORE FREQUENTLY USE PLATFORM SOLUTIONS BELIEVE THEY ARE RECEIVING MORE VALUE FROM THEIR TECHNOLOGY STACK

As with their experience of improvements, the value findings also show better outcomes among the frequent platform users.

GREATER VALUE FROM PLATFORM USAGE

The chart shows the overall averages at each degree of value and the variance between contractors using a platform for seven or more processes and all other commercial solution users.

While the moderate value category is nearly equal, the huge differentials in the low and high/very high degrees of value dramatically underscore the benefits of greater platform usage.

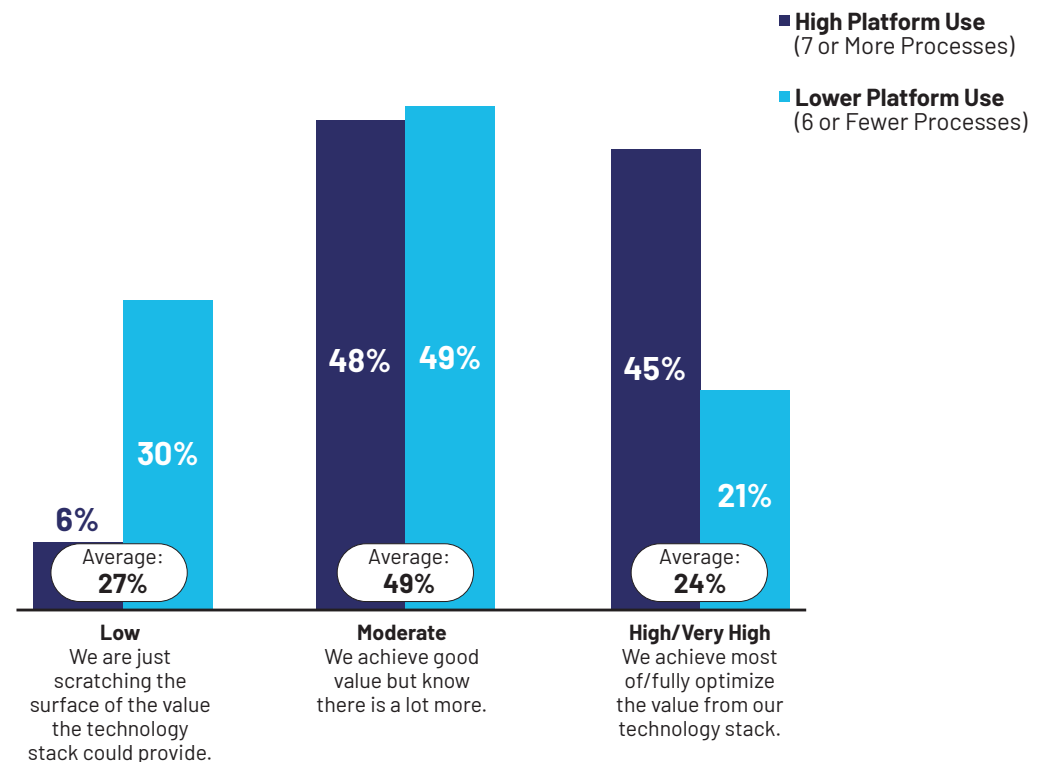
EVIDENCE FOR INCREASING CONTRACTORS' DIGITAL ENGAGEMENT AND USE OF COMMERCIAL (ESPECIALLY PLATFORM) SOLUTIONS

The findings throughout this section of the report clearly show the advantages of increasing digital engagement and of focusing technology adoption on commercial solutions, especially platforms.

Pages 22-26 of this report address data integration, which is one of the most valuable inherent capabilities of platform solutions.

Impact of Platform Usage on Value of Technology Stack to Collect and Analyze Data

Percentage at Each Level of Commercial Platform Solution Usage



Improving the Value of Technology

Top Factors That Contribute to Optimizing Technology Value

OPTIMIZATION ROADMAP

Regardless of where each company is on its digital journey, everyone can always gain insights from others who have faced challenges and achieved success.

FACTORS AND PRACTICES THAT CONTRIBUTE TO OPTIMIZING TECHNOLOGY VALUE

The respondents who report their companies are already fully optimizing their technology stack for data gathering and analysis (see page 12) were asked to identify the factors and practices that are most effectively contributing to their success.

The table at right shows the top three most frequently cited in each of three categories.

FOSTERING A SUCCESSFUL DIGITAL CULTURE

The lack of one or more of these nine factors is frequently identified in other Dodge technology studies as a significant obstacle to advancing technology use at design, construction and owner organizations. This list can serve as a roadmap for all companies as they strive to create an environment that fosters productive technology use and optimizes its available benefits.

TOP THREE ORGANIZATIONAL FACTORS

- 1 We have senior management buy-in on the strategic importance of technology.
- 2 We have an adequate budget for construction technology.
- 3 We have dedicated IT resources focused on optimizing technology for our company.

TOP THREE TECHNOLOGY MANAGEMENT PRACTICES

- 1 We have a well-developed process for adopting, piloting and implementing construction technology.
- 2 We invest in adequate training.
- 3 We make the technology part of standardized company processes.

TOP THREE EXTERNAL FACTORS

- 1 We receive good vendor support.
- 2 Other companies on our project teams have high levels of technology capability.
- 3 We actively engage with industry associations re: technology practices.

The Importance of Data Integration for Project and Construction Management

INTRODUCTION

The previous section of this report establishes the advantages of using commercial platform solutions for project and construction management processes. Two important advantages of platform solutions are:

- Multiple pre-integrated functionalities that have been purpose-built for use in construction.
- APIs(application user interfaces) that facilitate data exchange with other technology solutions.

This section of the report takes a closer look at why these aspects of platform solutions are particularly important for project and construction management.

THE CHALLENGES OF EFFECTIVE DATA INTEGRATION

Most general contractors experience data integration challenges. This part of the section identifies the most frequent ones.

THE NEGATIVE IMPACTS OF POOR DATA INTEGRATION

Poor data integration creates negative impacts during construction and also negatively affects project outcomes. This part of the section identifies the most frequent problems in both categories.

THE BEST STRATEGIES GOING FORWARD

This part of the section reveals that the two top strategies general contractors believe would most improve the value of their technology both directly relate to improving data integration.



Importance of Data Integration

Data Integration Challenges Faced by Contractors

MOST GENERAL CONTRACTORS FACE DATA INTEGRATION CHALLENGES

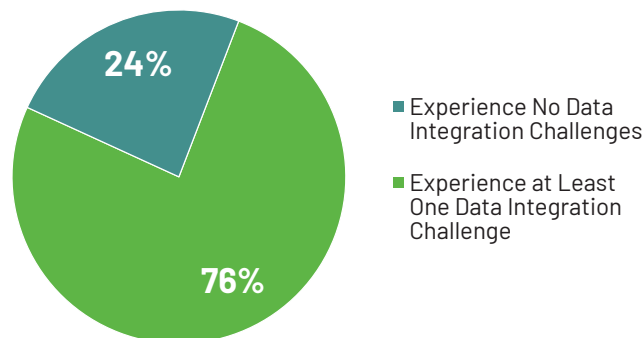
General contractors were asked to identify the challenges their companies face when they are trying to expand the use and value of technology for project and construction management.

- The list at right shows the top five data integration challenges reported by general contractors.
- As shown in the chart below, only 24% do not experience any of these data integration challenges. Among the other 76%, many report facing multiple ones, highlighting this is a widespread problem.

The following pages explore the negative impacts on construction projects due to poor data integration.

Percentage of General Contractors Who Experience Data Integration Challenges

Among the Five Challenges in the List at Right



Top Five Data Integration Challenges Reported by General Contractors

- 1 Data migration challenges**
(i.e., moving data from one solution to another)
- 2 Difficulty integrating the solutions in our technology stack**
- 3 Difficulty exchanging data effectively with other team members' solutions**
- 4 Poor integration with other software used at my company**
(e.g., financial, CRM, ERP, etc.)
- 5 Lack of internal ability to develop integrations between solutions**

Importance of Data Integration

Negative Impacts During Construction From Data Integration Problems

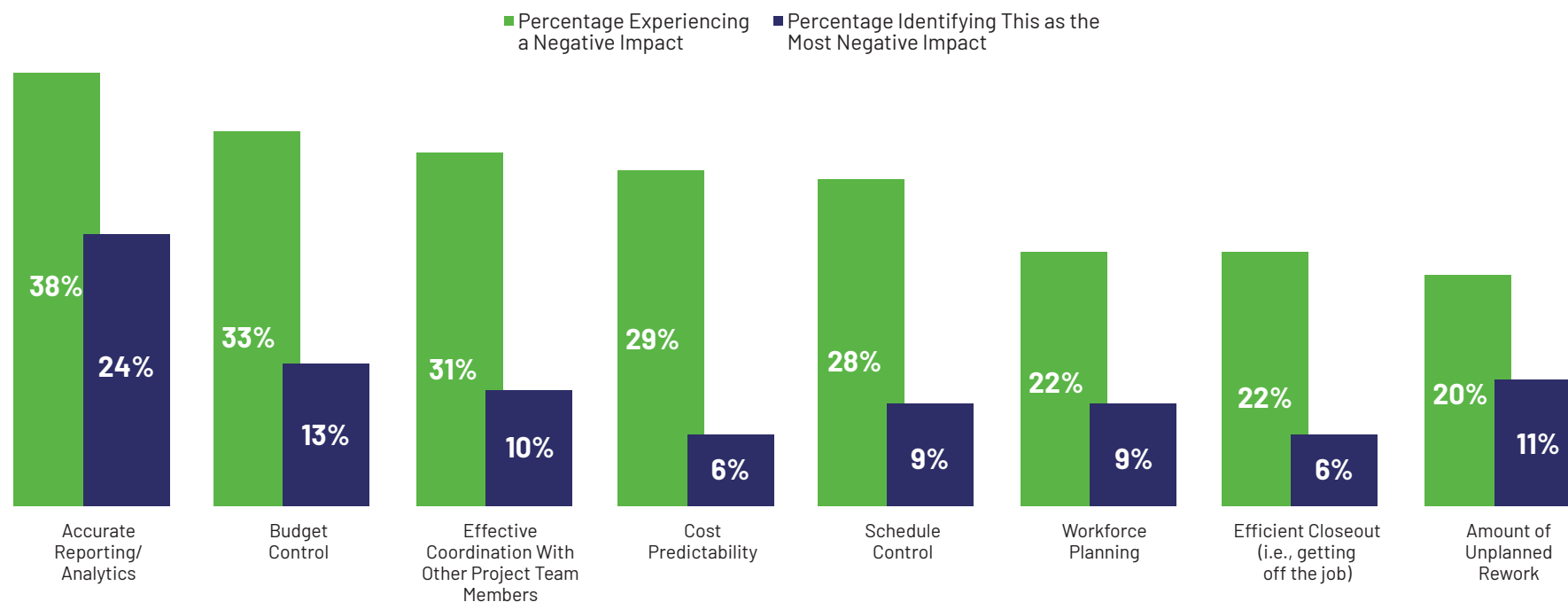
POOR DATA INTEGRATION HAS NUMEROUS NEGATIVE EFFECTS DURING CONSTRUCTION

From a list of 15 metrics, general contractors selected all those that have been negatively impacted during construction by poor data integration. Any contractor selecting more than one was asked to identify which among those has had the most severe negative impact. The chart shows these two findings for the eight most frequently selected metrics.

- 66% of general contractors report a negative impact on at least one of these processes, and no fewer than 20% report it on each one. This shows the breadth of problems caused by poor data integration.
- Interestingly, frequency does not always align with severity. As shown below, the most frequent (accurate reporting/analytics) and the least frequent (amount of unplanned rework) are each cited as the most negative by over half of those who experience them, notably more than the others.

Project Activities Negatively Impacted During Construction by Poor Data Integration

Showing Both the Percentage Experiencing Each Negative Impact and the Percentage Identifying It as the Most Negative



Importance of Data Integration

Negative Impacts on Project Outcomes Because of Poor Data Integration

POOR DATA INTEGRATION NEGATIVELY IMPACTS SIX KEY PROJECT OUTCOMES

The negative effects during construction of poor data integration shown on the previous page frequently extend to impacting overall project performance.

85% EXPERIENCE AT LEAST ONE NEGATIVE OUTCOME

As shown below only 15% of respondents escape any negative impact on outcomes from poor data integration.

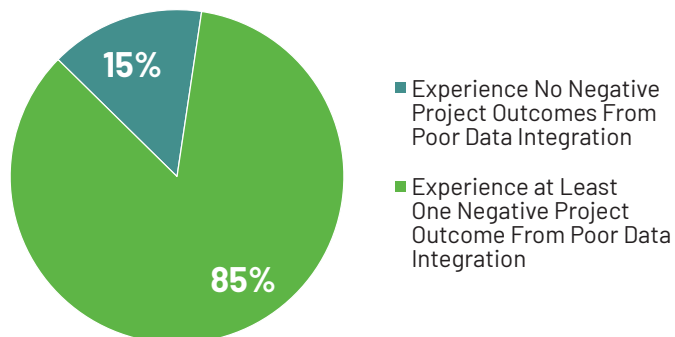
PROFITABILITY IS MOST FREQUENT AND MOST NEGATIVE

As shown at right, over one quarter experience negative impacts on four of the six outcomes studied. And those four garner 93% of the votes for the most negative.

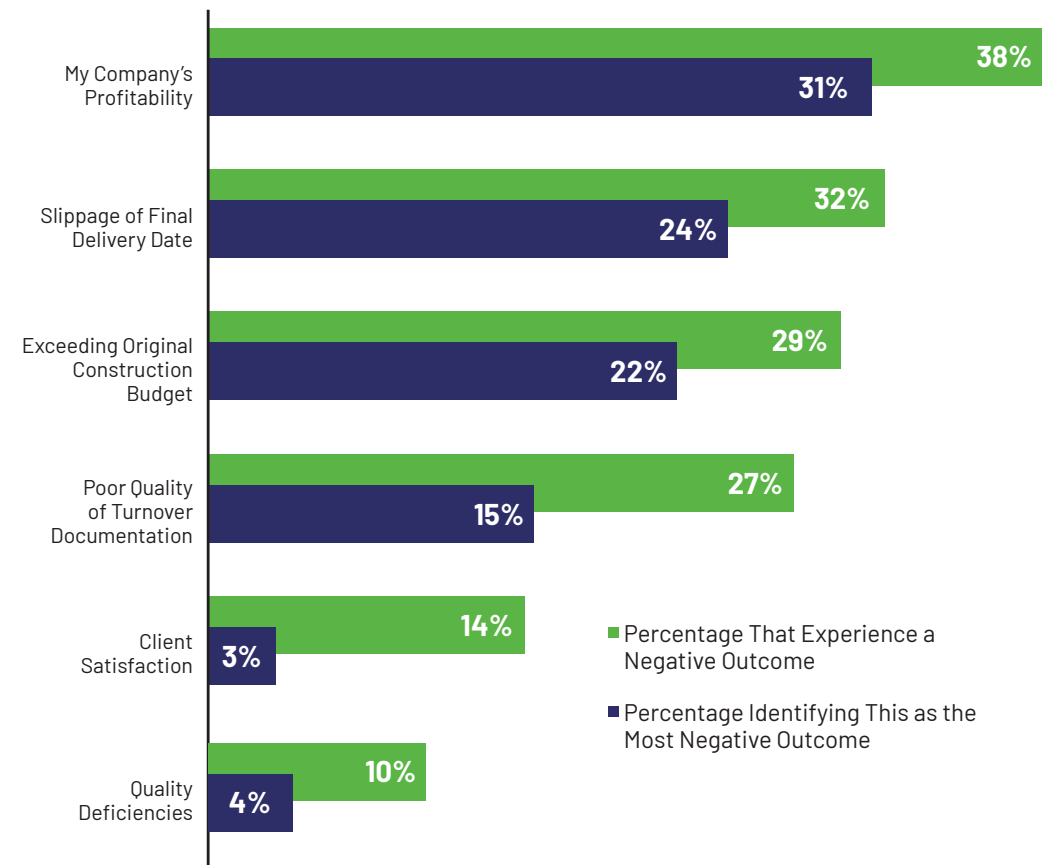
The next page shows what general contractors are doing to address this important and widespread problem.

Percentage of General Contractors That Have Negative Outcomes Due to Poor Data Integration

Among the Six Project Outcome Issues in the Chart at Right



Percentage of General Contractors Experiencing Each Negative Outcome From Poor Data Integration



Importance of Data Integration

Consolidation and Integration Are the Most Effective Improvements

CONSOLIDATION AND INTEGRATION ARE THE MOST EFFECTIVE STRATEGIES THAT WOULD IMPROVE THE VALUE OF TECHNOLOGY

General contractors were asked to rate how effective they believe each of the three strategies shown in the chart at right would be to improve the value of their technology stack.

The chart shows the percentage predicting a significant (i.e., medium, high or very high) degree of positive effect. The two most frequently selected relate directly to improving data integration.

ADDING MORE POINT SOLUTIONS

While the 52% citing this strategy reflects strong belief in the overall value of technology, it could worsen existing data integration issues and impede overall value enhancement.

INVESTING IN MORE TECHNOLOGY INTEGRATIONS

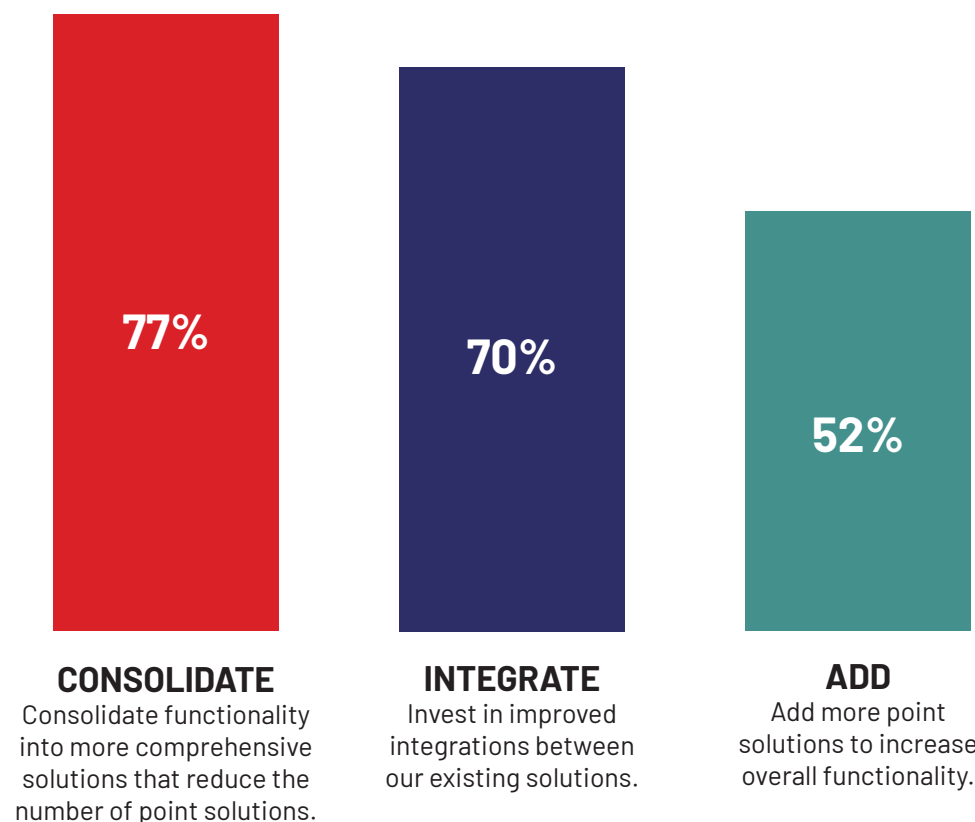
Fortunately, 70% support the positive impact of this strategy, so it can be assumed they will integrate any new point solutions they adopt.

CONSOLIDATING FUNCTIONALITY INTO MORE COMPREHENSIVE SOLUTIONS

This top-rated strategy avoids integration issues altogether by focusing on platform solutions with multiple pre-integrated functions and inherent integration capabilities. This may ultimately be the most effective way to deal with integration issues and achieve greater value from technology.

Percentage Who Believe Each Strategy Would Significantly Improve the Value of Technology for Their Company

Percentage of General Contractors Who Rate the Potential Effectiveness of Each Strategy as Medium, High or Very High



Advancing the Adoption of Technology for Project and Construction Management

INTRODUCTION

While previous sections of this report quantify numerous important values of technology, they also reveal that most general contractors have not yet adopted technology to conduct all of the processes studied in this research.

This section of the report examines:

- The challenges that are impeding further technology adoption.
- The processes general contractors are most frequently targeting for technology adoption in the near future.

FREQUENT CHALLENGES TO ADVANCING ADOPTION

General contractors were asked to identify several types of challenges their companies face when they are trying to expand the use and value of technology for project and construction management. This part of the section addresses:

- Technology-related challenges, including an examination of the use of redundant point solutions within companies.
- Organizational challenges (i.e., skills, resources, internal processes, etc.).

MOST GENERAL CONTRACTORS PLAN TO ADOPT MORE TECHNOLOGY IN THE NEXT THREE YEARS

Despite the challenges, most companies are planning to increase the number of processes they conduct with technology over the next three years. The last page in this section shows which processes are most frequently targeted for automation.



Advancing Technology Adoption

Technology-Related Challenges Faced by Contractors

TOP TECHNOLOGY CHALLENGES

The list at right shows the five most frequent technology-related challenges cited as obstacles to expanding adoption and usage.

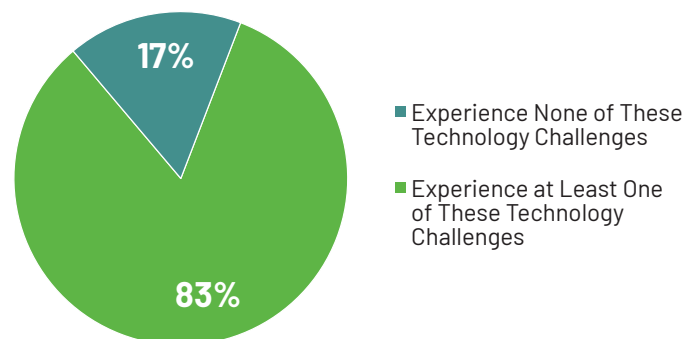
As shown in the chart below, only 17% do not experience any of these challenges. Among the other 83%, most report facing multiple ones.

- Vendors can address complexity and mobility issues.
- The other three involve internal management of a company's overall technology stack.

The following page provides further detail related to the specific challenge of too many solutions.

Percentage of General Contractors Who Experience Technology-Related Challenges

Among the Five Challenges in the List at Right



Top Five Technology-Related Challenges Reported by General Contractors

- 1** Some solutions are too complex
- 2** Too many different solutions/Need to consolidate our technology stack
- 3** Need to replace some of the current solutions with better solutions
- 4** Need more functionality in our technology stack
- 5** Some solutions lack adequate mobile capability

Advancing Technology Adoption

Number of Solutions Used for Similar Activities

USE OF REDUNDANT POINT SOLUTIONS IS WIDESPREAD

Many companies have adopted different commercial point solutions in various parts of their organization that perform very similar functions. While this may improve performance in each group, it also creates silos of information that may not be consistent and are often hard to integrate with other critical functions, hampering cross-project analysis and decision support for the overall organization.

NUMBER OF POINT SOLUTIONS IN USE FOR EACH PROCESS

General contractors who use a commercial point solution for any process were asked to identify how many are currently in use at their

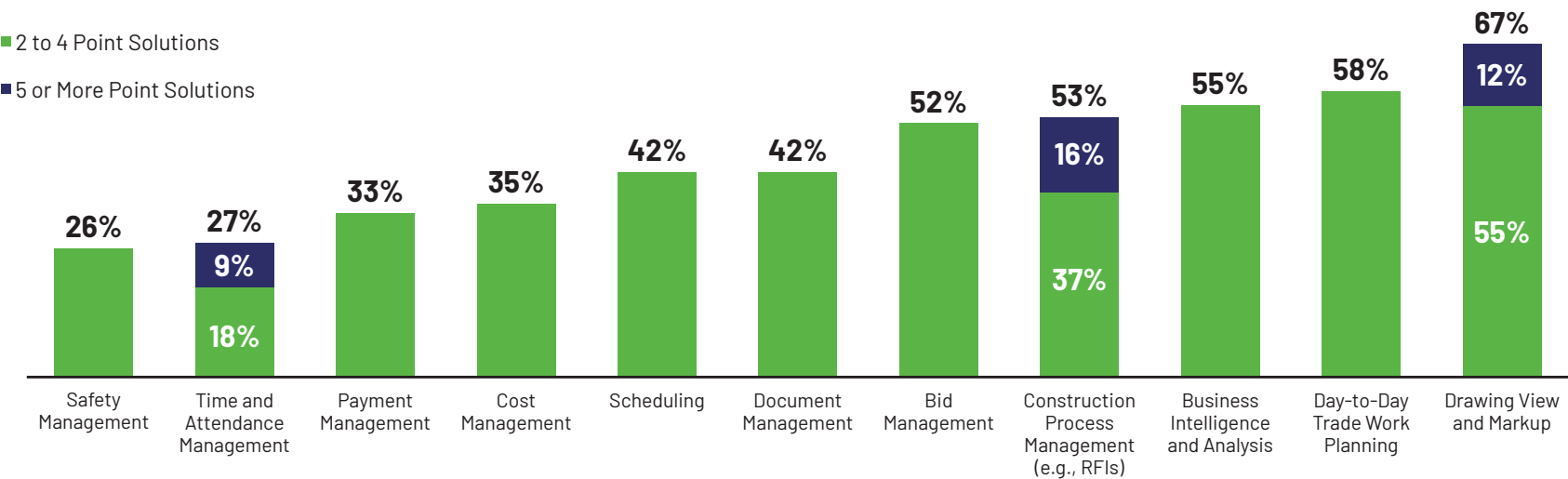
company for that process. The chart below shows the percentage reporting multiple solutions for each process.

- From one quarter to two thirds of companies report multiple solutions across the 11 processes studied. The overall average is 45%.
- Fortunately, only a small percentage report using more than five different point solutions, and that is limited to just three of the processes.

Although solution redundancy is widespread today, the findings in the previous section of this report about the value of increasing integrations and using more platform solutions suggest this practice will become less common, improving outcomes for everyone.

Percentage of General Contractors Using More Than One Commercial Point Solution for Each Process

Among the General Contractors Using a Commercial Point Solution for Each Process



Advancing Technology Adoption

Internal Organizational-Related Challenges Faced by Contractors

TOP ORGANIZATIONAL CHALLENGES

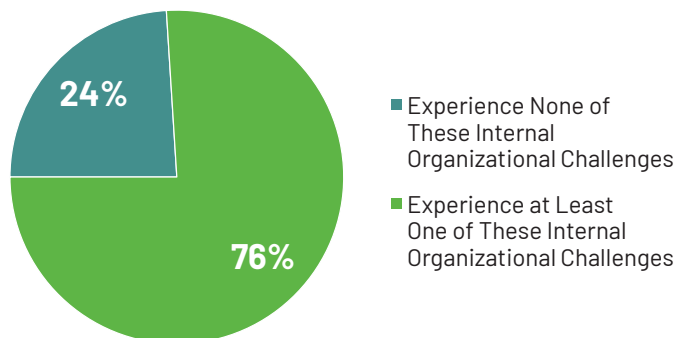
The list at right shows the five most frequent organizational challenges impeding more adoption.

As shown below, only 24% do not report any of these challenges. Most of the others face several.

- The first two issues are closely related, but external training resources can often meet a company's needs.
- Data gathering can be conducted with technology, but jobsite processes need to be modified to enable it.
- Similar to other key processes (e.g., safety, cost management, etc.), technology implementation requires an organizational commitment and resource investment.
- Involving users early in the implementation process can help to reduce their resistance.

Percentage of General Contractors Who Experience Internal Organizational-Related Challenges

Among the Five Challenges in the List at Right



Top Five Data Internal Organizational-Related Challenges Reported by General Contractors

- 1 Lack of qualified users at my company**
- 2 Lack of training resources at my company**
- 3 Challenges getting data from the jobsite from those performing the work (trades, superintendents, etc.)**
- 4 Poor internal processes for technology implementation**
- 5 Internal user resistance**

Advancing Technology Adoption

Processes Targeted for More Technology Adoption in the Next 12 Months

GENERAL CONTRACTORS PLAN SIGNIFICANTLY MORE ADOPTION OF TECHNOLOGY

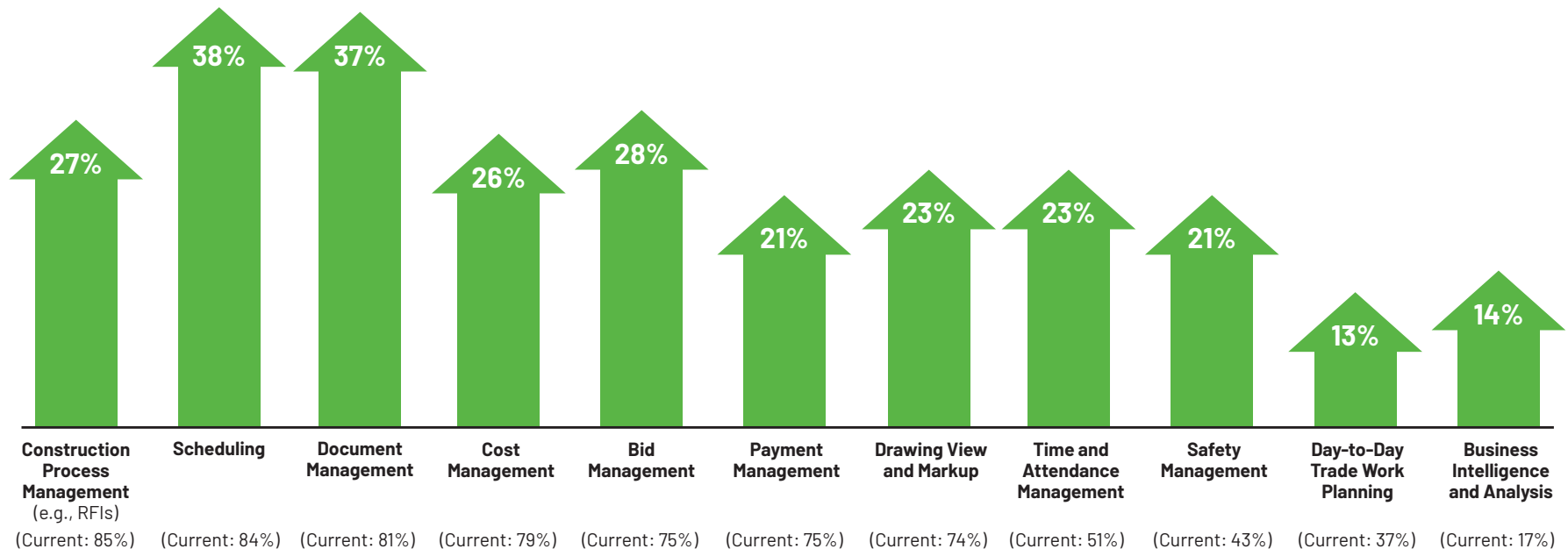
Any general contractor not currently using technology for each process shown in the chart below was asked if they are considering adoption of it within the next three years.

The chart shows how many current non-users are planning to adopt. For reference, they appear in the current overall order of technology usage and the title for each shows the percentage currently automating it (see page 9 for more detail on current technology use).

- The top four are already established processes (more than 75% currently use technology), so this incremental adoption will make them nearly ubiquitous.
- The four maturing processes (50% to 75% current adoption) also show strong growth, with about one quarter (21% to 28%) of current non-users saying they plan to adopt.
- Among the remaining emerging processes (less than 50% currently use technology), safety management shows the greatest forecasted growth.
- Although business intelligence and analytics has the lowest current use (17%), the predicted new adoption will significantly increase its user base.

Percentage Not Currently Using Technology for Each Process Who Plan to Adopt It in the Next Three Years

Shown in Order of the Current Percentage of General Contractors Who Use Technology to Conduct the Process



Methodology

This report is based on an online survey, conducted in December 2022, of 203 general contractors, construction managers and design-builders located in the US. For the sake of simplicity, they are referred to as general contractors in the analysis in this report.

RESPONDENT PROFILE

To participate in the survey, respondents had to be employed at a general contractor, construction management or design-build company, be actively engaged in company or project management or estimation and at least moderately familiar with the use of technology for managing construction projects at their company. The survey sample was provided by the DD&A Contractor Panel and the Dodge database.

JOB ROLES

- Company Executive: 37%
- Project Manager: 22%
- Estimator: 19%
- Project/Operations Executive: 15%
- Other: 7%

COMPANY PROFILE

PROJECT TYPES

Project types that companies engage in include both buildings and infrastructure. Top sectors include:

- Commercial (e.g., offices, retail, hotels): 80%
- Institutional (e.g., education, healthcare, government): 69%
- Industrial: 46%
- Multifamily Residential: 29%
- Transportation (e.g., highways, bridges, tunnels): 22%
- Water/Wastewater/Environmental: 22%

COMPANY LOCATION

- Northeast: 16%
- South: 31%
- Midwest: 26%
- West: 27%

SIZE OF COMPANY

Size of company is based on average annual revenue.

- Small (Revenues less than \$50 million): 46%
- Midsize (Revenues \$50 million to less than \$250 million): 36%
- Large (Revenues \$250 million or more): 18%

DEFINITIONS

Before being asked about their use of a technology, respondents were told that technologies include a commercially developed software solution, an internally developed software solution or a generic type of software customized to support a specific function at their company.

Before being asked about the value of their technology stack, respondents were told that a “technology stack” is all the software and hardware used to support project and/or construction management.

Contacts & Resources

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