

LEADING THE FUTURE OF BUILDING

Connecting Teams



Introduction

ABOUT THIS SMARTMARKET BRIEF

Dodge research conducted around the world shows that the project delivery process in the AEC industry is becoming increasingly integrated and collaborative. The rapid international expansion of BIM (building information modeling) and related model-based processes are facilitating new ways of breaking down traditional information silos between project team members and generating exciting new opportunities for improving efficiency, productivity and project outcomes.

Fundamental to this transformation is the growth of cloud-based collaboration solutions that enable fast, accurate and reliable digital workflows.

The research presented in this report is based on a survey of US architects, engineers, general contractors and trade contractors, and BIM and/or IT managers at those companies, to determine the extent and value of their use of cloud-based collaboration solutions.

Information about the respondents who participated in the research can be found in the Research Demographics section of this report.

CONTENTS

- 1 Introduction**
- 2 About Project Collaboration Solutions**
- 3 Benefits of Project Collaboration Solutions**
- 7 ROI on Project Collaboration Solutions**
- 8 Ideal Functions of Collaboration Solutions**
- 9 Owners' Use of Collaboration Solutions**
- 11 Obstacles to Use of Collaboration Solutions**
- 14 Perspectives of BIM/IT Managers**
- 15 Use of Collaborative Delivery Models**
- 16 Analyzing Collaboration Solutions**
- 20 Key Takeaways**
- 21 Industry Leaders**
- 24. Research Demographics**
- 25. Contacts & Resources**

MESSAGE FROM AUTODESK

The AEC industry is entering an era of connection. While historically the focus has been on the “M” of BIM (‘modeling’), we’re now seeing a rapid shift to focus on the ‘I’—“information.” This concentration on information, and the effective sharing of that information, enables project teams to work together in ways never before possible.

The era of connection is characterized by a holistic project-centric process. The project is at the center from the start, not the individual files and applications. Technology is enabling teams to become more connected and have access to a wealth of information from anywhere.

Autodesk is pleased to support the research on Connecting Teams presented in this report as part of the Leading the Future of Building series.

About Project Collaboration Solutions

COLLABORATION SOLUTIONS ON BIM PROJECTS

BIM AND COLLABORATION

One of the most consistent findings in BIM research by Dodge Data & Analytics around the world is its positive impact on improving project team collaboration.

- Owners¹ in both the US and UK cite “**Better Team Coordination/ Collaboration**” as the single greatest benefit of BIM to their projects.
- Over half of architects and contractors surveyed in China² report “**Better Collaboration with Other Project Team Members**” at either a high or very high level because of using BIM.
- In a report studying BIM metrics on US projects,³ 60% of contractors, 68% of architects and 73% of owners say BIM enables “**Improved Teamwork and Collaboration**” at either a high or very high level.
- In the Middle East⁴, “**Increased Efficiency Through Collaboration with Owners and Other Team Members**” is the top benefit of BIM, with 71% rating it high or very high.
- In Australia,⁵ current BIM users identify “**More Use of Contracts to Support BIM and Collaboration**” as the most important factor that would increase the value of BIM, especially for contractors (86%).

TYPES OF COLLABORATION SOLUTIONS

Because of the benefits, technology tools and platforms that facilitate multi-party collaboration and integrated workflow processes are becoming increasingly popular among teams using BIM. These collaboration solutions are continually evolving and take many forms, including:

- **FTP (file transfer protocol) sites:** a centralized server, typically controlled by one project team member, with project-specific permissions allowing upload/download access for multiple companies
- **Generic cloud solutions:** cloud-hosted services for file sharing, viewing, mark-up, etc., provided by non-AEC technology companies (e.g., Box, Dropbox)
- **AEC-specific cloud solutions:** cloud-hosted services often with greater functionality specific to AEC workflows, provided by AEC industry technology companies (e.g., Autodesk, Bentley, e-Builder)

THIS RESEARCH ON COLLABORATION SOLUTIONS

Because the AEC technology environment in general is evolving away from reliance on premise-based applications operating within firewall constraints, and towards shared server and cloud-hosted platform solutions, this study focuses on how current BIM users are engaging with three specific types of collaboration solutions: **FTP sites, generic cloud solutions and AEC-specific cloud solutions.**

The report shares key research findings on:

- Benefits users are enjoying
- Users’ perceived ROI
- Relative usage of these three types of solutions
- Most ideal solution functionalities
- The specific use case of equipping an owner with a collaboration solution
- Challenges to expanded use
- Collaborative project delivery methods

¹ *The Business Value of BIM for Owners SmartMarket Report, 2014*

² *The Business Value of BIM in China SmartMarket Report, 2015*

³ *Measuring the Impact of BIM on Complex Projects SmartMarket Report, 2015*

⁴ *The Business Value of BIM in the Middle East SmartMarket Report, 2016*

⁵ *The Business Value of BIM in Australia and New Zealand SmartMarket Report, 2014*

Benefits of Project Collaboration Solutions

BENEFICIAL IMPACT OF COLLABORATION SOLUTIONS ON BIM PROJECTS

BIM users rated how much they experience each of nine benefits from using a project collaboration solution. The chart at right shows the percentages who give high or very high ratings (i.e., 4 or 5 on a scale of 5).

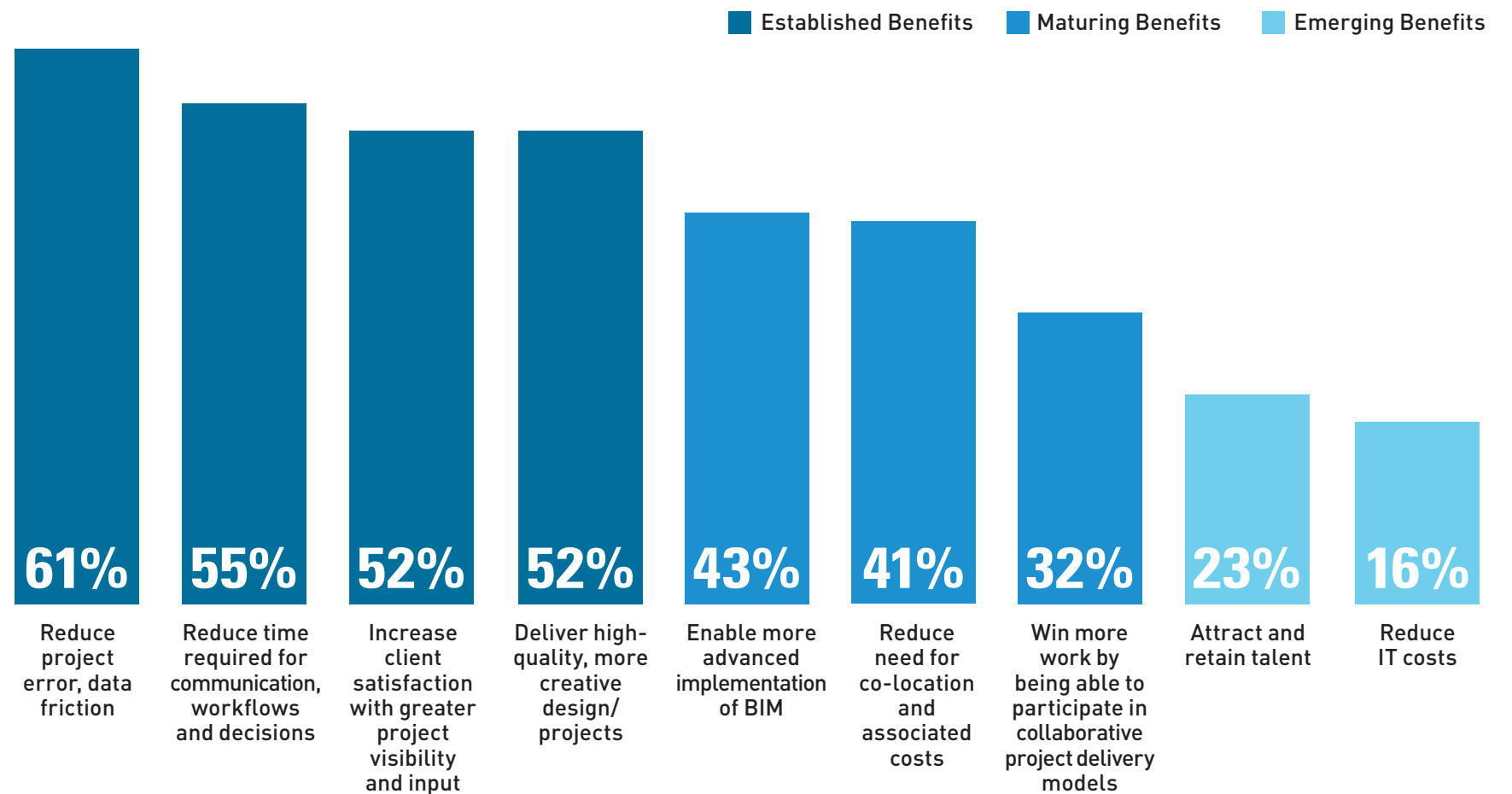
MATURITY OF BENEFITS

The chart divides the nine benefits into three categories based on the responses:

- **Established Benefits:** Highly rated by over 50%. Most project teams can reasonably expect to receive them from their use of a collaboration solution.
- **Maturing Benefits:** Highly rated by 25% to 50%. These benefits are still maturing, and are likely to be received by more experienced users.
- **Emerging Benefits:** Highly rated by less than 25%. These benefits will require more usage to validate.

Benefits of Using Project Collaboration Solutions

Percentages of all respondents who report receiving each of nine benefits at a high or very high level of frequency



Benefits of Project Collaboration Solutions: Project Process Improvements

PROCESS IMPROVEMENTS

Among the nine benefits studied, three are related specifically to improving the project process. The chart at right shows respondents who give high or very high ratings to each (i.e., 4 or 5 on a scale of 5).

FASTER CYCLE TIMES

Scoring highest in this category, this benefit is especially appreciated by engineers, who, it should be noted, generally express the least engagement with and benefit from using collaboration solutions.

ADVANCED BIM IMPLEMENTATION

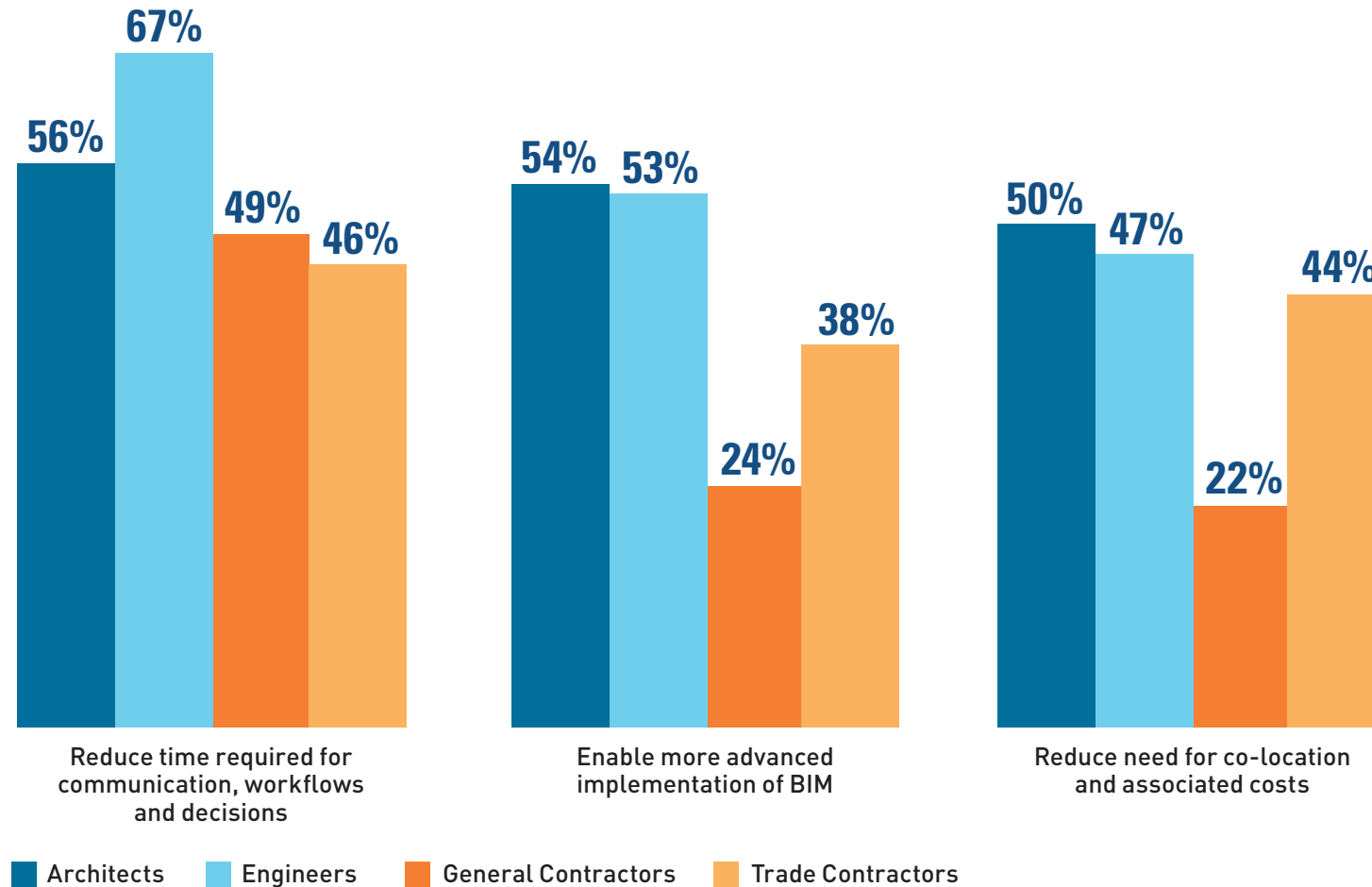
While not surprising that design firms lead in citing this benefit, it is very encouraging that 38% of trade contractors also agree, which aligns with the trend of greater BIM adoption by these companies.

REDUCED NEED FOR CO-LOCATION

Physically co-locating key team members can facilitate collaborative behavior, but often incurs an additional cost. A significant number of architects, engineers and trade contractors report that a project collaboration solution can reduce that need and expense.

Project Process Improvements From Using Collaboration Solutions on BIM Projects (by Type of Company)

Percentage of respondents, by discipline, who report receiving these project process improvements at a high or very high frequency from using a collaboration solution on their BIM projects



Benefits of Project Collaboration Solutions: Project Outcome Improvements

OUTCOME IMPROVEMENTS

Among the nine benefits studied, three are related specifically to improving the project outcomes. The chart at right shows respondents who give high or very high ratings to each (i.e., 4 or 5 on a scale of 5).

FEWER ERRORS, LESS DATA FRICTION

This scores highest across all nine benefits, especially for design firms and trade contractors, suggesting that increased collaboration is helping those parties more effectively convey and implement design intent and avoid costly errors that can result from misunderstandings.

INCREASED CLIENT SATISFACTION AND BETTER DESIGN

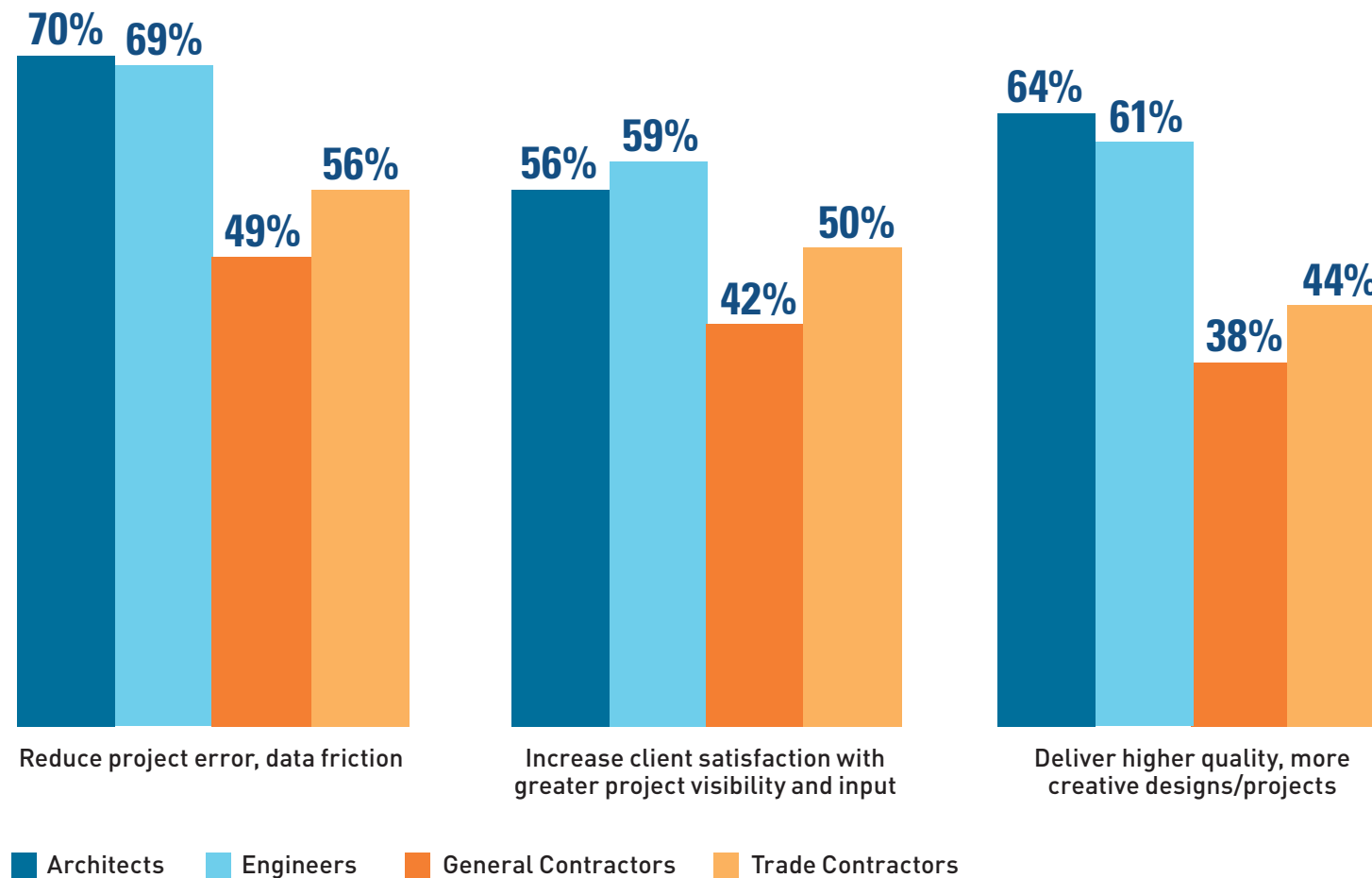
Previous Dodge research¹ shows that owners believe BIM produces more well-reasoned design solutions and more functional, better-performing buildings. Design professionals in this study strongly believe collaboration solutions also contribute to improved design outcomes, and about half of all respondents cite that it improves client satisfaction by facilitating greater visibility and input.

¹The Business Value of BIM for Owners SmartMarket Report, 2014

¹Measuring the Impact of BIM on Complex Projects SmartMarket Report, 2015

Project Outcome Improvements From Using a Collaboration Solution on BIM Projects (by Type of Company)

Percentage of respondents, by discipline, who report receiving these project outcome improvements at a high or very high frequency from using a collaboration solution on their BIM projects



Benefits of Project Collaboration Solutions: Internal Business Improvements

INTERNAL BUSINESS IMPROVEMENTS

Among the nine benefits studied, three are related specifically to generating internal business benefits for the users' companies. The chart at right shows respondents who give high or very high ratings for each (i.e., 4 or 5 on a scale of 5).

BUSINESS DEVELOPMENT IMPACT

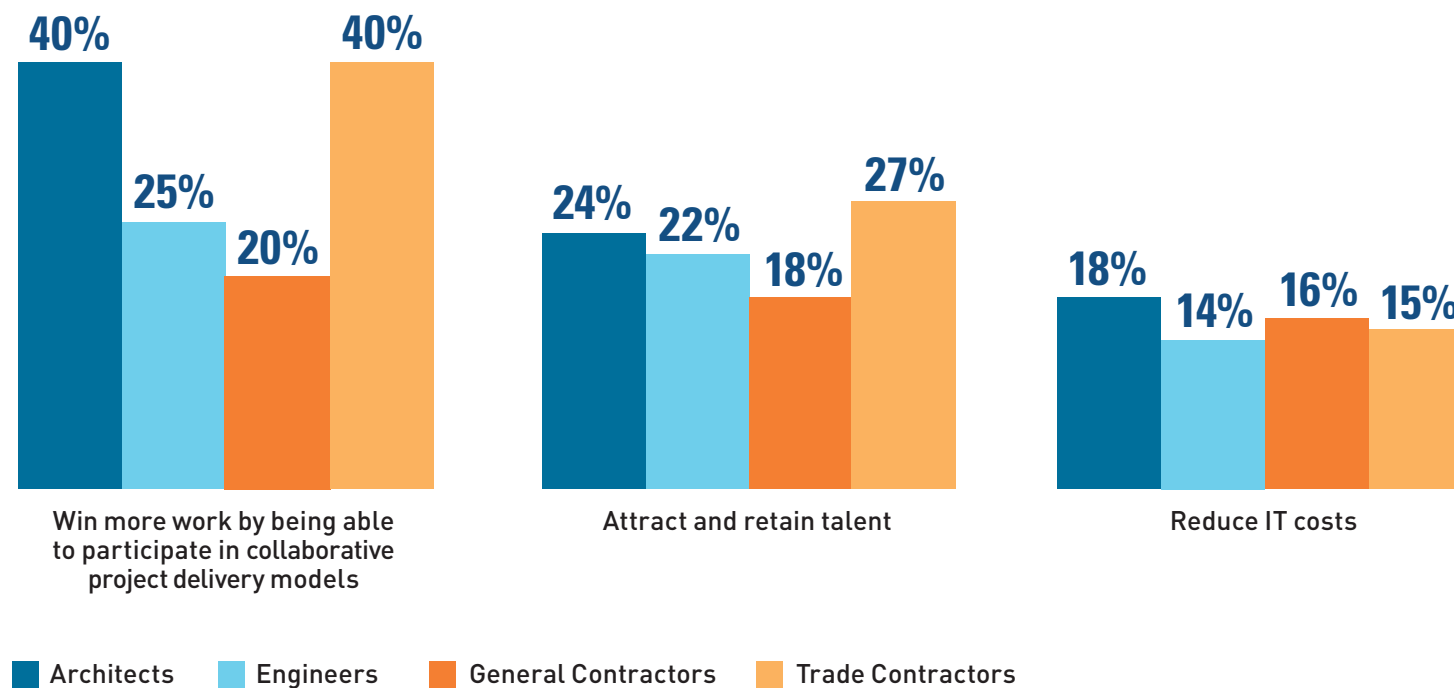
Structured and reliable methods for collaboration can facilitate more creative approaches to team formation and pursuit of work. Though highly rated by less than half of respondents, this benefit can be expected to increase over time, as more firms become familiar with collaborative processes and seek to establish them earlier in the process.

NURTURING TALENT AND REDUCING IT COSTS

As stated earlier in the section (see page 3), these are emerging benefits that score relatively low at this point because they will take more time and experience to validate. The fact that they are rated highly by 23% and 16% of all respondents, respectively, is encouraging, and it merits revisiting this benefit in the future as use of collaboration solutions continues to advance.

Internal Business Improvements From Using Collaboration Solutions on BIM Projects (by Type of Company)

Percentage of respondents, by discipline, who report receiving these internal business improvements at a high or very high frequency from using a collaboration solution on their BIM projects



ROI on Project Collaboration Solutions

INVESTMENTS AND ROI

INVESTMENT IN PROJECT COLLABORATION SOLUTIONS

42% of respondents report that they have made a significant investment in project collaboration solutions.

ROI FOR COLLABORATION SOLUTIONS

There is no generally accepted method to calculate ROI for a collaboration solution. Therefore, each user who cited significant investment was asked to select one of five ranges that best represents their current perceived ROI. The chart at upper right shows the responses.

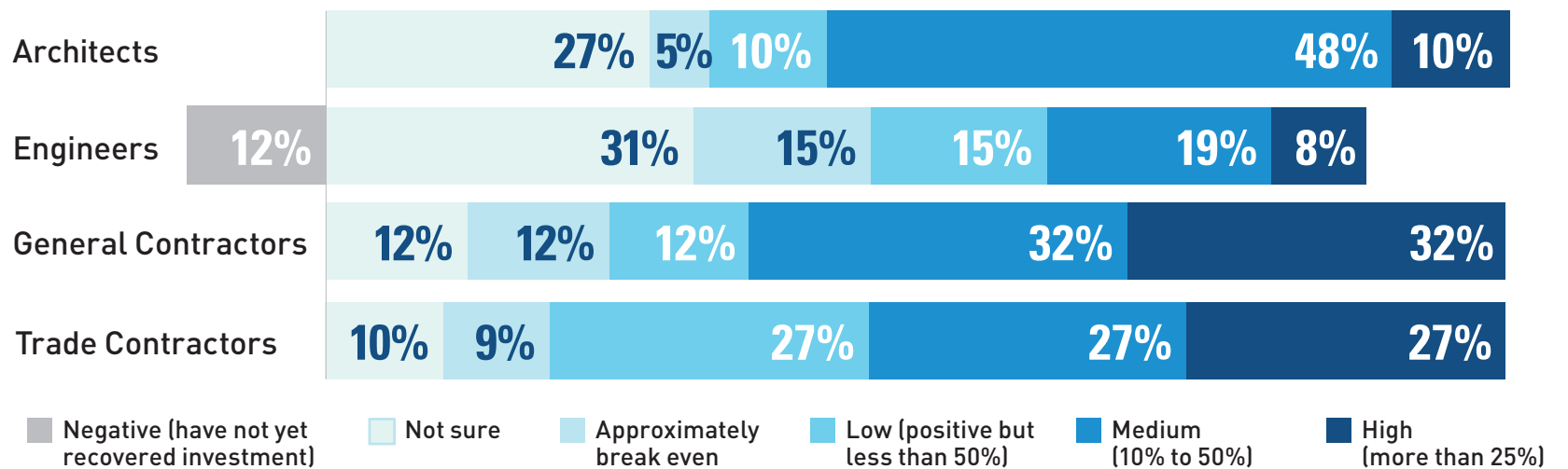
- About 30% of contractors perceive high ROI (more than 25%) versus only about 11% of design firms.
- Many more architects (27%) and engineers (31%) are unsure about their ROI than general contractors (12%) or trade contractors (10%).

HIGH BIM ENGAGEMENT CORRELATES WITH HIGH ROI

Most of the respondents who perceive high ROI (i.e., more than 50%) are also highly engaged with BIM (i.e., 50% or more of their projects involve BIM). This finding reinforces the positive impact of deploying collaboration solutions on BIM projects.

Perceived ROI for Project Collaboration Solutions

Among the 42% of respondents who have made a significant investment in collaboration solutions, the percentages who perceive each of 5 levels of ROI (or are not sure of their ROI)



Impact of BIM Engagement on ROI for Project Collaboration Solutions

Among the respondents who report high ROI (more than 25%), the percentages who also report high level of BIM engagement (50% or more of their projects involve BIM)

RESPONDENTS REPORTING HIGH ROI	ARCHITECTS	ENGINEERS	GENERAL CONTRACTORS	TRADE CONTRACTORS
High BIM Engagement (50% or more of projects involve BIM)	100%	50%	84%	67%
Low BIM Engagement (less than 50% of projects involve BIM)	0%	50%	16%	38%

Ideal Functions of Collaboration Solutions

MOST DESIRED NEW FUNCTIONALITY

Users were asked to rate six functions for how valuable they would be on their BIM projects if they could be made available in a collaboration solution. The chart at right shows the percentage, by company type, who give high or very high ratings for each (i.e., 4 or 5 on a scale of 5).

ARCHITECTS

Browser-based multi-format 2D/3D annotation capabilities take top ratings from architects.

ENGINEERS

Live access to collaborate on the latest file version, and the ability to annotate directly on a design, are engineers' top needs, which both align well with their responsibilities on a project team.

GENERAL CONTRACTORS

This group rates all the functions relatively strongly (average 67%), especially access to design files without requiring the native authoring software.

TRADE CONTRACTORS

Live access to collaborate on the latest file version is also trade contractors' top need. This avoids executing construction from an outdated version of a design, which usually causes costly rework.

Most Valued Potential Capabilities of Project Collaboration Solutions

Percentage of all respondents, by discipline, who assign high or very high value to each of these functions of a project collaboration solution, if they could be made available

	Architects	Engineers	General Contractors	Trade Contractors
Mark up, redline and comment directly on designs	70%	71%	69%	51%
Get live access to collaborate on the latest file versions	62%	75%	65%	58%
View, share, review and mark up building design-specific 2D and 3D design file formats in your browser	72%	65%	69%	49%
View, mark up and search within design files	64%	67%	71%	53%
Interact directly with models and drawings in a browser or mobile device (via mobile app and tablet or phone) without requiring the software used to create the file	56%	60%	76%	51%
Control access and manage user roles and permissions	58%	54%	55%	31%

¹including AutoCAD (DWG, CAD), DXF, Revit (RVT), IFC, and Navisworks (NWD, NWF)

Owners' Use of Collaboration Solutions

OWNER COLLABORATION USAGE

This section of the report addresses the frequency and beneficial impact of project team members equipping an owner with a collaboration solution.

OWNERS PERSPECTIVE ON COLLABORATION

Previous Dodge research¹ shows that owners acknowledge the value of BIM as a facilitator of improved collaboration on their projects.

IMPACT OF BIM ENGAGEMENT ON FREQUENCY OF EQUIPPING OWNERS WITH COLLABORATION

To examine the role of BIM in the specific use case of a team member equipping a project owner with a project collaboration solution, the chart at right shows the percentage of respondents who have done this, broken out by their level of BIM engagement.

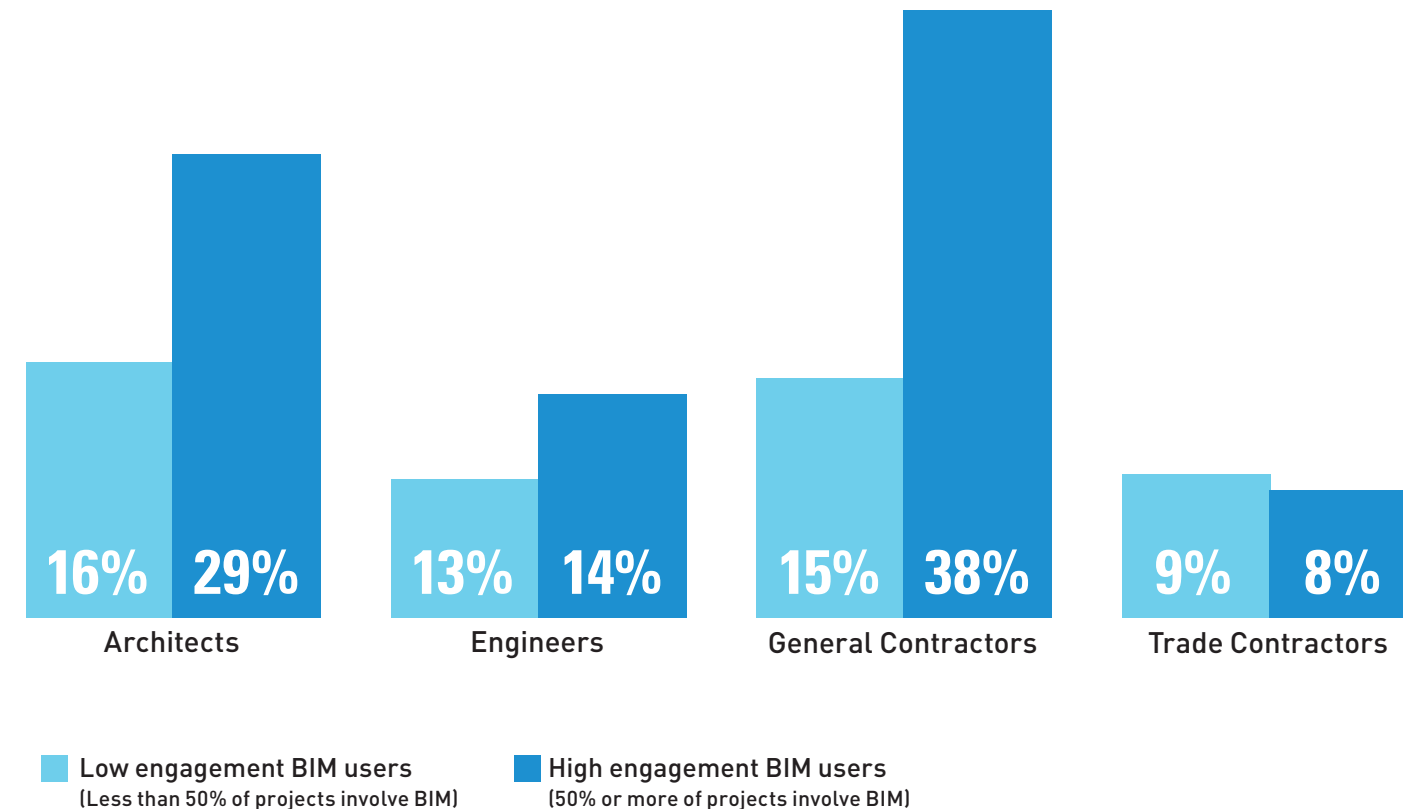
The findings clearly show that architects and general contractors are the most frequent drivers of this practice and that those with a higher level of BIM engagement do it significantly more often than their low engagement peers, validating the strong value proposition of collaboration solutions on projects that involve BIM.

¹The Business Value of BIM for Owners SmartMarket Report, 2014

¹Measuring the Impact of BIM on Complex Projects SmartMarket Report, 2015

Frequency of Equipping an Owner With a Collaboration Solution on BIM Projects (by Level of BIM Engagement)

Percentage of respondents, by discipline, who have equipped an owner with a collaboration solution for their BIM projects. Results are divided between high engagement BIM users (50% or more of their projects involve BIM) and the remaining low engagement BIM users



Owners' Use of Collaboration Solutions: Benefits

OWNER COLLABORATION SOLUTION¹ BENEFITS

To examine team members' perspectives on the benefits of equipping an owner with a collaboration solution, respondents who indicated they have done so were asked to what degree it generates each of five benefits. The chart at right shows the percentage, by company type, who give each benefit high or very high ratings (i.e., 4 or 5 on a scale of 5).

- Architects and general contractors are the most enthusiastic about the benefits of equipping an owner with a collaboration solution, with the majority rating all five as high or very high impact. This finding is aligned with the frequency of this activity among architects and contractors (see page 9).
- Trade contractors, though not as active in actually equipping owners with collaboration solutions, are also very positive about the beneficial impact of doing so.

Overall, these results clearly indicate that a strong set of benefits can be generated by equipping an owner with a collaboration solution.

Benefits of an Owner Using a Collaboration Solution on BIM Projects (by Type of Company)

Percentage of respondents, by discipline, who report receiving these project outcome improvements at a high or very high frequency from an owner using a collaboration solution on their BIM projects

	Architects	Engineers	General Contractors	Trade Contractors
Better client understanding of the proposed design	92%	57%	92%	75%
Improved client-design team relationship	92%	43%	85%	50%
Improved overall design solution	92%	43%	85%	50%
Faster decision-making	75%	43%	85%	50%
Fewer design changes during the process	58%	43%	54%	75%

Obstacles to Use of Collaboration Solutions

OBSTACLES

A challenge for all technology-oriented solutions in AEC is to drive significant implementation among adopters in order to become an established practice.

To identify the most impactful issues preventing current users from expanding implementation, respondents were asked how much of an obstacle each of six factors is to increasing their use of collaboration solutions on their BIM projects.

Overall results, in the chart at right, show that cost and complexity of use are the top concerns across all respondents.

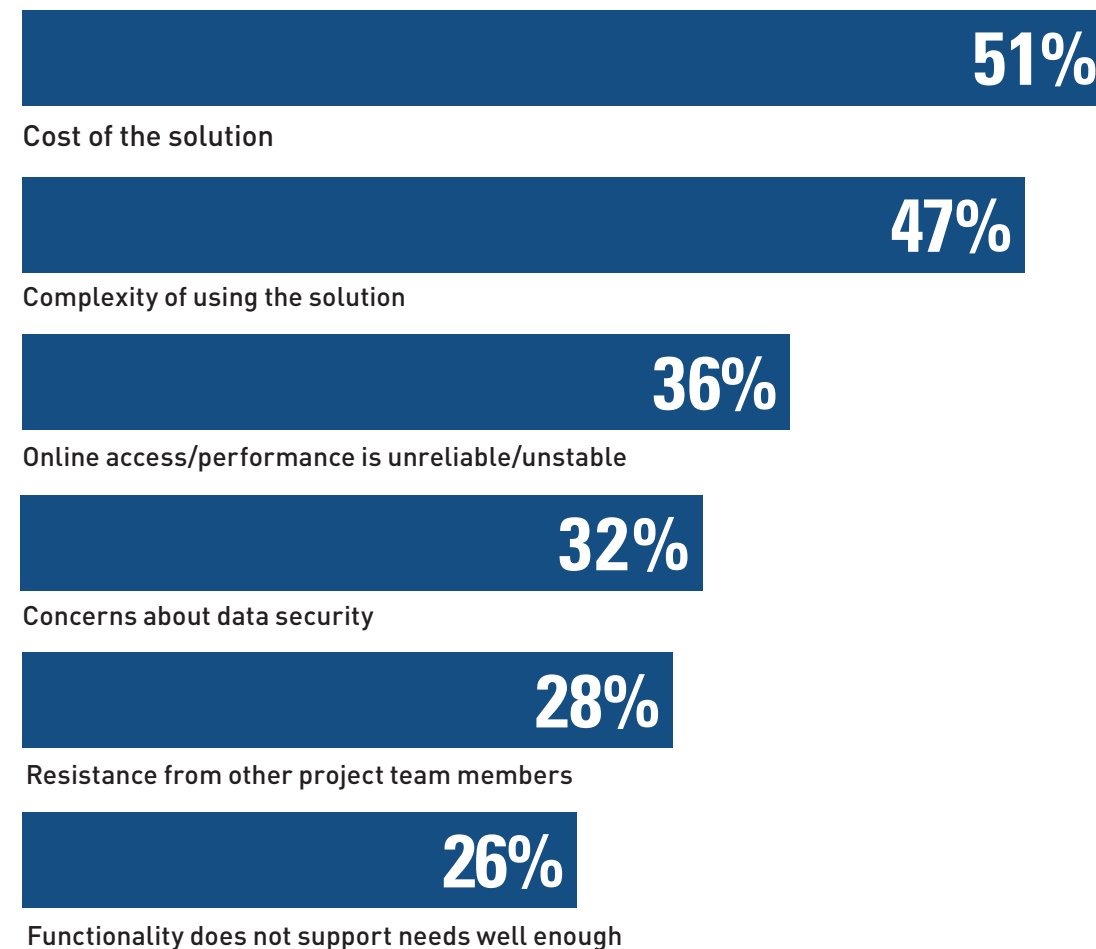
FURTHER ANALYSIS

The following two pages provide responses by company type, divided into two categories of obstacles:

- **Technically-oriented obstacles:** Complexity and functionality of the solution, and challenges related to online access and performance
- **Business-related obstacles:** Cost, data security concerns and resistance from other team members

Obstacles to Increasing Use of Collaboration Solutions on BIM Projects

Percentage of respondents who cite each of these as high or very high impact obstacles to increasing their use of collaboration solutions on their BIM projects



Obstacles to Increasing Use of Collaboration Solutions: Technical Obstacles

TECHNICALLY-ORIENTED OBSTACLES

COMPLEXITY OF USING THE SOLUTION

Engineers, who as a group express the greatest concern among company types for all three technical obstacles, are also most vocal about user complexity. This issue ranks second among all six obstacles studied and should send an important message to technology providers.

ONLINE ACCESS/PERFORMANCE

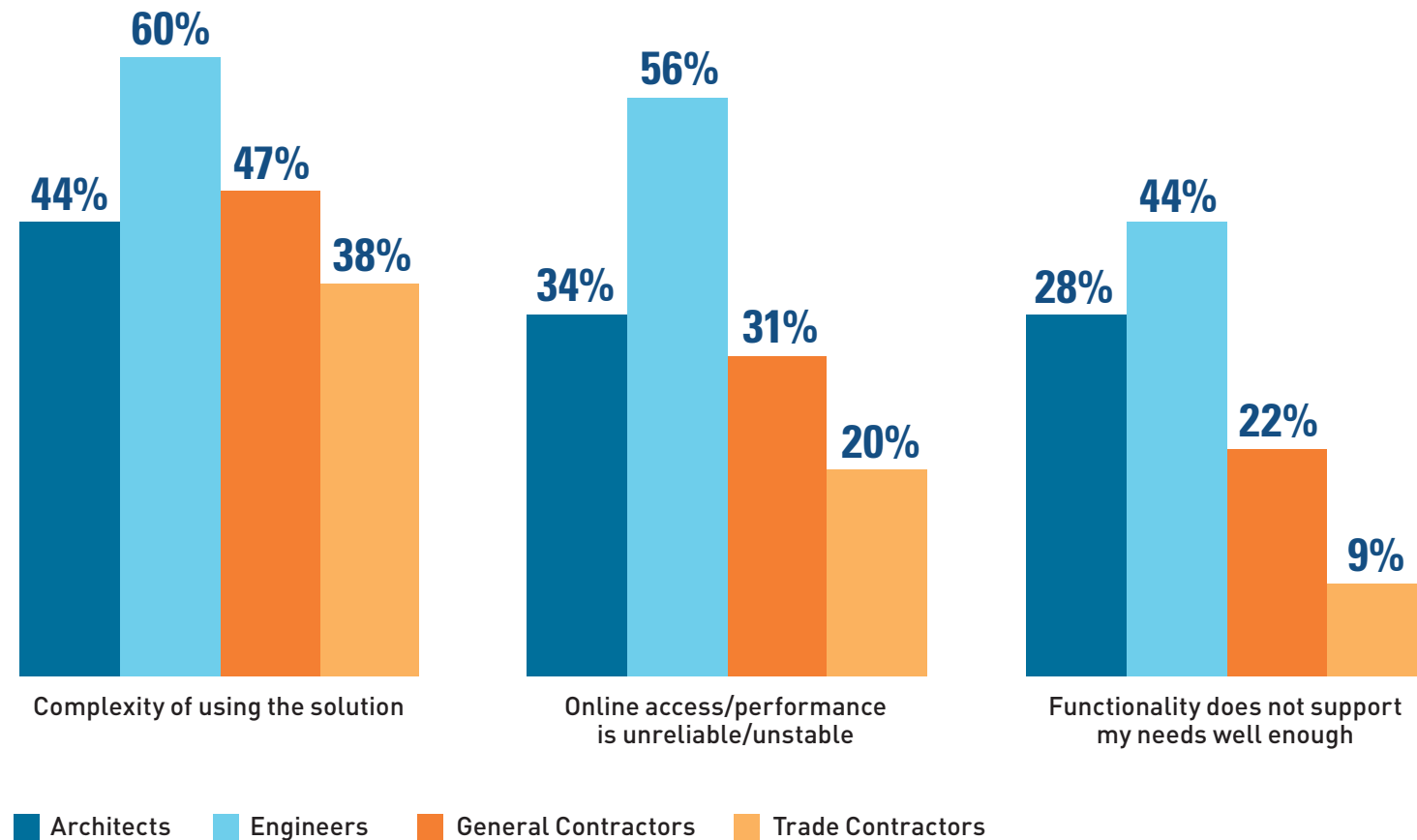
Again, engineers lead the others in citing access and performance issues as a top obstacle to increasing use of project collaboration solutions. Interestingly, very few trade contractors (20%) cite this as a challenge, which may relate to the different amount of time each company type spends engaging with a collaboration solution.

FUNCTIONALITY

Although almost half of the engineers again cite this as a top obstacle, its overall lower rating suggests that functionality is currently at least adequate for most participants. Trade contractors, in particular, express very low dissatisfaction. The wide variance across company types is an indicator for technology companies of unmet functionality needs.

Technical Obstacles to Increasing Usage of Collaboration Solutions on BIM Projects (by Type of Company)

Percentage of respondents, by discipline, who cite each of these as high or very high impact technically oriented obstacles to increasing their use of collaboration solutions on their BIM projects



Obstacles to Increasing Use of Collaboration Solutions: Business Obstacles

BUSINESS-RELATED OBSTACLES

COST OF THE SOLUTION

Although cost is the most significant among all six obstacles studied, it is far less of an issue for high BIM engagement users (50% or more of their projects involve BIM) than for their low engagement peers. This is especially true for contractors, where 56% with low BIM engagement rate it as a high or very high obstacle, versus only 33% at high BIM engagement. This suggests that its value outweighs its cost for more active BIM users.

CONCERNS ABOUT DATA SECURITY

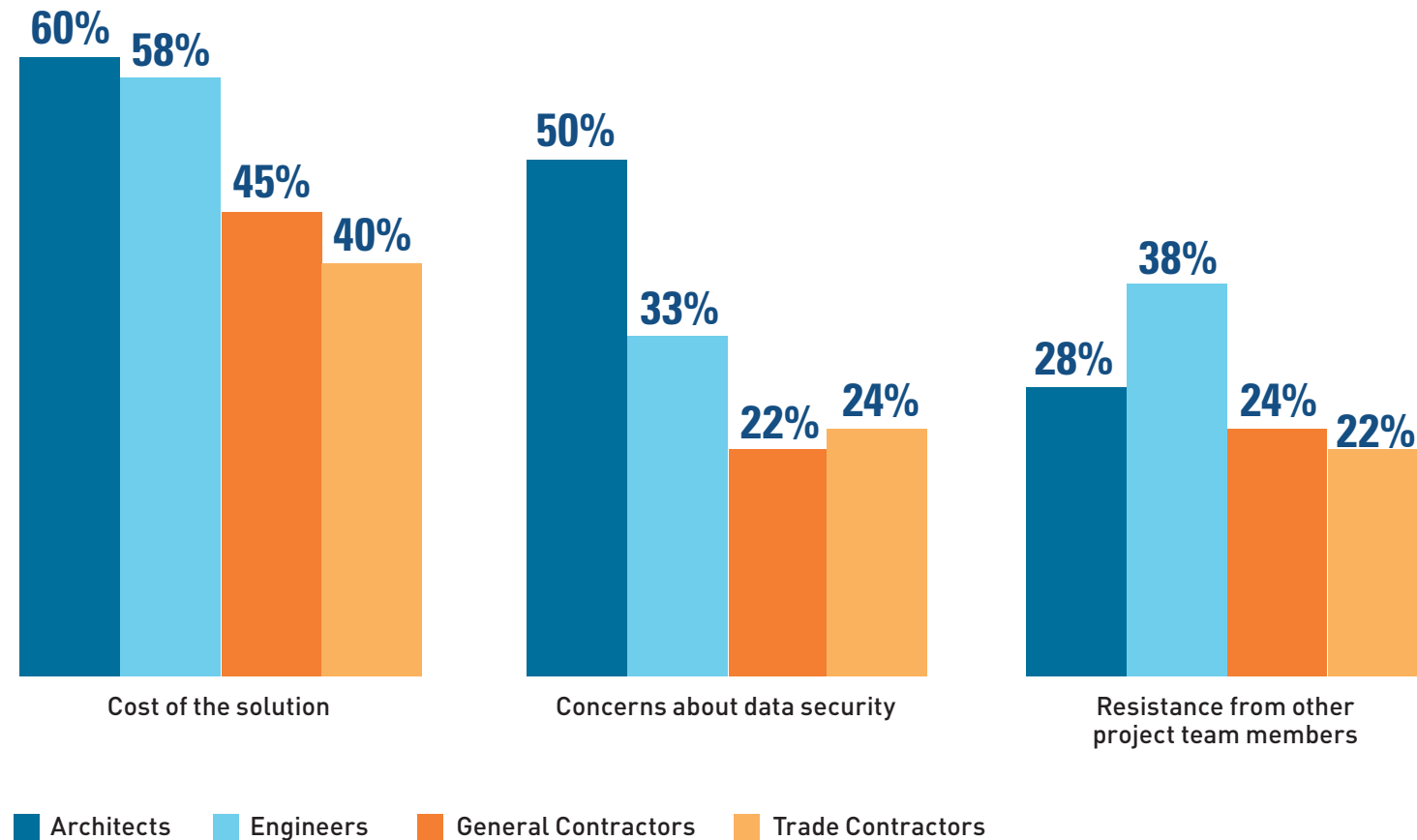
This concern is most strongly expressed by architects, likely due to the intellectual property involved in design files. Interestingly it is relatively consistent across both high and low BIM engagement levels, indicating a concern for 2D as well as 3D files.

RESISTANCE FROM OTHER TEAM MEMBERS

The relatively low rating of this obstacle is an encouraging sign that the industry is increasingly willing to participate in project collaboration solutions.

Business Obstacles to Increasing Usage of Collaboration Solutions on BIM Projects (by Type of Company)

Percentage of respondents, by discipline, who cite each of these as high or very high impact business-related obstacles to increasing their use of collaboration solutions on their BIM projects



Perspectives of BIM/IT Managers

TECHNOLOGY MANAGERS' PERSPECTIVES ON PROJECT COLLABORATION SOLUTIONS

BIM and IT managers are typically at the forefront of technology adoption. They enthusiastically evaluate, deploy and adapt new solutions, and train users to optimize their value. A number of these knowledgeable specialists participated in the survey. In most cases their responses align with the other practitioner respondents. Some of the variances are described on this page.

BENEFITS OF PROJECT COLLABORATION SOLUTIONS

The chart below shows average percentages of AEC practitioners compared with BIM/IT managers who give high or very high benefit ratings to project collaboration solution benefits. The technology managers are more enthusiastic, especially for improved cycle times, more advanced BIM and reducing co-location (which often requires significant BIM/IT resources). Because BIM/IT managers are probably highly aware of IT costs, their slightly higher rating for reduced IT costs may be an indicator that the occurrence of that benefit is likely to increase.

BENEFITS OF COLLABORATION SOLUTIONS	AEC	BIM/IT
Reduce time required for communication, workflows and decisions	55%	81%
Enable more advanced implementation of BIM	43%	62%
Reduce need for co-location and associated costs	16%	43%
Reduce IT costs	16%	19%

ROI FOR PROJECT COLLABORATION SOLUTIONS

BIM/IT managers are far more enthusiastic about the ROI they believe their companies are receiving from project collaboration solutions than the practitioners. This is a very encouraging sign for the continued implementation at firms already using solutions.

ARCHITECTS	ENGINEERS	GENERAL CONTRACTORS	TRADE CONTRACTORS	BIM/IT MANAGERS
10%	8%	32%	27%	47%

OBSTACLES TO INCREASING USE OF PROJECT COLLABORATION SOLUTIONS

Expressing their practical focus, BIM/IT managers express greater concern than practitioners for three key obstacles to increased usage that impact them directly.

OBSTACLES TO INCREASING USE	AEC	BIM/IT
Cost of the solution	51%	67%
Concerns about data security	28%	57%
Online access/performance is unreliable/unstable	32%	38%

Use of Collaborative Delivery Models

COLLABORATIVE DELIVERY MODELS

A project delivery model that encourages collaboration and integration can contribute to facilitating the use of a project collaboration solution.

To capture this trend, respondents were asked which of five collaborative delivery models they have worked with. Those reporting no experience with a model were asked about their level of interest (from none to very high) in participating in it sometime over the next five years. The chart at right shows the findings.

CURRENT USE AND FUTURE ADOPTION

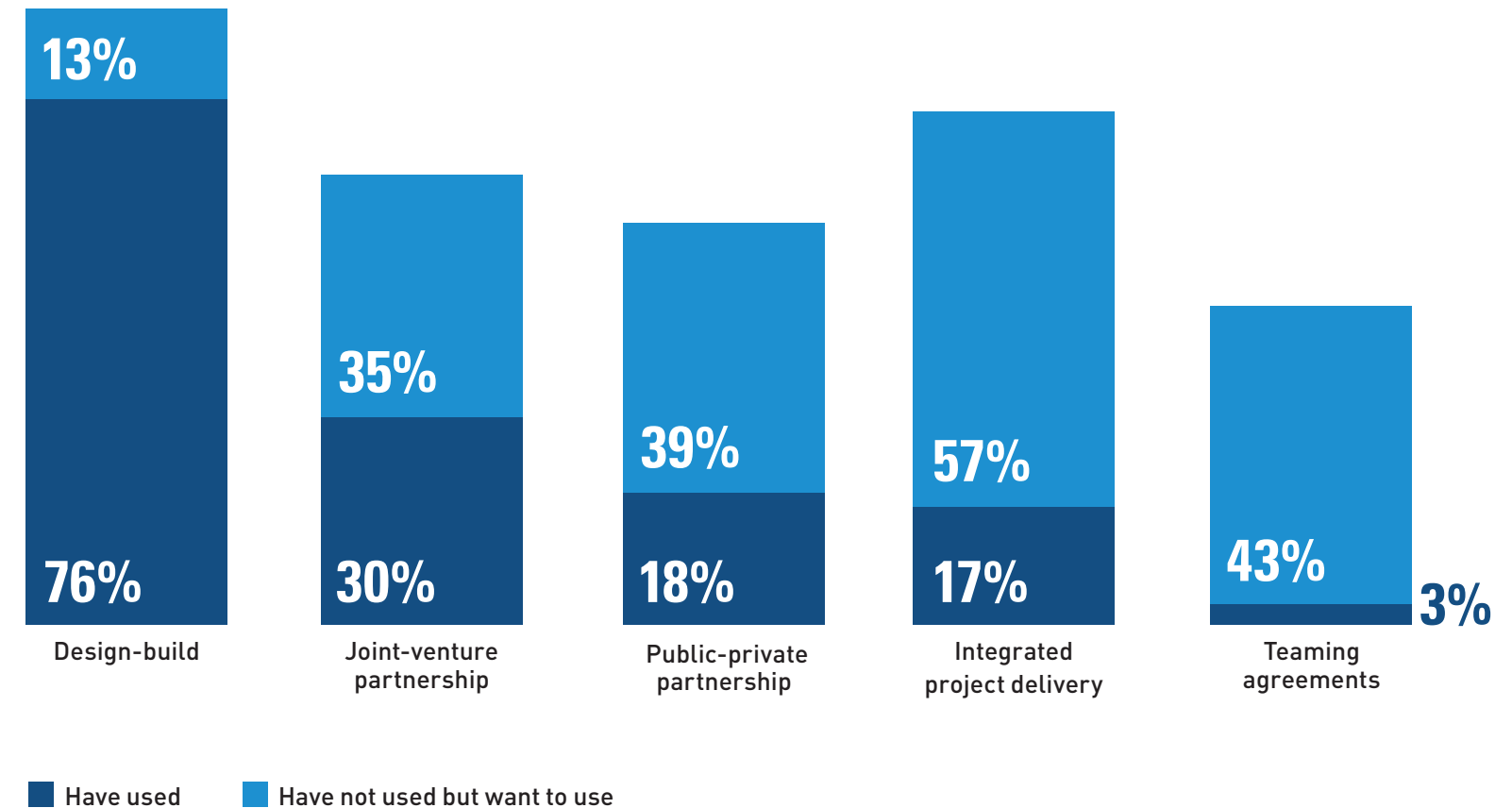
Design-build shows by far the greatest current penetration (76%), but integrated project delivery shows the greatest potential adoption (57%), particularly with high BIM engagement users, which makes sense because it aligns well with BIM-driven processes.

FORECASTED GROWTH

Not shown in the chart, those reporting experience with a model were also asked about expected growth/decline of its use. The strongest forecast (73%) from current users is for growth in public-private partnerships.

Experience With and Desire to Use Collaborative Project Delivery Models

Percentage of respondents who have participated in each of these types of collaborative project delivery models, and percentage of those who have not participated but express medium, high or very high interest in doing so in the next 2 years



Analyzing Collaboration Solutions

MAJORITY OF BIM USERS ARE WORKING WITH COLLABORATION SOLUTIONS

This section of the report focuses on how distributed teams are using collaboration solutions to view, share, review, mark up and comment on models or documents on their projects that involve BIM. Specific topics include:

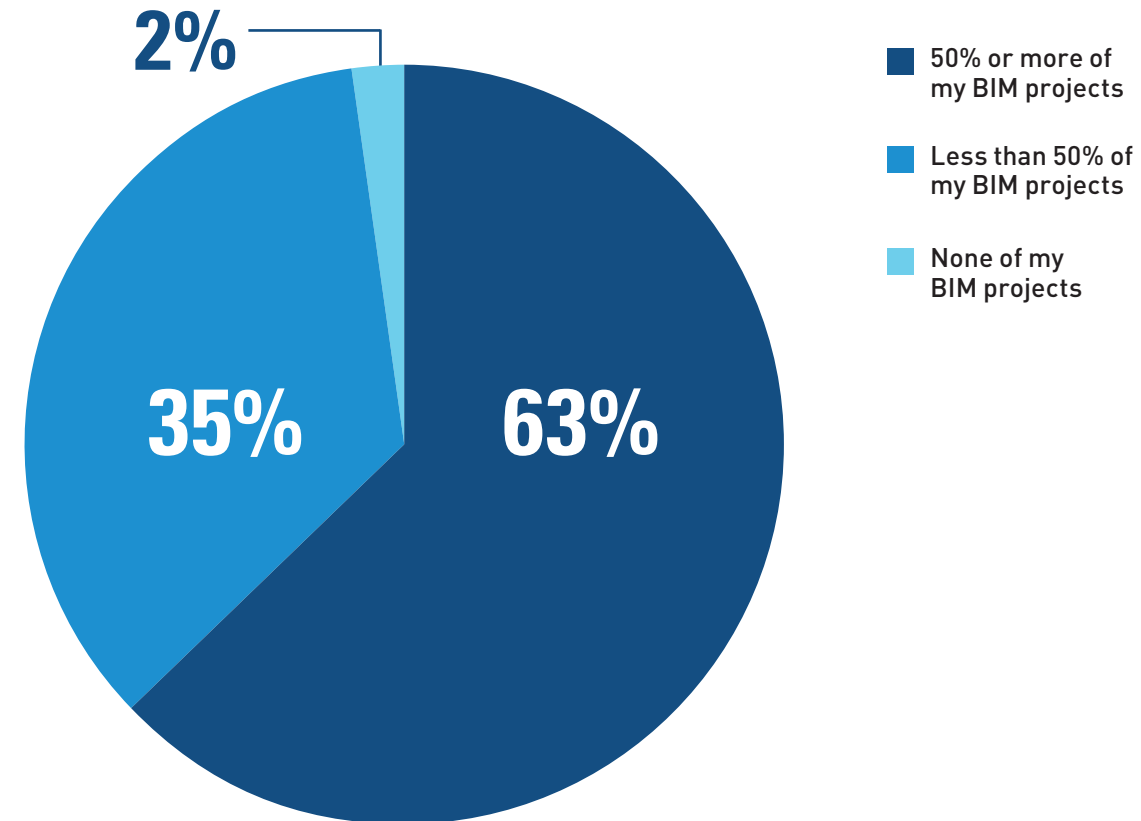
- Frequency of use for all types of collaboration solutions
- Impact of BIM engagement level on frequency of use
- Frequency of use for the three specific types of collaboration solutions studied in this research (see page 2)
- Satisfaction with the three types of collaboration solutions

FREQUENCY OF USING COLLABORATION SOLUTIONS

The chart at right shows the percentage of respondents who report using a collaboration solution on at least half of their BIM projects (63%) versus those using it less frequently (35%) or not at all (2%). This finding suggests that project collaboration solutions are becoming standard practice on BIM projects in the industry.

Frequency of Using a Collaboration Solution on BIM Projects

Degree to which respondents report currently using some type of collaboration solution on their BIM projects to view, share, review and/or mark up/comment on models and/or documents



Analyzing Collaboration Solutions

BIM ENGAGEMENT LEVEL CORRELATES TO GREATER USE OF COLLABORATION SOLUTIONS

BIM ENGAGEMENT LEVELS

About half (48%) of all respondents are high engagement BIM users, meaning that 50% or more of their projects involve BIM. Below is the breakdown by company type:

	ARCHITECTS	ENGINEERS	GENERAL CONTRACTORS	TRADE CONTRACTORS
High BIM Engagement	62%	54%	46%	30%
Low BIM Engagement	38%	46%	54%	70%

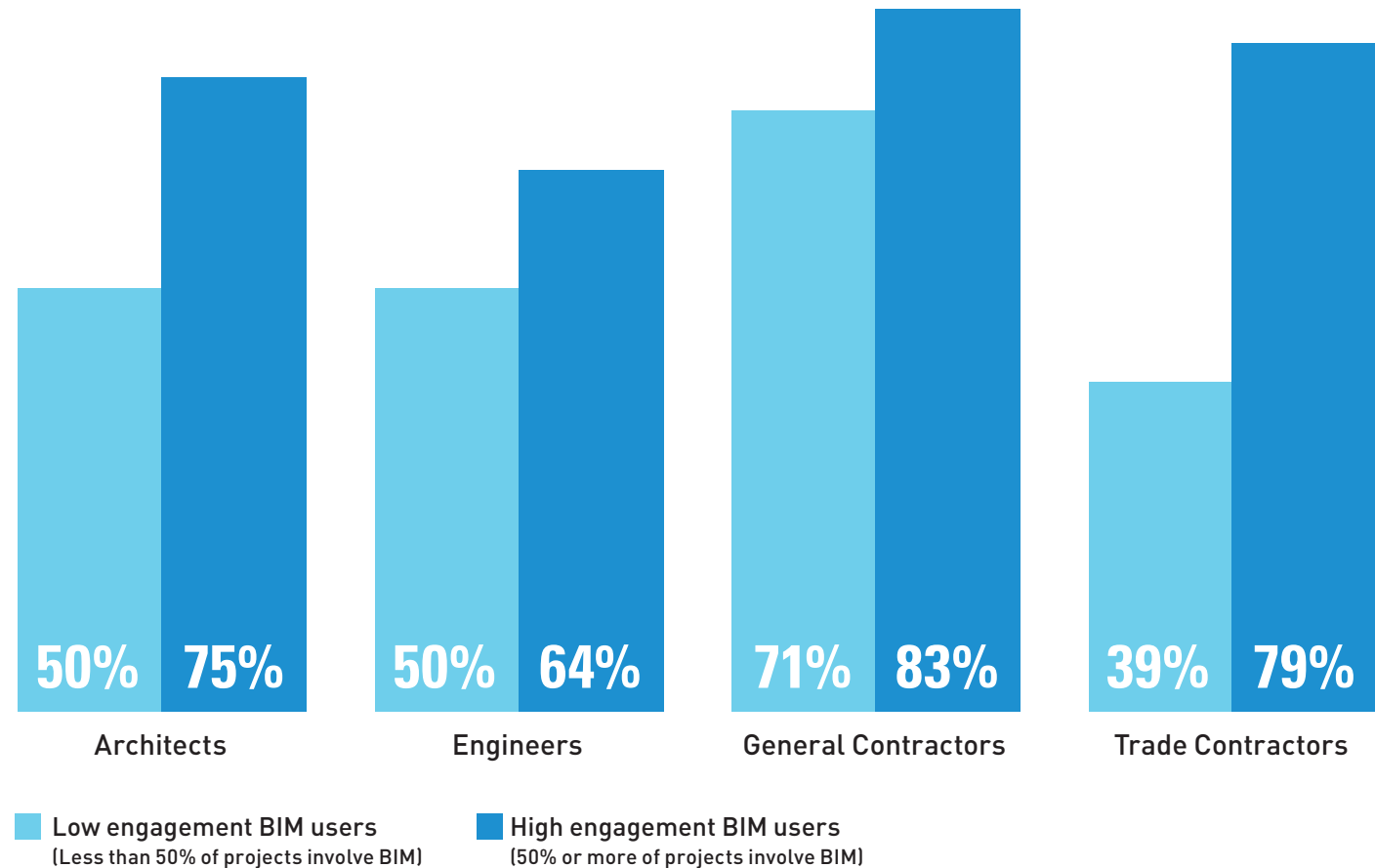
FREQUENCY OF BIM AND COLLABORATION

As shown in the chart at right, there is a consistent positive correlation across all company types between high BIM engagement and frequent use of project collaboration solutions.

This trend is especially pronounced for trade contractors, which suggests how both BIM and collaboration solutions are driving deeper engagement by the full supply chain.

Impact of BIM Engagement Level on Frequency of Using Collaboration Solutions on BIM Projects

Percentage of high and low engagement BIM users, by discipline, who use some type of collaboration solution on at least half of their BIM projects



Analyzing Collaboration Solutions

TYPES OF COLLABORATIVE SOLUTIONS

Respondents were asked how frequently they use each of three types of collaborative solutions.

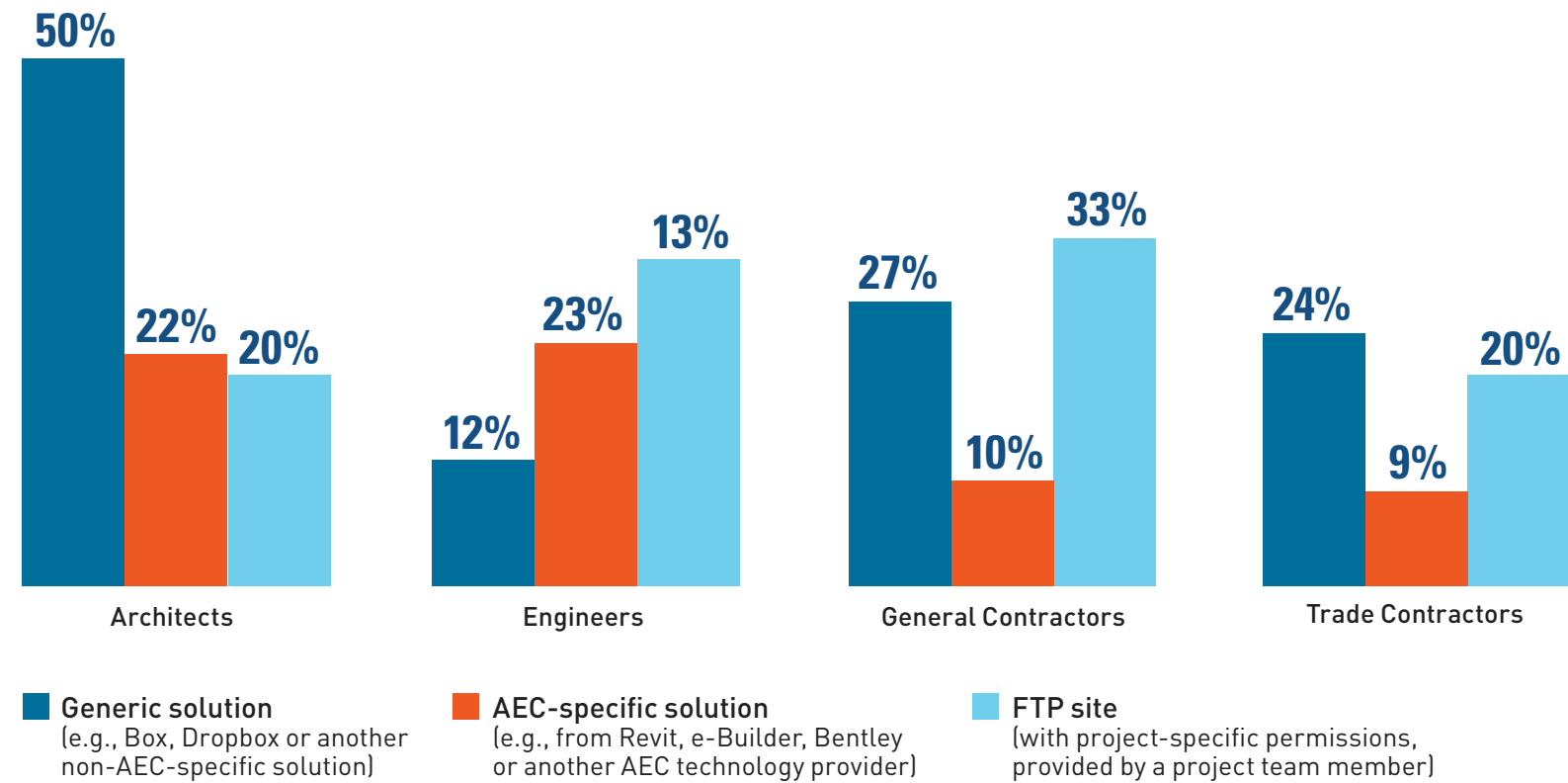
- **Generic solution**, such as Box, Dropbox or another non-AEC-specific solution
- **AEC-specific solution**, such as one from Autodesk, e-Builder, Bentley, or another AEC technology provider
- **FTP site** with project-specific permissions, typically provided by a project team member

IMPACT OF BIM ENGAGEMENT ON HIGH FREQUENCY USE OF AEC-SPECIFIC SOLUTIONS

Frequent use (on more than 50% of projects) of generic and FTP solutions is roughly even across high and low BIM engagement users. However, all (100%) architects, almost all (89%) trade contractors, and two thirds of the engineers who report frequent use of AEC-specific solutions are high BIM engagement companies, indicating what may become a growing preference among BIM-experienced users.

High Frequency¹ Use of Collaboration Solutions on BIM Projects (by Type of Solution)

Percentage of respondents, by discipline, who use each of three types of collaboration solution on at least half of their BIM projects



¹Used on at least 50% of respondents' BIM projects

Analyzing Collaboration Solutions

USERS LEAST SATISFIED WITH FTP SITES

Respondents who reported using each type of collaboration solution were asked about their level of satisfaction and reasons for dissatisfaction. The chart at right shows the combined percentages of “somewhat” and “very” satisfied users (the remainder selected neutral, somewhat dissatisfied or very dissatisfied).

LEVEL OF SATISFACTION

FTP sites have the lowest level of satisfaction (especially among high BIM engagement users). The most frequent reason for dissatisfaction is because “share, review, markup functionality is lacking.”

AEC-specific and generic solutions tie for the highest average positive satisfaction (69%) across all company types. Though all the satisfaction numbers are relatively high, in most cases, the percentage of somewhat satisfied significantly exceeds very satisfied, indicating room to improve for technology companies.

Satisfaction With Collaboration Solutions Being Used on BIM Projects (by Type of Solution)

Percentage of respondents, by discipline, who express positive levels of satisfaction (somewhat or very satisfied) with each of three types of collaboration solutions on their BIM projects

	Architects	Engineers	General Contractors	Trade Contractors
FTP SITE (with project-specific permissions, provided by a company on the project team)	67%	67%	67%	47%
AEC-specific solution (e.g., from Autodesk, e-Builder, Bentley or another AEC industry technology provider)	73%	70%	62%	67%
Generic solutions (e.g., Box, Dropbox or another non-AEC specific solution)	92%	73%	65%	49%

Key Takeaways

CONNECTING TEAMS

PROJECT COLLABORATION SOLUTIONS ARE BEING USED FREQUENTLY

Almost all (98%) respondents report using some type of a cloud-based collaboration solution on their BIM projects, and about two thirds (63%) are using one on over half of their projects.

BIM ENGAGEMENT CORRELATES TO MORE FREQUENT USE OF COLLABORATION TOOLS

Users who have a high level of BIM engagement (i.e., 50% or more of their projects involve BIM) use collaboration solutions more frequently than their lesser-engaged peers, underscoring their value for BIM projects.

MOST USERS PERCEIVE POSITIVE ROI

Among the respondents who report having made a significant investment in collaboration solutions and could provide an estimated ROI, the vast majority (82%) cite a positive ROI, and another 14% believe they are at break-even. Only 5% feel they have not have yet recovered the value of their investment.

COLLABORATION SOLUTIONS PROVIDE MULTIPLE BENEFITS TO USERS

Over half of users cite receiving key benefits from their involvement with project collaboration solutions, including:

- Reducing project error and data friction
- Reducing time required for communication, workflows and decisions
- Increasing client satisfaction with greater project visibility and input
- Delivering higher-quality, more creative designs/projects

BENEFITS OF EQUIPPING AN OWNER WITH A COLLABORATION SOLUTION

Over half of users who have equipped owners with a project collaboration solution report a number of key benefits, including:

- Better client understanding of the proposed design
- Improved client-design team relationship
- Improved overall design solution
- Faster decision-making
- Fewer design changes during the process

DISSATISFACTION HIGHEST WITH FTP SITES

Users express generally high satisfaction with AEC-specific products from industry technology companies and generic collaboration sites, but are less enthusiastic about FTP sites for BIM projects, primarily because of the lack of share, review, markup functionality.

USERS IDENTIFY KEY OBSTACLES TO INCREASING USE OF COLLABORATION SOLUTIONS

Users cite cost and complexity as the two top obstacles to increasing their use of project collaboration solutions, both of which should improve as usage increases and technology companies advance their development.

USE OF COLLABORATIVE PROJECT DELIVERY MODELS POISED TO SPUR GROWTH

Users are forecasting growth in use of collaboration-friendly project delivery models such as integrated project delivery, which should facilitate increased use of project collaboration solutions.

Industry Leaders

EXAMPLES OF CONNECTING TEAMS

The following pages show a variety of ways that project teams are leveraging collaborative solutions to improve project processes and outcomes.

ARCHITECTS IN TWO CITIES COLLABORATE ON MAJOR NEW CITY HALL

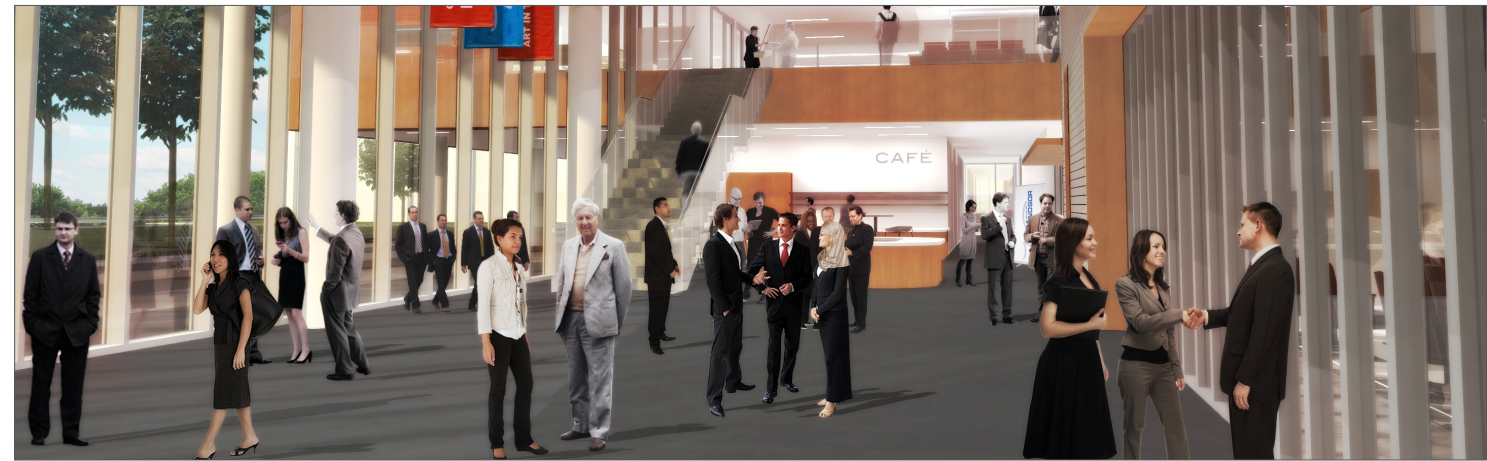
As joint-venture architectural projects deploying BIM become more common, having a centralized location for collaboration is increasingly essential.

To design a new city hall in their home of Windsor, Ontario, Architettura teamed with Toronto-based Moriyama & Teshima. “Being a BIM project, it was necessary to have joint access to our BIM model. We didn’t have the infrastructure set up to accommodate this kind of joint-venture prior to this project,” explains Claudia Cozzitorto, BIM Director at Moriyama & Teshima. “We needed to address and determine how we were going to handle communication being split between two offices.”

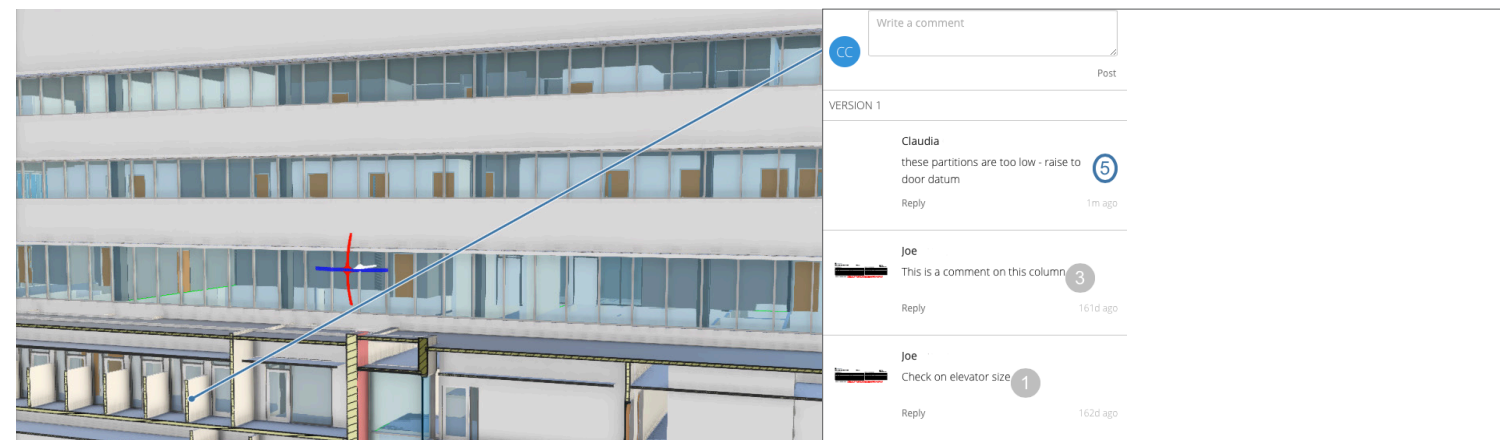
A cloud-based project collaboration solution successfully provided the team with a central project repository, communication center and a space for the two design teams to view, review and collaborate across BIM models. Even team members who are non-BIM software users could access the model without fear of damaging it or making unintentional modifications.

Source: Moriyama & Teshima

Two Architectural Firms Leverage Cloud Solution for Collaboration



Collaborative BIM Workflows Enhance Design Process



Industry Leaders

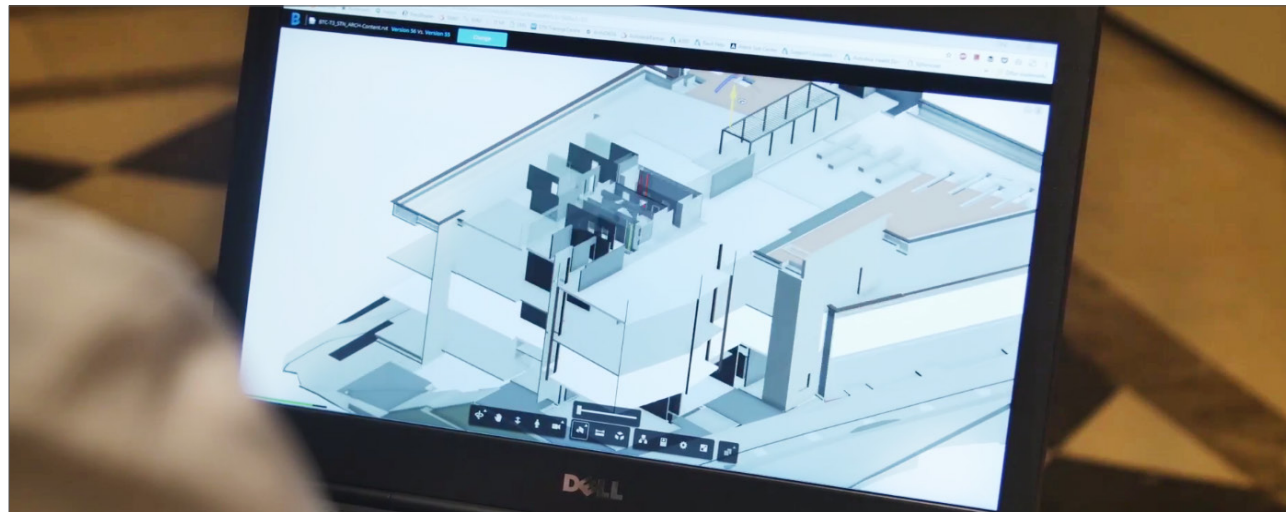
EXAMPLES OF CONNECTING TEAMS

DISTRIBUTED TEAM COORDINATION ON A 10-TOWER MIXED-USE PROGRAM

Because the multi-building program was so complex, it required a high degree of collaboration between multiple teams. Stantec, a large multidisciplinary architecture and engineering firm, implemented a collaborative solution as a central cloud repository, where distributed team members could share and view BIM models in real time from anywhere. This saved hours by tracking updates immediately with version history and digitized comments, thus avoiding manual processes. The client could also participate with just browser access to monitor progress.

Source: Stantec

Digital Workflows Save Time and Improve Owner Engagement



Mixed-Use Towers Leverage Cloud Collaboration



Industry Leaders

EXAMPLES OF CONNECTING TEAMS

JOINT VENTURE LEVERAGES CLOUD FOR UNIFIED DESIGN EFFORT AT LAX

Corgan and Gensler combined their design teams in a joint venture with Turner/PCL for the \$1.3 billion Midfield Satellite Concourse at Los Angeles International Airport.

Wanting more than a typical association, the firms committed to fully integrating as one partner, rather than splitting the work up or handing things off back and forth. “Many times when multiple architectural firms associate, they look at how they will break work apart. In this case, we decided to comingle the team: all the way from the top management down to how we actually produce the document, we had members of each firm working side by side,” says Brent Kelley, Aviation Principal, Corgan.

A cloud-based collaboration platform was critical to the success of this approach, enabling designers to communicate efficiently and share complex BIM models across multiple teams in different offices, effectively working in real time as one unified design team.

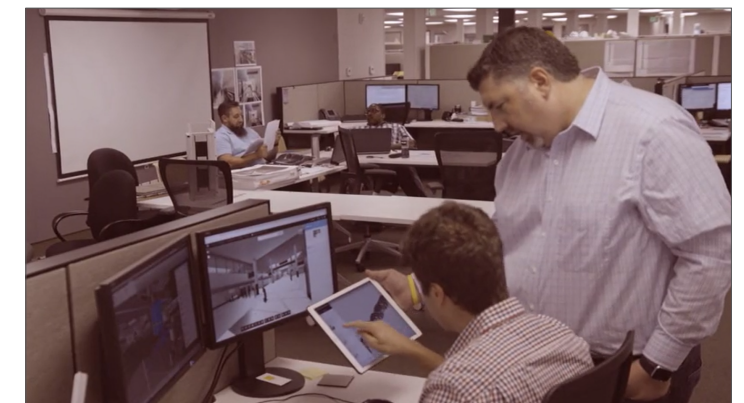
This approach also saved costs. “When it comes to infrastructure for our projects, relying on the cloud for our model hosting also eliminates requirements for local servers, maintenance on servers, server updates. We can now take design further with the same dollar,” asserts Chad Speas, Design Applications Manager, Corgan.

Source: Corgan and Gensler

Joint Venture on Complex Airport Project Requires Innovation Solution for Successful Integration



Cloud Collaboration Solution Enables Unified Design Team Across Two Architectural Firms



Research Demographics

SURVEY

An online survey fielded in June and July 2017.

RESPONDENTS

Total of 203 respondents include:

- 52 architects
- 52 engineers (18 structural, 34 MEP)
- 52 GC/CMs (general contractors or construction managers, listed as general contractors in the analysis for the sake of brevity)
- 47 specialty trade contractors

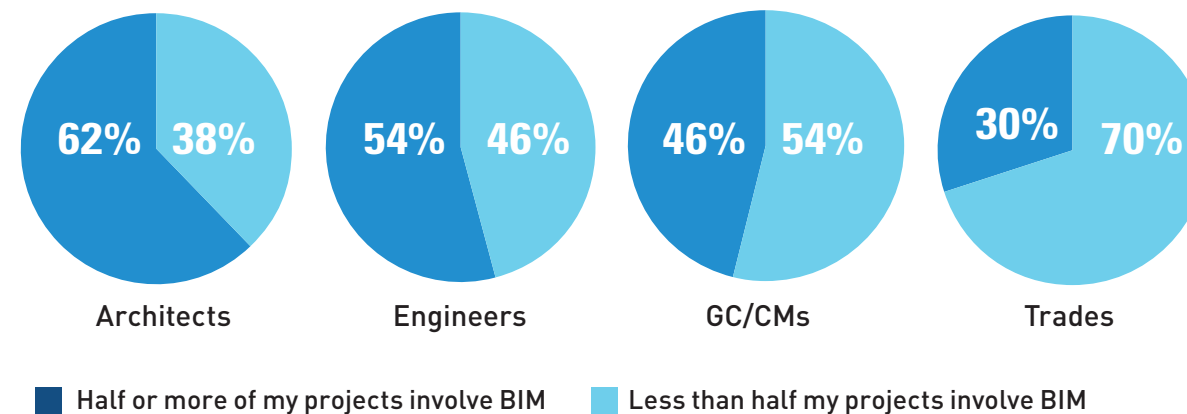
Respondents' roles include principal/senior executive (33%), project manager/project executive (52%), and other (15%).

All respondents:

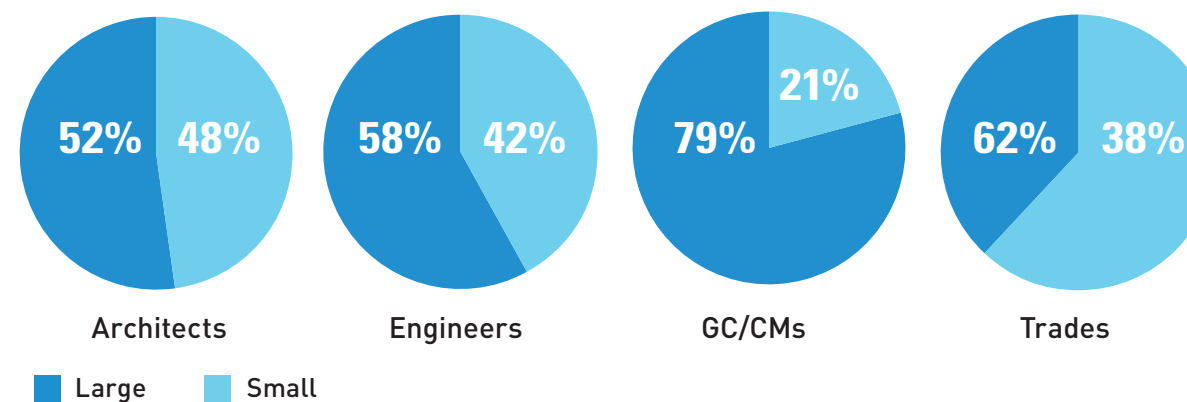
- Do mostly buildings projects.
- Are currently involved with BIM on their projects. The chart at upper right shows their level of engagement with BIM, by discipline.

	DESIGN FIRMS	GC/CMs	TRADES
SMALL	Less than \$5M	Less than \$50M	Less than \$20M
LARGE	\$5M or more	\$50M or more	\$20M or more

BIM Engagement of Respondent Companies



Size of Respondent Companies



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 news gathering organization, where she gained detailed insight into the construction industry. She holds a PhD 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
Research



Donna Laquidara-Carr
PhD, LEED AP
Research Director
Industry Insights
Research

ADDITIONAL RESOURCES

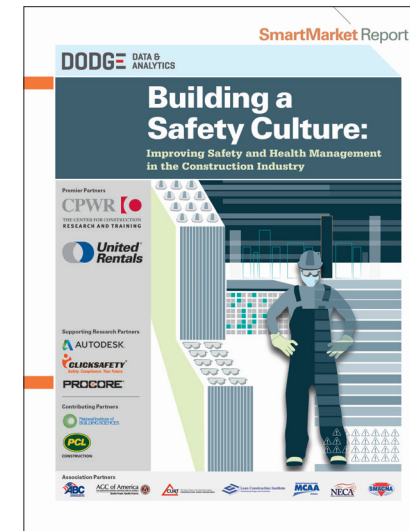
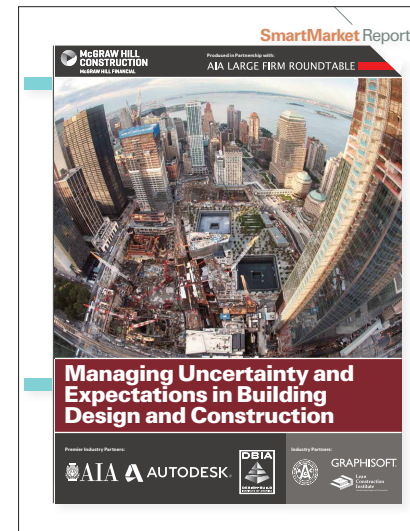
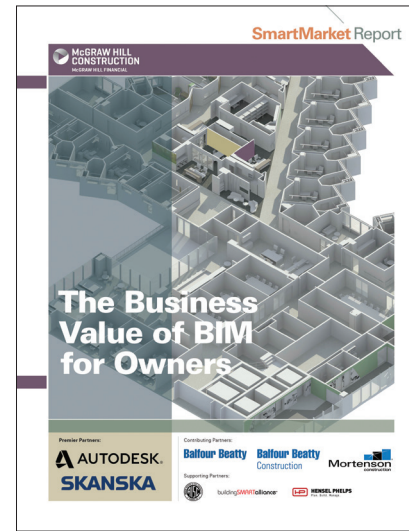


Technology is radically disrupting the way buildings and infrastructure are designed, built and used. Disruptive innovation is transforming markets, and traditional methods of working are being displaced. Tools and processes are evolving rapidly, blurring the lines between physical and digital, and creating a new landscape for innovation and competition.

Autodesk understands the challenges our customers face today and in the future because we have a history of leading through change. Beginning 30 years ago, Autodesk led the shift from the drafting table to the computer (CAD) through the era of documentation. When 2D moved to 3D, Autodesk invested strongly, with BIM technologies that helped visualize, simulate and analyze the physical and functional performance of buildings and infrastructure before breaking ground; and now we are leading the industry's transformation to BIM during the era of optimization. Today, as new technology is disrupting the way things are designed and made, Autodesk will lead again, building upon our BIM portfolio with technology and platforms that connect designers and builders not just through the model, but through connected projects, teams, insight and outcomes that will enable a new means of creating, using, and measuring building and infrastructure systems in the era of connection.



Dodge Data & Analytics: Main Website: construction.com Dodge: construction.com/dodge
Research & Analytics: www.construction.com/products/dodge-research-analytics Sweets: sweets.com
SmartMarket Reports: analyticsstore.construction.com



Get Smart About the Latest Trends.

About Dodge Data & Analytics Dodge Data & Analytics is North America's leading provider of analytics and software-based workflow integration solutions for the construction industry. Building product manufacturers, architects, engineers, contractors, and service providers leverage Dodge to identify and pursue unseen growth opportunities and execute on those opportunities for enhanced business performance. Whether it's on a local, regional or national level, Dodge makes the

hidden obvious, empowering its clients to better understand their markets, uncover key relationships, size growth opportunities and pursue those opportunities with success. The company's construction project information is the most comprehensive and verified in the industry. Dodge is leveraging its 100-year-old legacy of continuous innovation to help the industry meet the building challenges of the future. To learn more, visit www.construction.com.

For more information on these reports and others, visit analyticsstore.construction.com.