The Future of Project Information Management

Finding Common Ground

Dodge Construction Network

ConstructionProgressCoalition

BIM TRACK®

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Contents

Introduction

Last year Newforma conducted its inaugural thought leadership research in conjunction with Dodge Construction Network (formerly known as Dodge Data and Analytics) to gain deeper insights into how the management and flow of project information affects the AEC industry and successful construction project delivery.

This year we expanded our survey to include our industry partner, The Construction Progress Coalition, and general contractor professionals.

The primary focus of this year's research is to examine the pain points of sharing information across external firm boundaries, and exchanges of information at critical points in the project life cycle including the design process and the handoff from design to construction. By identifying where information bottlenecks in key workflow processes are occurring, project teams can focus improvement efforts on the areas that have the greatest impact to the project and the firm.

The research is comprised of two components: Newforma partnered again this year with Dodge Construction Network to conduct an online survey. The Dodge Construction Network survey was fielded across an anonymous panel of architects, engineers, and construction professionals. In addition, Newforma conducted a virtual, closed-session roundtable discussion with a panel of AEC professionals to get their perspective on challenges with collaboration and sharing across firm boundaries.

As digital solutions continue to expand in the industry, building relationships and trust by sharing information more freely across firm boundaries is imperative for all project stakeholders.

The findings from this year's research clearly indicate that the industry is ready for the change in basic assumptions required to achieve this goal. However, the question regarding who takes the first step may still be a barrier to overcome.

The panel insights combined with the survey results may help project teams benchmark their processes for collaborating and sharing information with the common goal of delivering excellent projects.

About this Study

Roundtable Participating Companies

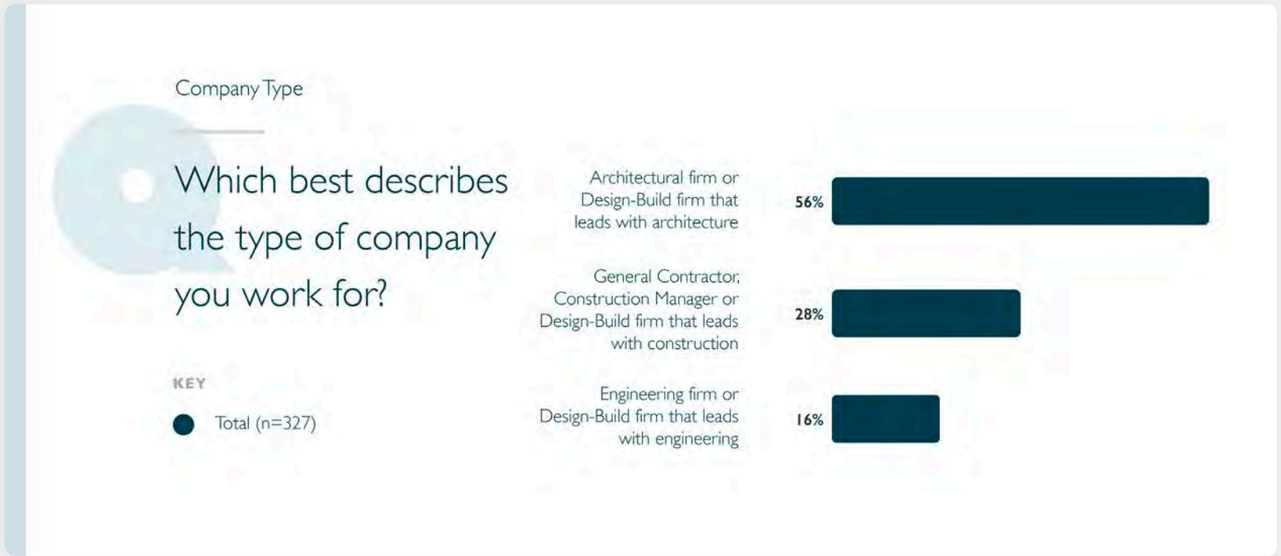
This year's roundtable discussion was held on July 19, 2022 and was moderated by Nathan Wood, Executive Director of the Construction Progress Coalition, and Tony Page, Senior Director of Newforma Strategic Accounts (formerly a practicing architect).

- Hargrove Engineering
- HDR
- Mortenson
- RS&H
- The Walsh Group

Dodge Construction Network Survey Methodology

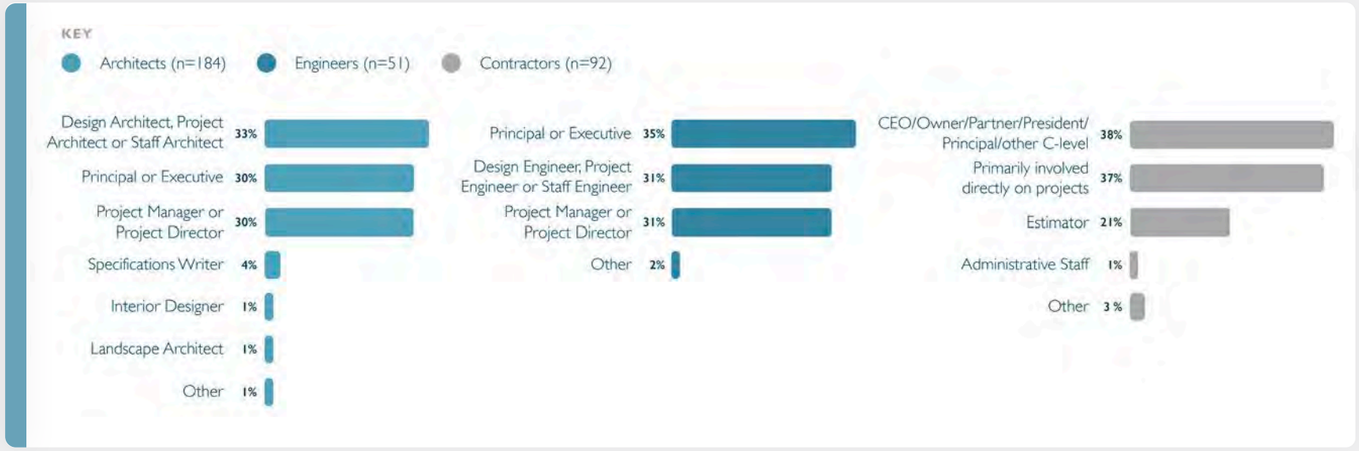
The study was conducted anonymously online from June 29 to July 12, 2022, among 327 US design and construction professionals, including 184 architects, 51 engineers, and 92 contractors. All respondents have worked primarily on non-residential construction projects (excludes single-family) in the last five years.

Most firms (70%) only conduct business within the US; however, twenty percent also conduct business in Canada and Mexico. Respondents from US firms are quite evenly dispersed across the South, West, Midwest, and Northeast regions.



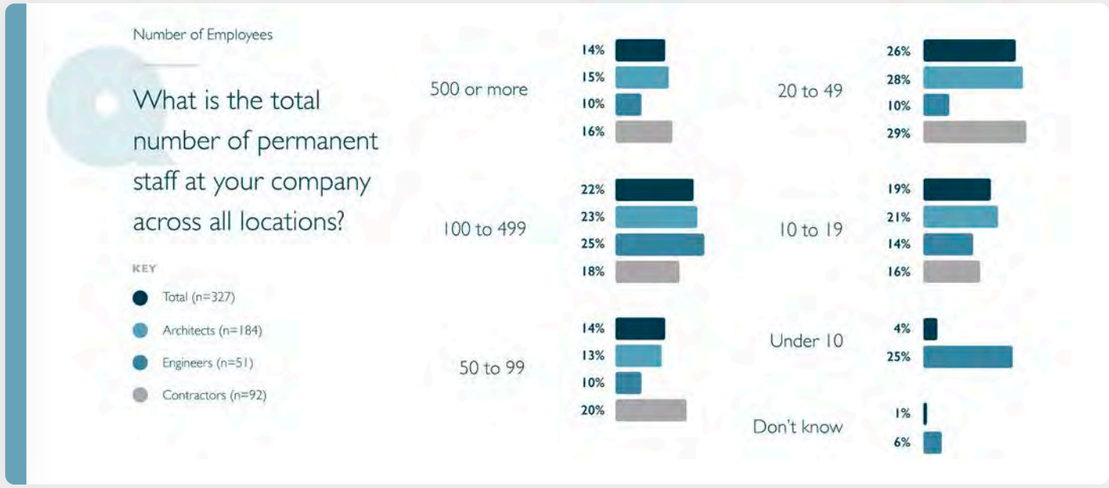
Job Roles

At least one-third of respondents hold executive or principal level positions, and most are directly involved in the day-to-day management of the project.



Firm Size: Number of Employees

There is a wide distribution of company sizes by number of employees across segments. Note: architectural and contractor firms with less than 10 employees were screened out from the survey.



Key Findings

Main themes surfaced related to finding information needed to make informed decisions, and difficulty collaborating and sharing with external team members.

We still struggle to find common ground. However, the barriers to sharing information are not obvious. Both human and technology obstacles are cited in this year's findings. The challenges cited in this survey are similar to those in the 2021 survey. However, some priorities have shifted.

This year's major themes include:

Firms cannot find the information needed to make informed decisions. This is a major challenge for sixty-nine percent of this year's respondents. However, survey results revealing that project decisions are tracked through email and meeting minutes, and lack of standard processes create inconsistencies across projects, could be contributing factors.

Firms are still struggling with collaborating and sharing information with people externally. Many respondents say that they do not receive complete and clear information on time. In addition to technology barriers, human barriers related to trust and expectation setting also get in the way of open sharing of information between external project team members.

Even with the cloud, firms are still uploading and downloading information. Respondents are making technology investments in the cloud with the primary business goal of improving team collaboration. However, it appears that AEC professionals have multiple clouds that still require uploading and downloading information between clouds. Respondents are looking for a more standardized approach to sharing information.

69%

The top challenge to managing project information is finding the right information to facilitate informed decisions, closely followed by collaboration.

68%

Share that a major impact of workforce volatility is new staff members being required to learn new processes and systems.

76%

Say that the main methods to track and document project decisions are through meeting minutes and decisions noted in email (59%).

47%

Suggested more standardization through cloud usage and system integration as the industry-wide change that is needed to improve project collaboration between stakeholders.

Section One: Top Challenges & Impact on Project Performance

There was a shift in the top spot from last year's survey for the net top three challenge related to the management of project information.

This year the challenge of finding information needed to make informed decisions outranked last year's top challenge of collaboration and sharing. Across the board, close to one third of architects, engineers, and contractors ranked finding information as their number one challenge, and 69% of respondents ranked this as a top three challenge.

69%
cannot find the information needed to make informed decisions.

66%
are challenged with collaboration and sharing externally.

57%
struggle with manual administrative tasks needed to enter data across systems.

7%
list accessing project information from remote locations as a challenge. This is up slightly from the 2021 ranking of 5%.

Collaboration and sharing across external organizations continue to persist as a significant challenge. Architect and engineering respondents ranked this slightly higher than peers in contractor organizations. However, almost a quarter of architect respondents cite manual administrative time spent entering data across systems as an issue, which may impact how architects feel about collaboration and sharing with people outside their organization.

Architects and engineers were asked this question in last year's survey.

There was a considerable jump from last year's responses from architect respondents regarding finding information needed to make informed decisions up from 15% in 2021 to 28% in 2022. While collaboration and sharing challenges stayed the same for architects from last year (24%), there was a slight uptick for engineers from 2021 at 20% and 2022 at 25%. In addition, there was also a considerable increase in the response about challenges related to maintaining audit trails of project documents for legal or client requirements with engineers reporting an 18% increase from last year, and a 10% increase for architects.

Given that remote work is the new norm as a fallout from the Covid-19 pandemic, it is surprising that only 7% of all respondents rank accessing project information from remote locations as their number one priority. This is only a slight increase from last year's architect and engineering response of 5%. Contractors prioritize this higher at 12% which could be related to accessing information from the field vs. home.

Finding Information Needed to Make Informed Decisions

Finding information needed to make informed decisions was the net top three response for most respondents (69%) regarding top challenges in managing project information.

More contractors than architects or engineers ranked this as their number one challenge (30%), however responses from counterparts were not far behind. Twenty-eight percent of architects ranked finding information to make informed decisions as their number one challenge. Engineering firms were equally split between this challenge and collaborating with external parties (25% each).

There are several contributing factors outlined in other survey questions. For example, factors related to how information is shared and stored reveal that critical project decision information is often exchanged through email and meeting minutes. Given that this type of information is unstructured and often not organized in a meaningful way, it is not surprising that professionals cannot find the project information they need.

Roundtable participants were also able to shed some light on this problem. Many participants struggled with the same issue and discussed the importance of having a common or standard structure for storing information. They explained that this does not necessarily mean that information needs to be stored in the same location, as firms have regional offices spread across varying locations. However, having standard folder structures and folder naming conventions across the firm ensures that everyone knows where to look for the information they need regardless of what project they are working on.

"We got off the rails several years ago. We had several different operating groups, and regional offices where our Chicago office does it this way, and our Milwaukee office does it another way. Our HQ positions like legal, senior leaders, and risk, needed to go find something in everyone's folder structures, and everyone's saved stuff in different places. Now we are all going to do things the same starting with that folder structure. Bring it down to two parent levels. And then after that, have at it."

Alison Hart, Mortenson

Challenges with Communicating, Collaborating & Sharing Externally

Two-thirds of respondents ranked collaboration and sharing externally as a major challenge.

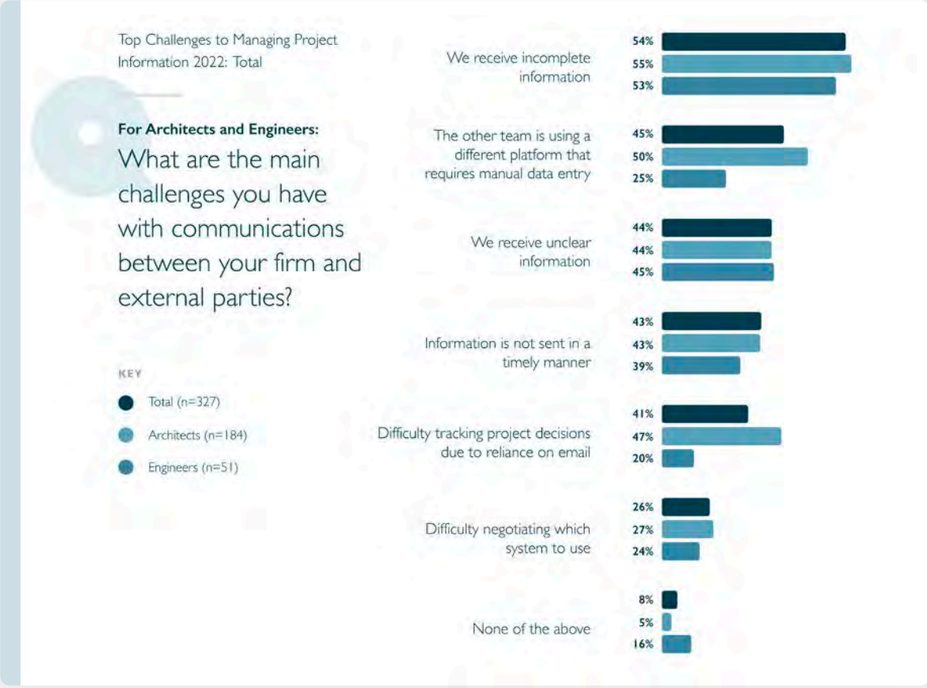
To gain a better understanding of why collaboration and sharing across external organizations continues to be a major challenge, we asked a few more probing questions related to communication, collaboration, and sharing. We also asked questions to identify where in the project life cycle pain points are occurring.

Communication Challenges

We first examined issues related to communication. The main issues common with all stakeholders which represent the widest gaps are:

Half of the architect respondents cite that the contractor is using a different platform that requires manual data entry. This may explain why information received is incomplete or is not received on time as information may be transferred manually between systems.

In addition, a substantial proportion of all stakeholders rank difficulty tracking project decisions due to reliance on communication through email as a major concern (41% architects/ engineers, 36% contractors). Project decisions sent via email may also be a contributing factor to incomplete, untimely, and unclear communication across project teams.



54% of architects and engineers, and **61%** of contractors commonly recieve incomplete information.

58% of contractors and **43%** of architects and engineers do not revieve information on time.

49% of contractors and **44%** of architects and engineers recieve unclear information.

"The big question is, whose model is it and at what point in time? And is there one model or is it different copies of the model where we think it's one copy but it's not? Who has the contractual obligation to maintain that model? There are still a lot of unknows."

Nathan Wood, Construction Progress

"Getting away from the mentality of "I'm over here on this side, and I'm over here on that side", requires breaking down the walls to really make a successful project and team. If you can address that much earlier in the process and start with little things, such as a common model that we all own on a project, you make much more progress on a project in reducing risks and mitigating quality. It also helps with future interrelationships as you go forward."

Alison Hart, Mortenson

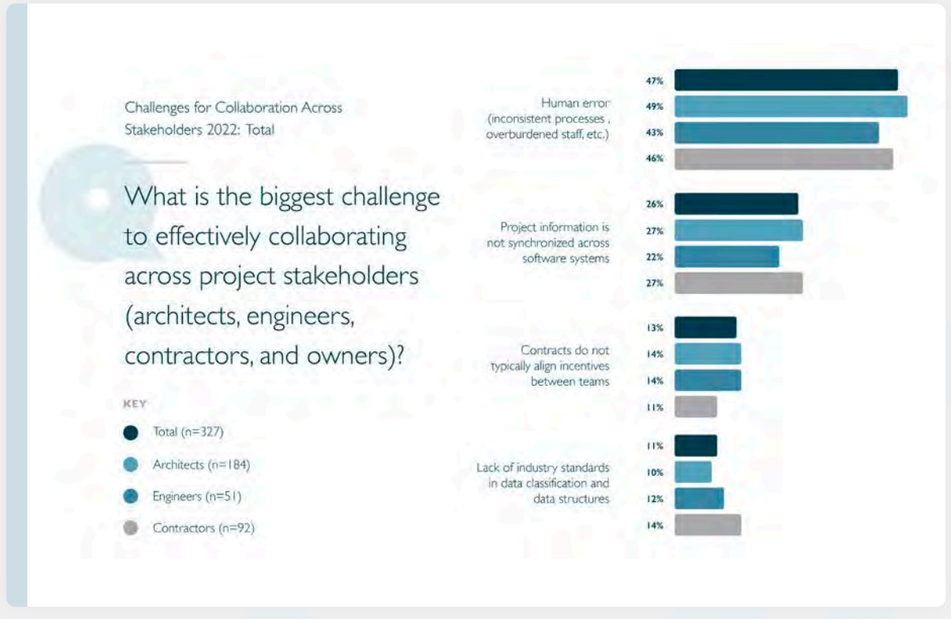
Collaboration Challenges

Effective communication and collaboration go hand in hand. Almost half of respondents (47%) cite human error as the biggest challenge to effectively collaborating across project stakeholders. Errors commonly occur when data is manually entered across different platforms. In addition, information communicated primarily through email is subject to human error.

Communication issues cited in this year's findings including 'receiving incomplete information', 'receiving unclear information', and 'not receiving information in a timely manner' may also be due to human error.

Project information that is not synchronized across software systems was also reported as a challenge impacting effective collaboration by one quarter of respondents. Miscommunication may occur when information is out of synchronization between stakeholder platforms. If all parties are not on the same page with document versions, schedule changes, or issues found, friction between parties is likely to occur.

Interestingly, very few respondents (13%) cited collaboration challenges due to misalignment of contract incentives.



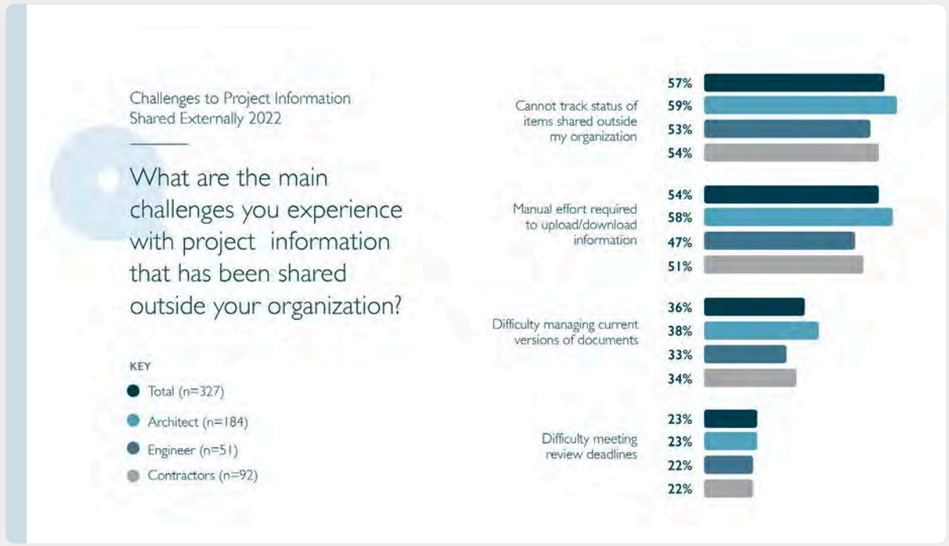
Issues with Sharing Information Outside the Firm

When sharing information outside of their organization, more than half of respondents (57%), cannot track the status of items shared outside their organization. This lack of visibility once information is transferred to another party's system often results in communication issues that ultimately impact team relationships.

Effective collaboration requires open and efficient sharing of information. What information needs to be shared and when in the project life cycle may also impact successful collaboration. As highlighted in this year's roundtable discussion, sharing information introduces risk. The lack of transparency between stakeholders is also a contributing factor to issues with sharing information externally.

Almost as many respondents (54%) are challenged with the manual effort required to upload and download information between systems. This is a shift down from 65% in 2021 for architects and engineers. As cloud solutions and system integrations with open APIs increase, less manual effort to transfer information between platforms is required. However, the industry is still challenged with each party needing a specific software solution that is not addressed by other platforms.

In addition, over one-third of respondents report difficulties with managing current versions of documents. This correlates to responses related to challenges with document issuance and tracking.



"We are going from an environment where we're used to doing downloads and uploads, and now we are moving more towards a collaborative situation where people want real-time data so everyone can be looking at the same files at the same time."

Connie Thorne, Hargrove Engineering

"Having transparency and trust enables faster workflows, more transparency into the project, and frankly a level of trust that allows us to remove that minutia that constantly is just stringing us along on projects. So, whether it be costs, schedule delays, coordination delays, or just communication between stakeholders, it affects the entire life cycle of a project."

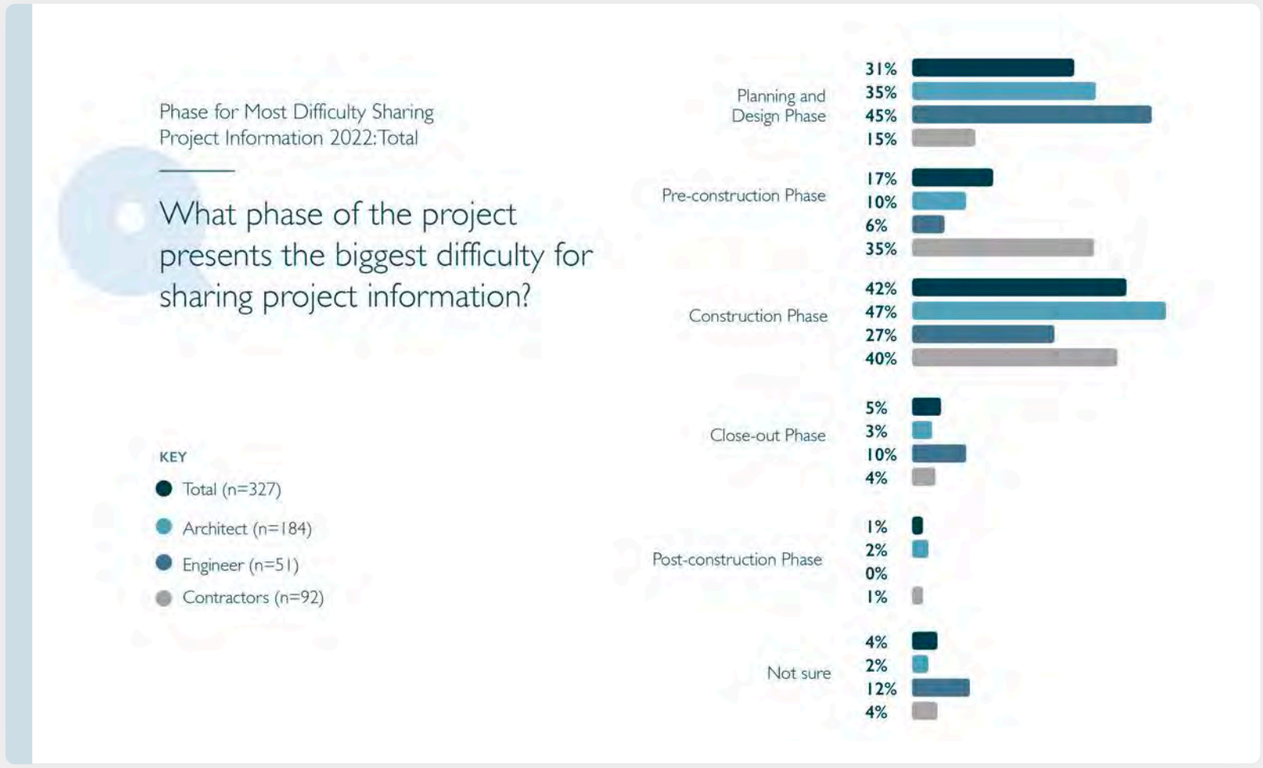
Dan Smolilo, Walsh Group

Where Challenges with Sharing Information are Occurring

Finding where in the project life cycle issues related to sharing information are occurring can help teams pinpoint where to focus improvement efforts. Although the construction phase ranked highest overall (42%), forty-five percent of engineering respondents ranked the planning and design phase as the most difficult phase for sharing information. Given that engineering firms must coordinate with architectural firms for model development, this response is not unexpected.

Architects (47%) and contractors (40%) are more likely to find the construction phase to be difficult while contractors also cite the pre-construction phase as challenging (35%). This is not surprising given the significant amount of interaction and sharing that needs to occur between the design team and construction team prior to construction.

When it comes to sharing information, roundtable participants named the handover from design to construction as the most challenging point in the project. In the design phase, sharing models between architects and engineers is still problematic. As more companies move to cloud environments, it easier to share models, however, roundtable panelists shared that software licensing and access permissions to data are increasing the barriers.



"As the industry moves into more user type licensing, assigned licensing, or cloud-based licensing, it becomes more problematic because companies are having to purchase licenses in order to collaborate with the system that we use."

Michael Finley, RS&H

"We often must go through our IT group, or some sort of security protocols to make sure that everybody has the right access. As project teams change throughout the longer projects, we have to update that access. It is constant change and it's hard to keep up with it. When we are talking real-time collaboration with people outside of our company, it gets a lot more complicated."

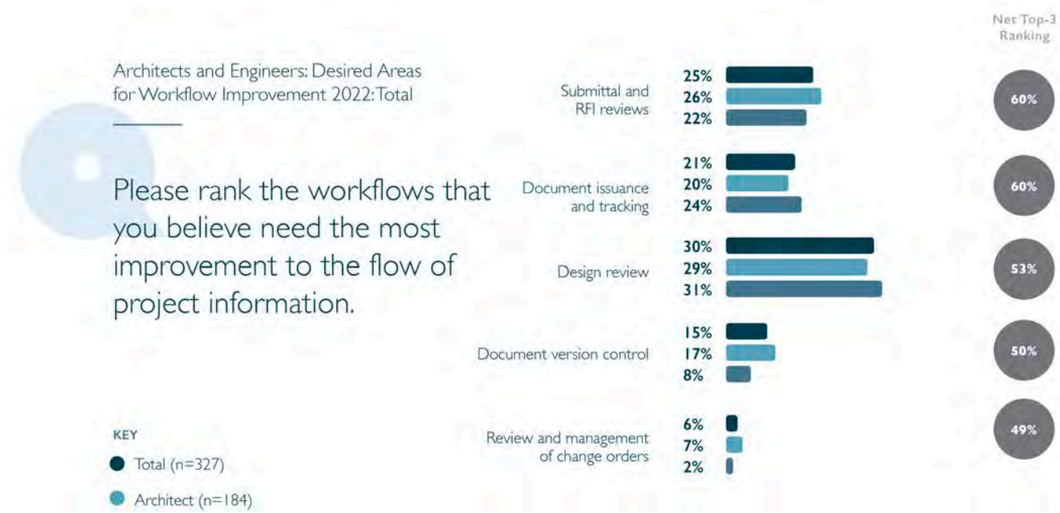
Connie Thorne, Hargrove Engineering

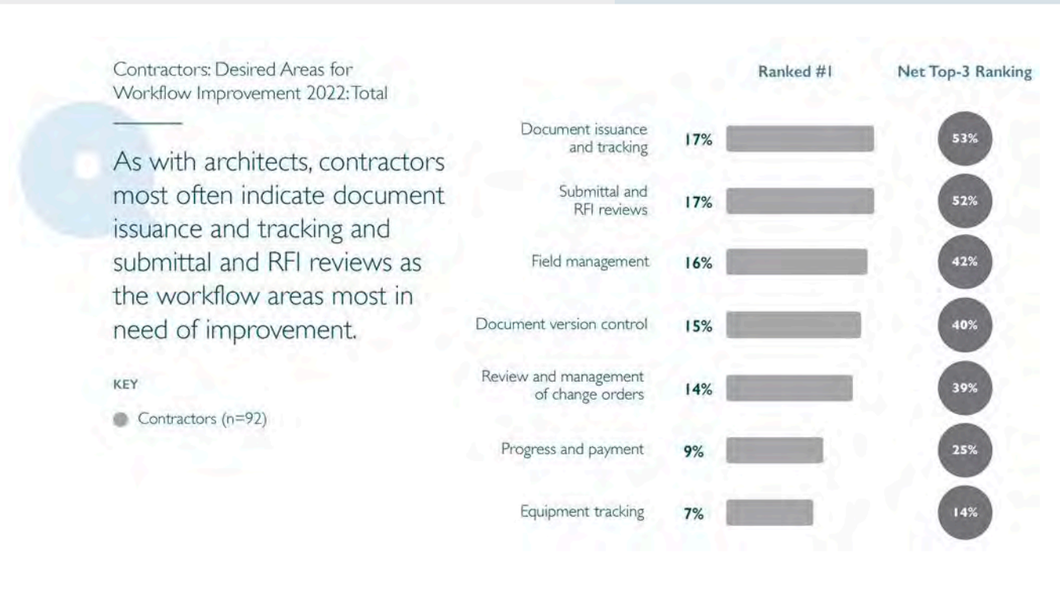
Where Workflow Improvements are Needed

When asked which workflows require the most improvement related to the flow of project information, submittal and RFI review along with document issuance and tracking tie as top contenders with a net top three ranking of 60% among architects and engineers.

Contractors were asked the same question, however survey response options varied. Over half of the contractor group ranked document issuance and tracking as their net top three concern. Submittal and RFI reviews also ranked as a top challenge with over 50% of respondents. These workflows typically cross external team boundaries where information needs to be shared between platforms.

> *Half of architect and engineering respondents also rated document version control as a top three challenge, in comparison only 40% of contractors cited this as issue.*



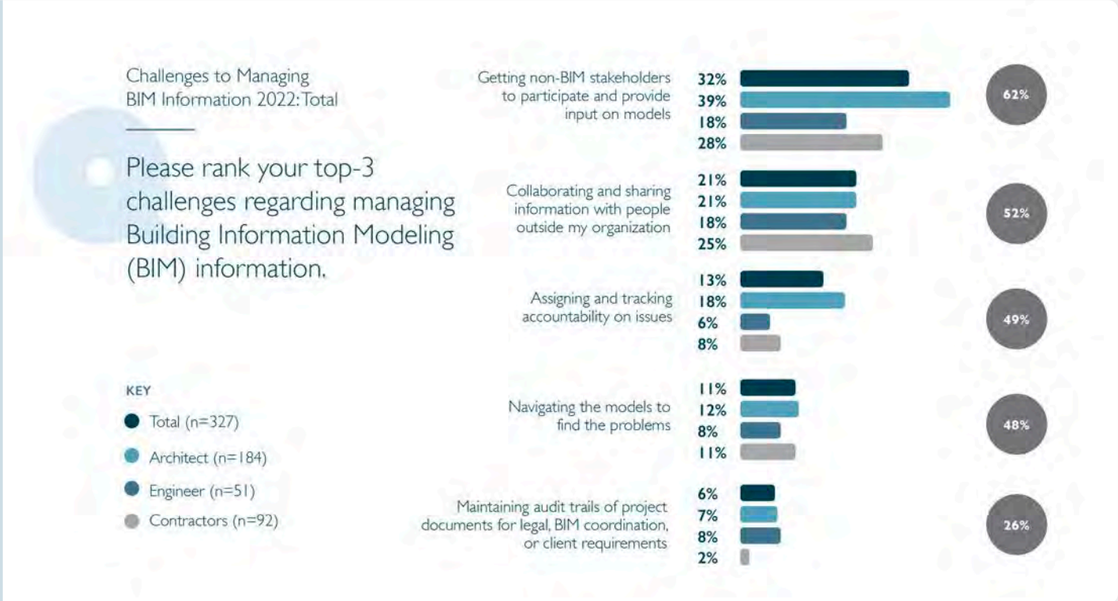


Obstacles Managing Building Information Modeling (BIM)

Sixty-two percent of respondents from this year's survey (net top three ranking) say the key obstacle to managing BIM information is convincing non-BIM stakeholders to take part and provide input. This is seen as more of a challenge for 70% of architects. However, over 58% of contractors also feel the pain.

Collaboration and sharing of BIM information with people externally is also a major challenge for more than half of respondents net top three ranking. Our roundtable panel highlighted issues with software licensing and security as barriers to sharing, however, workflow processes involving uploads and downloads of models still exist. Cloud technology has helped alleviate the manual workload; but there are still obstacles to overcome to truly collaborate and share BIM information.

Roundtable participants were able to shed light on the challenges with collaborating on models. As the universe of stakeholders expands, so does the complexity. Issues related to where models are hosted, how often they are synchronized, and who has access come into play. In addition, risk management and liability issues also factor into the equation when sharing models.



"One of the challenges is the transparency issue between designers and builders. Whenever we go into the modeling component, it's, 'here's our model, and your assets, and you are liable for anything that's wrong in the model that we might have messed up.' Which is fine. We'll take on that risk."

Dan Smolilo, Walsh Group

"Are we sharing models in the cloud, or are we still kind of uploading and downloading?"

Nathan Wood, Construction Progress Coalition

"When you are talking about exchanging models, you may have to merge these models and determine how best can you do that. In the past, we did downloads every Friday, and everybody just dumped them in a server location. But now, we are trying to use some sort of a cloud based, sharing software, and it's easier."

Donovan Wattier, HDR

Impact on Project Performance

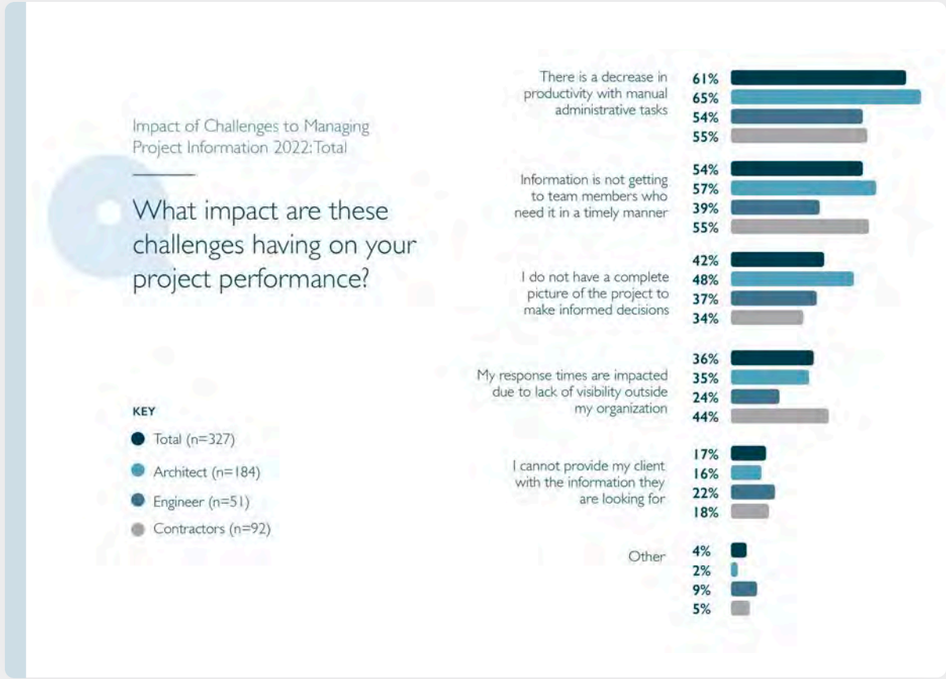
The impacts that project information management challenges have on project performance are significant. Many survey respondents (61%) flag a decrease in productivity due to manual administrative tasks as the number one impact on project performance.

This is a bigger issue for architect respondents (65%) than engineers or contractors (54% and 55% respectively). Productivity is certainly impacted when there are manual administrative tasks associated with entering data across multiple systems. In addition, productivity is impacted by team members spending too much time trying to find information needed to make informed decisions.

In addition, over half (54%) of respondents say that information is not getting to team members who need it on time. This is consistent with responses to earlier questions about challenges with communication. This is more of a challenge for contractors (55%) and architects (57%). It may be that manually transferring information between the two party's systems causes delay. Given the volume and time sensitivity of information exchanged between these parties throughout the project life cycle, this is not surprising.

There is also a correlation between the finding that respondents do not have a complete picture of the project to make informed decisions, and the top challenge of finding information to make informed decisions. Almost half of architects (48%) say that not having a complete picture of the project impacts project performance. Twenty-eight percent of architects ranked not finding information to make informed decisions as the number one challenge.

Our roundtable panel supplied further insight explaining that productivity is impacted when employees spend too much time trying to learn new technology.



"Sometimes we're almost crippled by having way too much technology to contend with working between different systems. We measure the impact these challenges have on project performance by how busy our team is - when someone can't figure out how to do something and we have to spend a lot of time helping them. Right now, we're very busy so that means that our users are very frustrated."

Michael Finley, RS&H

Section One Roundtable Insights: Barriers to Freely Sharing Information

This year's roundtable participants discussed the barriers to collaboration and sharing information with a focus on the key intersections of external stakeholders. When asked about the challenges to effectively collaborating in the early design and construction phases, several barriers to sharing information where highlighted. But they are not obvious.

Not all barriers are technology related.

Roundtable participants were open in sharing that there are still issues with trust between parties. When information is shared across firm boundaries, risk is introduced. The risk associated with transparency on how information will be used can affect a firm's willingness to share that information. As a result, sharing information such as models early in the process when the model is still under development, may be viewed as a liability.

> *However, setting expectations early in how and why information will be used may be the key to more open sharing of information. Openness with teams on how information will be used also creates a level of transparency that builds trust.*

From the architect side, Donovan Wattier from HDR shared, "When we look back at how BIM has evolved, 3D really helped us start to visualize spaces and visualize volumes and that helped us improve our deliverables. And then we start to load up on more content and data to make our production quicker, easier, faster, and more accurate. But at the same time, we have a contractor and owner running alongside, looking at our model, going, 'Hey, that's valuable information. Can we look at that? Can we have that? Can we use that?' And now we find ourselves handing over the model, which at one time was just basically our production tool."

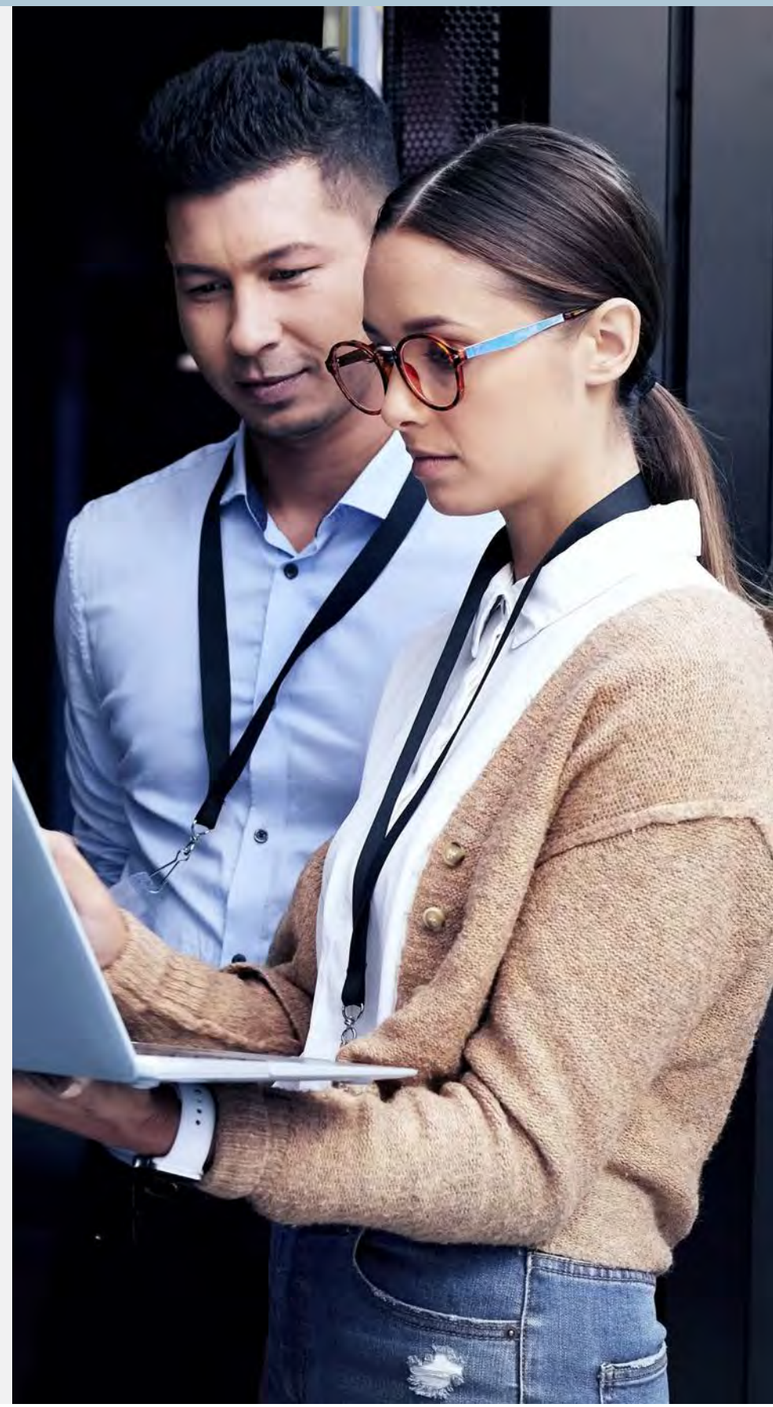
The question for project teams when it comes to sharing information, is there more risk associated with sharing information early and often in the process or is the risk greater by holding back information that other project team members may need to get up to speed quicker.

"How do we all come to the table and really build out a holistic process that's going to work both for the designers, ourselves (General Contractors) and our stakeholders such as our vendors and subcontractors, all the way up the pipeline to our owner. There's a lot of complexities in the process."

Dan Smolilo, Walsh Group

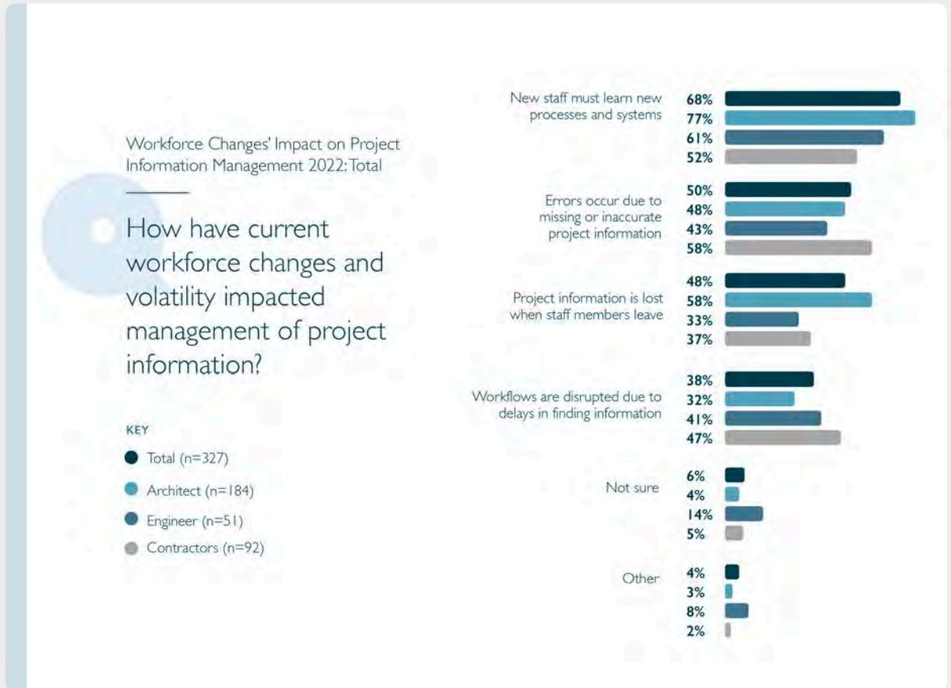
"It is not only trust, but it's also expectations. If you know at the beginning of the job that I'm handing this over to the contractor and I'm handing it over to the owner, you know that there are certain aspects that have to be in alignment with their expectations of how they're going to use it."

Donovan Wattier, HDR



Section Two: Factors Impacting Effective Management of Project Information

There are several factors that influence the challenges faced by project teams. Factors such as workforce volatility, how project decisions are tracked, and how information is managed, impact the construction industry's ability to effectively manage project information.



Workforce Volatility

The construction industry has been significantly challenged this year by workforce volatility. Flexibility in remote work has made it easier for construction professionals to jump to other firms for incentives such as increased pay, paid time off, and flexibility in work hours. As a result, the workforce is on the move.

We asked survey respondents how workforce volatility impacts their ability to manage project information. The majority (68%) say that new staff members joining a project team will need to learn new processes and systems. Architects are most impacted by this factor (77%). Learning new processes and systems requires time and training.

Errors occurring due to missing or inaccurate project information is also a factor that is particularly impacting many contractors (58%). As new team members ramp up on a project, training may not be provided which can result in an increase in errors.

Over half of architects (58%) also say that when staff members leave the organization, information is lost. Since email communication is a major component of project information, if email is not filed to the project, it can be lost when the employee's inbox is purged. In addition, information may be lost if it is not filed in a way that is organized or accessible by others. There is also a correlation in findings where workflows are disrupted due to delays in finding information.

Roundtable participants discussed issues related to learning new processes and new systems. Participants noted that new team members not only have to learn processes and systems internal to the firm, but also systems that they are required to use by other parties on the project.

How Project Decisions are Tracked

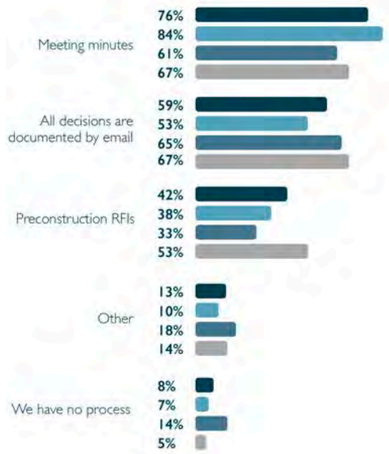
One of the most surprising findings from this year's survey are the factors related to how project decisions are tracked. Most respondents (76%) track project decisions in meeting minutes. Almost as many respondents document project decisions in email (59%). Architects are more likely to use meeting minutes (84%).

Both methods for documenting project decisions many include manual efforts to file information. Email is often not filed or associated with a project and is more likely to be saved in individual inboxes. This type of information is also unstructured making it difficult to organize and search. If questions arise later in the project, or after the project has been completed, meeting minutes and email threads may make it difficult to find information documenting project decisions.

More than half of contractors (53%) are using preconstruction RFIs to track project decisions. Although RFIs are usually frowned upon, this is a more formal and structured approach for documenting project decisions. Only 33% of engineering firms and 38% of architecture firms use preconstruction RFIs to track project decisions.

Ways of Tracking and Documenting Project Decisions 2022: Total

How do you track and document project decisions?



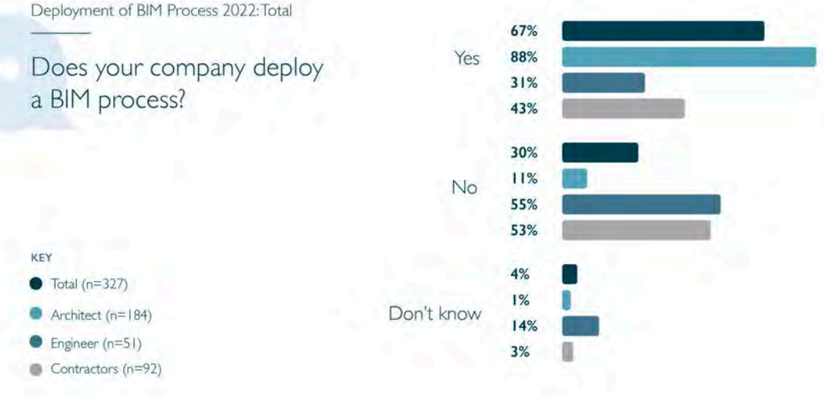
Use of Building Information Modeling (BIM)

Building Information Modeling is used by construction teams to create and manage data during the design, construction, and operations phases of a project. BIM is designed to be a process to share multi-disciplinary data (structural, architectural, MEP, etc.) to create detailed digital representations of the build. The BIM process begins with the creation of an intelligent 3D model and enables document management, coordination, and simulation during the entire lifecycle of a project (plan, design, build, operate, and maintain).

While most architects (88%) deploy a BIM process at their company, about one-third of engineers (31%) and less than half of contractors (43%) do so. These findings are unexpected given that the goal of BIM processes in construction is to provide a way for project stakeholders to share and collaborate throughout the project life cycle. Roundtable panelists shared that even when BIM is used for a project, the model data is not shared, or multiple copies of the models are created, defeating the intended collaboration intent

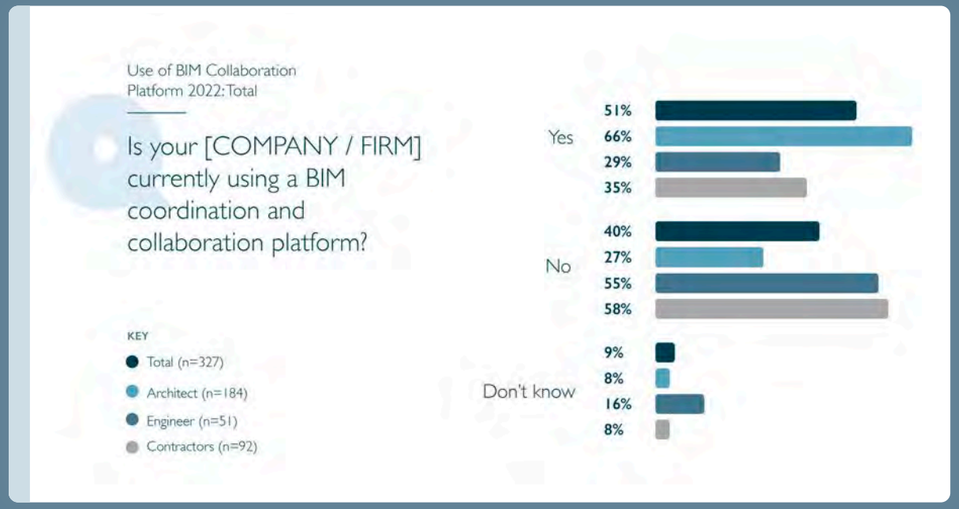
Deployment of BIM Process 2022: Total

Does your company deploy a BIM process?



Deployment of a BIM Coordination Platform

Although 88% of architects report that they have a BIM process, only 66% use a BIM coordination and collaboration platform. In addition, a much lower percentage of engineers (29%) and contractors (35%) are doing the same.



"We are running into problems where the federal government has certain requirements and that they don't accept BIM 360. I know they are trying to jump through hoops to get that approval, but we need something now."

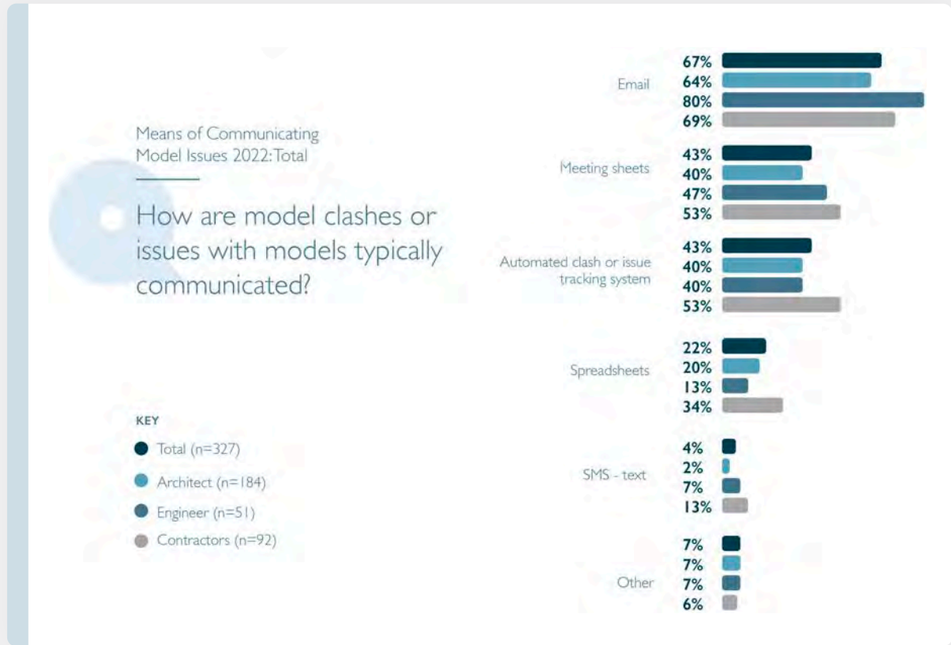
Donovan Wattier, HDR

Managing Clashes

In Building Information Modeling (BIM), clash detection is the method of identifying if, where, or how parts of a building or structure (e.g., plumbing, walls, etc.) interfere with one another.Across the board respondents most often use email to communicate model clashes or issues. Engineering firms (80%) are much more likely to communicating model clashes or issues through email.This is not surprising given that most engineering firms do not have a BIM process or platform.

> *When looking at challenges such as information not being shared in a timely manner, or incomplete information being shared, communicating clashes via email may be one source of the problem.*

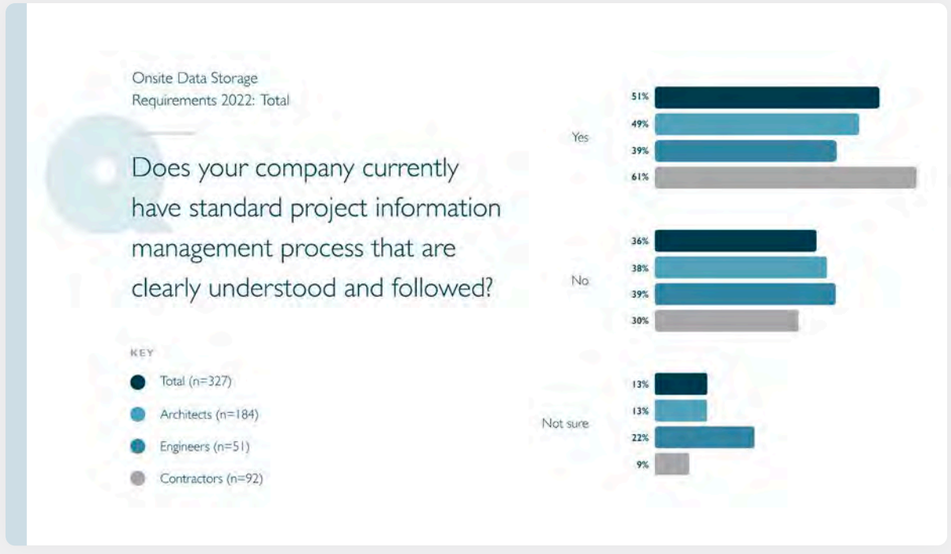
More than half of contractors are communicating clashes through meeting notes and just as many (53%) are using an automated clash or issue tracking system.

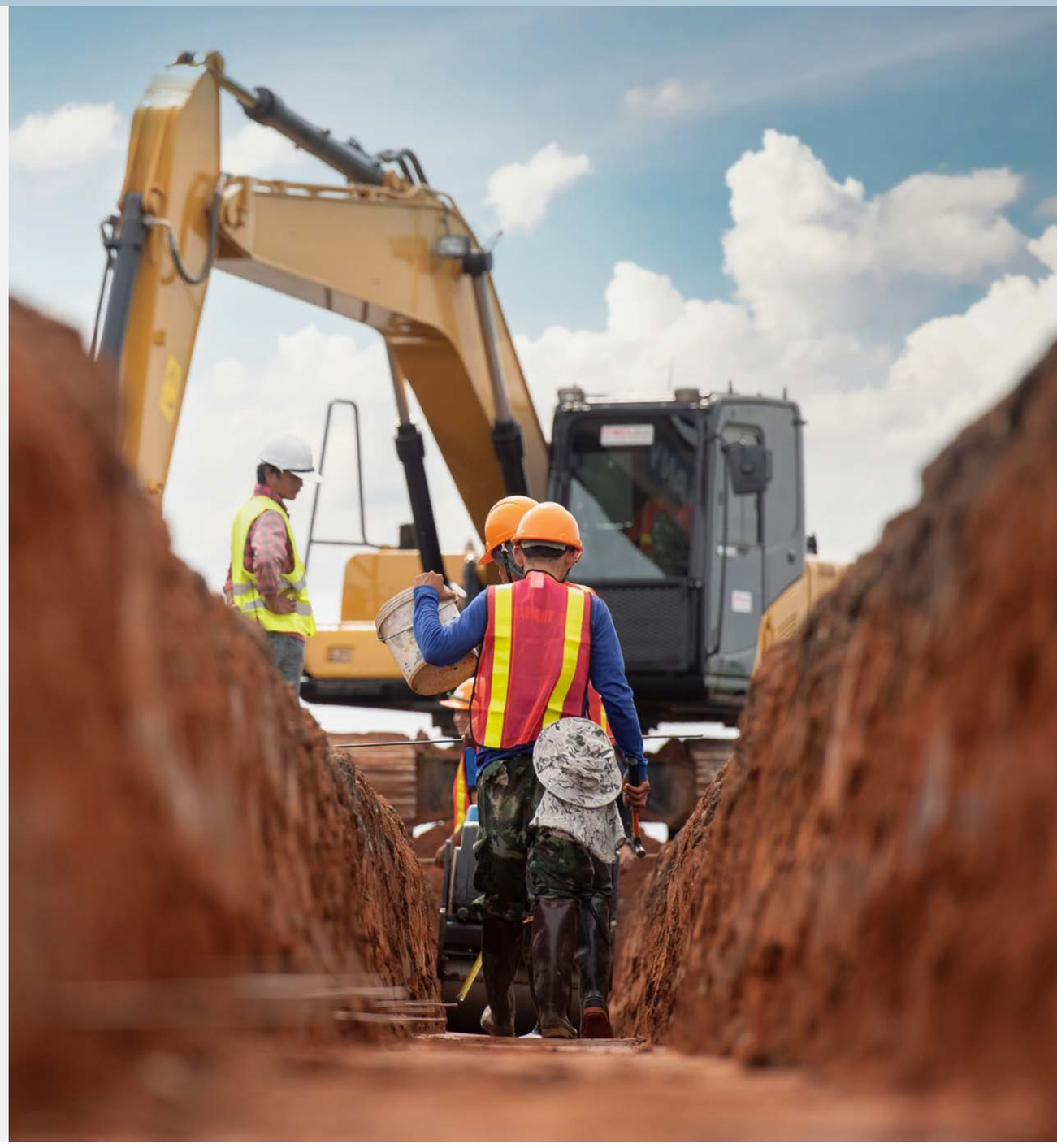


Standard Processes for Managing Project Information

Standard processes for managing project information include guidelines such as how information is shared, how it is organized, what project information needs to be stored and for how long (retention period). There are also usually processes and policies related to management of archived data. Standard processes ensure that there is consistency across the organization or across projects for how information will be managed.

About half of all respondents (51%) have a standard project information management process that is clearly understood and followed in the firm. More contractors (61%) report that they have standard processes, and less than half of architects and engineers have standard processes for managing project information that are fully understood (49% and 39%, respectively).





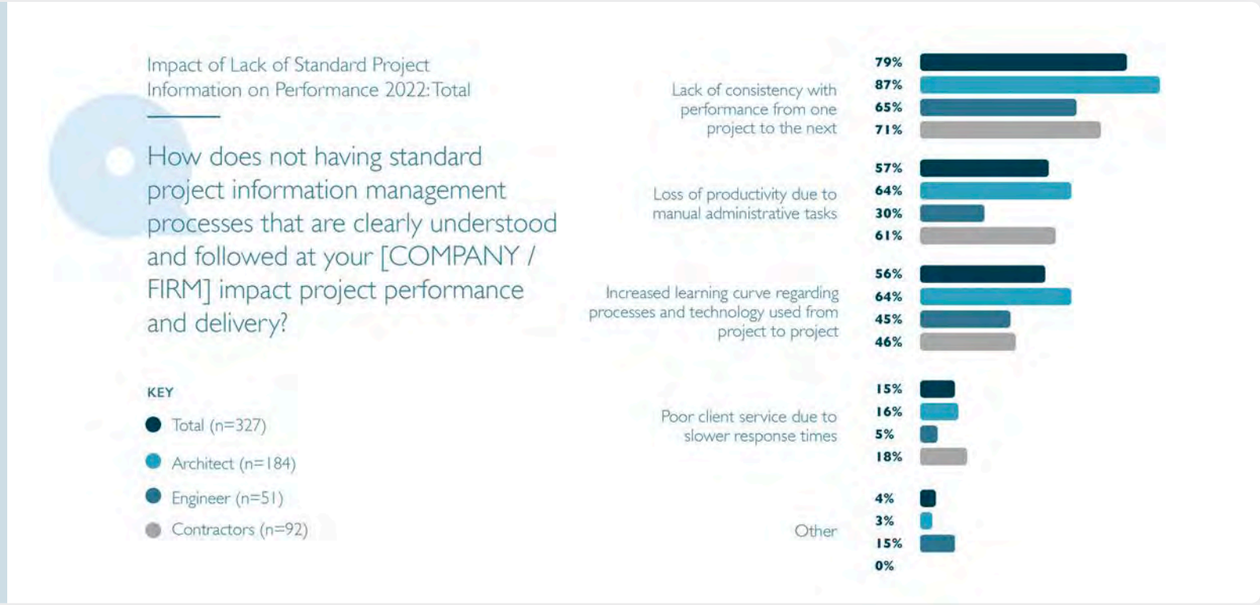
Impact of not having Standard Processes for Managing Project Information

We then asked a follow-up question to those who answered that they did not have standard project information management processes in place. Those respondents were asked how not having standard project information management processes impacts project performance and delivery.

Most respondents (79%) cite a lack of consistency in performance from project to project as the greatest impact when there is a lack of standard processes for managing project information. This is felt more by architecture firms (87%), however this was also the top issue reported by engineering and contractor respondents.

Over half of respondents also say that a lack of standards for managing project information result in productivity loss due to manual administrative tasks. Architects (64%) and contractors (61%) report this as a bigger issue than engineering counterparts (30%).

In addition, a majority of respondents say that lack of standard processes increase the learning curve regarding processes and technology when moving from project to project. When employees have a consistent way to find project information, regardless of which project they are working on, less time is spent searching across folders, files, applications, and systems.



"Everyone does create their own unique little workflows locally, but we don't have a problem with people necessarily following process or procedures. We have an access issue. It's where to find information that is a problem - it's on the server under folder, blah, blah, blah under this, under that."

Dan Smolilo, Walsh Group

"We push standardizing what the folder structure is. We standardize on what the folders are going to be called and what they're going to be used for. You can put them in whatever categories you want them, but it needs to be accessible to the whole team. It needs to be somewhat organized, such that it is familiar for everyone going from project to project. That consistency is also part of our archival system, when we're starting to do stuff from WIP and you're pulling it into the final and you want to close a project out, you know which folders to go in and pull that in."

Donovan Wattier, HDR

Methods for Sharing Information

How Information is Shared in the Handover Phase

Most architects (84%) and engineers (65%) use file transfer software to deliver documents to the construction team during the handover phase. In addition, most contractors report that design-related documents are sent to their companies via file transfer software.

File transfer software enables parties to securely transfer data over the internet. This method is also preferred when sending large files. This is particularly helpful when working from home. Some file transfer software solutions also provide a tracking mechanism including receipt acknowledgement and download status.

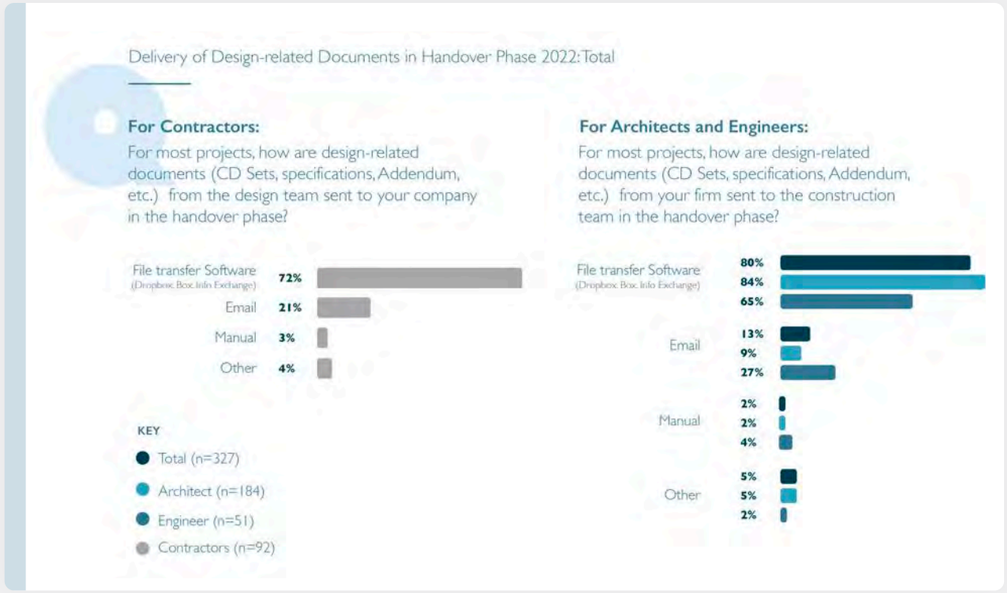
Although respondents cite file transfer software as the most common method for sharing information externally in the handover phase of the project, email is still part of the equation primarily for engineering firms (21%).

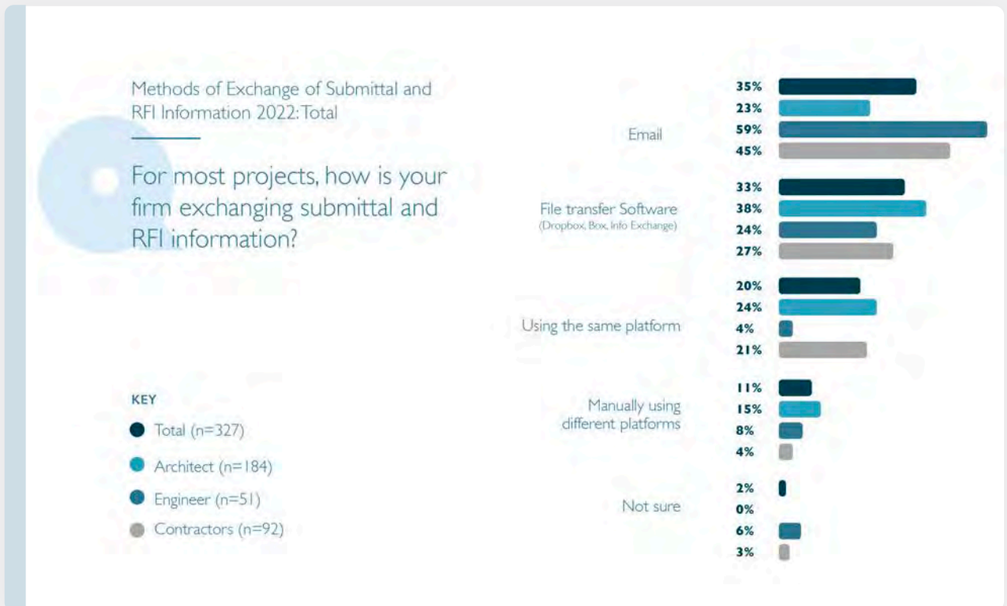
How Information is Shared for Submittal and RFI Processes

The most frequent methods for exchanging submittal and RFI information from design teams with construction teams and vice versa are also email exchanges (35%) and file transfer software (33%). Engineering respondents are more likely to use file transfer software which is expected given that many attachment files are too large to process through email.

Exchange of submittal and RFI information is still communicated primarily through email (35%), particularly among engineering respondents (59%). A much smaller percentage of architects (23%) exchange submittal and RFI information through email.

File transfers and email communications do not have the checks and balances to ensure that all required information for submittals and RFIs is included. This may factor into to respondents reporting that they receive incomplete or unclear information.





How Information is Stored

Requirements for Storing On-Premises

More than half (62%) of respondents say their company has requirements to store project data onsite using internal servers. This is more often required among architects (67%), however, many engineering (61%) and half of contractor respondents (52%) also have this requirement.

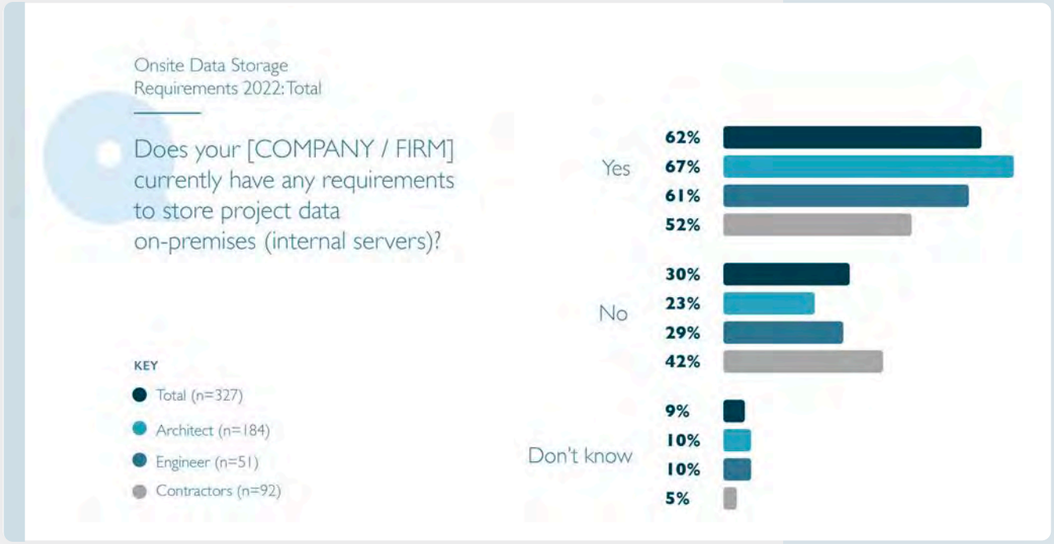
When compared to last year's findings, responses from architects remained about the same. However, there has been a significant decrease in requirements for on-premises storage for engineering firms (61% in 2022 vs. 83% in 2021).

Reasons for On-premises Storage

For respondents who indicated that they have requirements to store project information on-premises, we then asked why?

> *Respondents most often say the primary reason for onsite data storage is to achieve greater data security.*

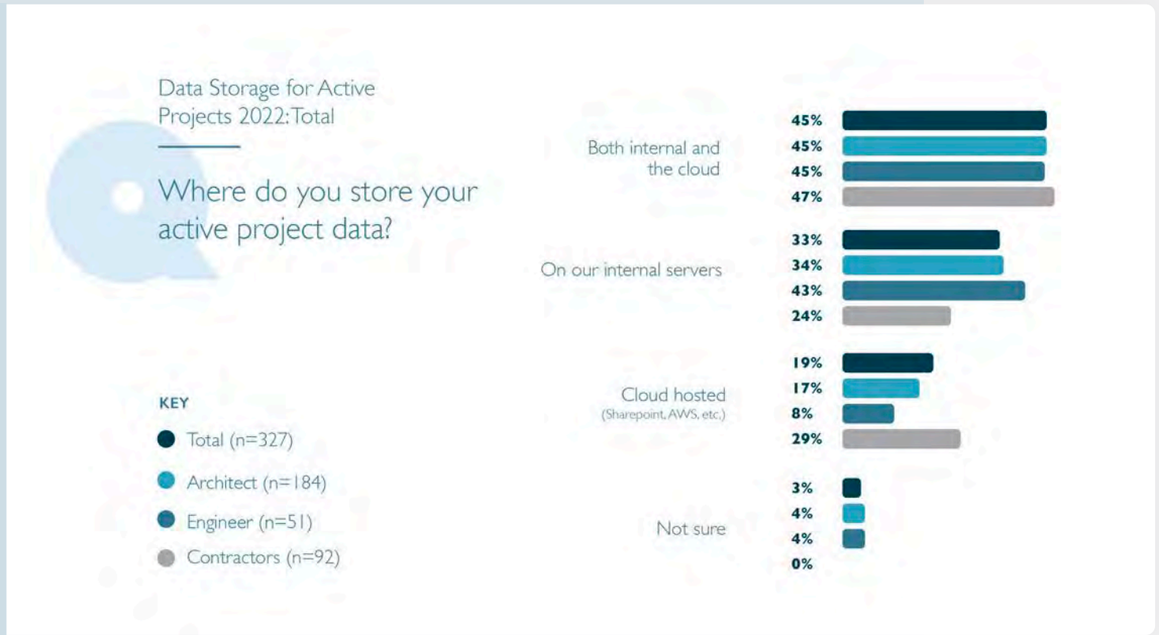
The primary reasons for onsite storage cited by architects and engineers are like those cited in 2021. The only exception is legal purposes, which is named more often this year. Architects cited legal purposes last year as 25% compared to 44% this year. There was also a jump in engineering firm responses from 16% last year to 39% this year.



Where Active Project Data is Stored

Almost half of contractors more often store active project data both internally and, in the cloud, and 29% store active project data on cloud platforms only. Engineers are more likely to store their data in both internal and cloud (45%), and almost equally on internal servers only (43%). Engineers are least likely to store active project data solely on cloud-hosted platforms.

Architects also lean towards storing data on both internal servers and cloud platforms (45%) or solely on internal servers (34%). Less than 20% of all respondents report that active data is stored solely in the cloud. There are no significant changes from last year's findings for architects and engineers.



Section Two Roundtable Insights: Standardizing and Digitizing Where it Makes Sense

We assume that if we digitize or automate a workflow process, it is going to make life easier. However, this is not always the case. This year's roundtable participants discussed varying factors that should be considered when implementing a digital solution.

Digitizing Outdated Business Processes

Participants commented on processes that are being digitized that do not necessarily need to be. Many firms are automating the existing workflow process without consideration of how technology changes that process. Michael Finley from RS&H shared how business unit consolidation forced his team to ask the question "why are we doing this".

Many times, it becomes a history lesson. Firms build up processes over time based on past issues or hardcopy paper requirements. By asking the "why" question, it may reveal that the problem the process was designed to address has been resolved, and as Michael explained, "we learned that we don't have to do this anymore". Michael used the example "we still we put electronic stamps instead of rubber stamps, and I can even turn that digital stamp to make it look like it was actually stamped. How can we take that and move that to technology, so we do not have to do that anymore?".

"Where are we drawing that line between the things that must change, and things that must stay the same, or where people need to have things different, or where things need to be standardized and locked down?"

Nathan Wood, Construction Progress Coalition

Standardizing the Processes that Make the Most Sense

Dan Smolilo from the Walsh Group shared how his company has digitized Standard Operating Procedures (SOPs) in a meaningful and impactful way so that anyone in his organization can access it. He also shared that in addition, it provided quantifiable metrics to show when the workflow was last reviewed, updated, and tested. It also tracked who accessed it, when, and how often.

Standardizing the How and What, not the Where

Participants also discussed how their firms were able to standardize on what information needed to be maintained as part of the project record, and how this information will be stored. Donovan Wattier from HDR, and Alison Hart from Mortenson shared how their firms have standardized their folder structures and folder naming conventions so that team members could find the information they need regardless of what project they are working on, or which office they are in.

Companies often focus on the technology before a comprehensive project information management strategy has been developed. By developing the strategy first, companies identify what information needs to be accessed and shared, along with how it needs to be accessed. This provides an opportunity to eliminate outdated workflows and organize information that is more accessible and useful for the organization.

"We collect data because data is immensely powerful, but if you don't have a means to access that data, it's useless. So, the big part about the data architecture is to collect it in a meaningful way so it can be re-used later."

Michael Finley, RS&H

"The one thing that people always think is that if it's digital, it must be easier. It is not always easier."

Donovan Wattier, HDR

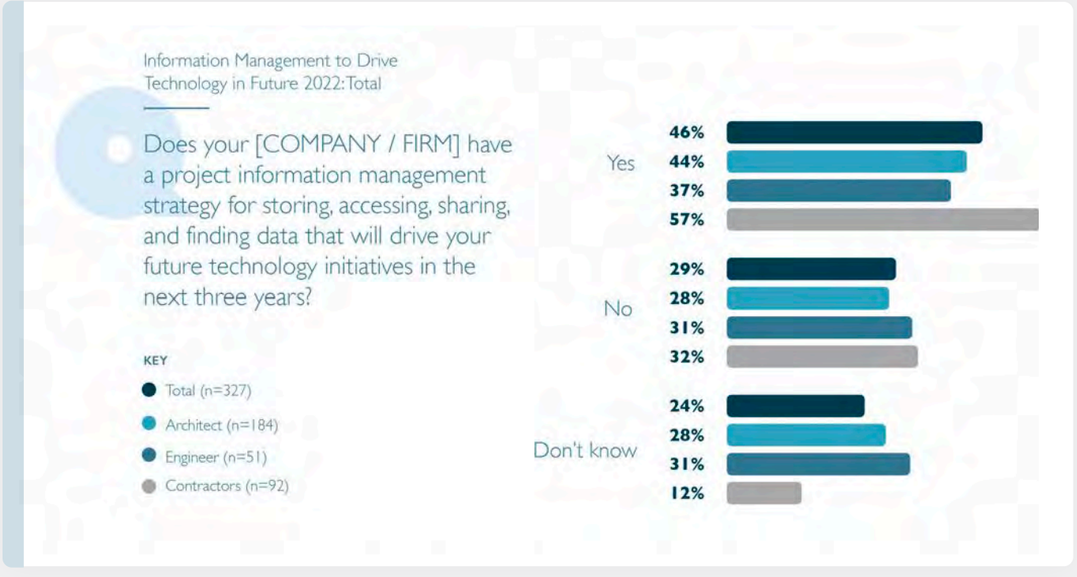
Section Three: Future Direction of Project Information Management

Project Information Management Strategy

A project information strategy to store, access, share, and find data that will drive future technology initiatives in the next three years is common with almost half of respondents saying they have this. It is more common for contractors (57%) to have such a strategy in place.

This year the needle moved with significantly more engineers having a project information management strategy in place as compared to last year (37% in 2022 vs. 10% in 2021). There was also an increase in the number of architects having a strategy in place (44% in 2022 vs. 33% in 2021).

This year's findings indicate that firms are recognizing the value of managing project information as an asset.



Main Considerations for a Project Information Strategy

The most often named principal elements of a comprehensive project information management strategy are the ability to access information from anywhere (74%) and the ability to collaborate with external team members (68%).

> *Working from home has become the new norm for most firms. This requires employees to have access to information that is usually locked down behind firewalls. In addition, most field staff have mobile devices and require access to project information on the job site.*

The ability to collaborate with external team members is also a priority with most respondents (68%). It is particularly important for architects (78%). Companies are starting to recognize that technology alone will not enable the level of collaboration required to meet today's fast-paced construction demands. Cloud technologies are making it easier to collaborate, however, a comprehensive strategy for managing project information enables firms to work consistently across projects, and with internal and external organizations.

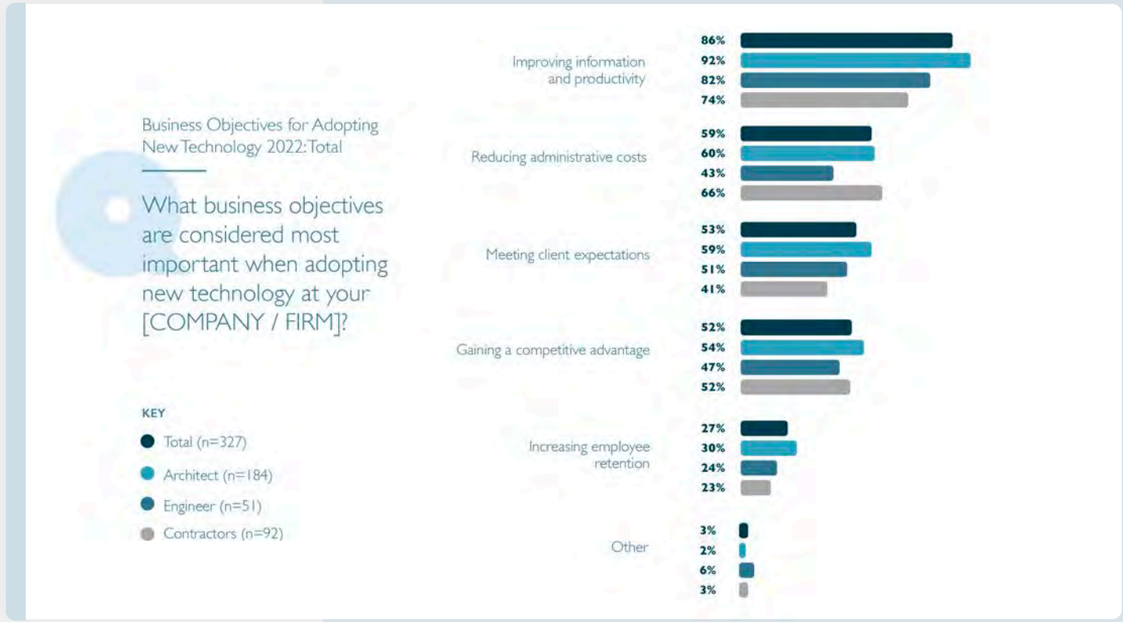
Security is also a major consideration for over 60% of respondents, and more so for architects (70%). The construction industry has been more vulnerable to cyber-attacks over the past few years which may be driving more firms to place a higher focus on security. In addition, with the signing of the $1 trillion infrastructure bill into law in November 2021, federal government requirements for security have increased.

Objectives & Barriers to Technology Adoption

It is not surprising that responses regarding considerations for a project information management strategy align with business objectives for adopting new technologies.

The primary business consideration when adopting new technology for most respondents is improving team collaboration and productivity. Architects cite this more often than do contractors (92% vs 74% respectively).

> *Findings for other objectives such as ways to reduce administrative burden and cost, meeting client expectations, and gaining a competitive advantage are also high priorities.*



Barriers to Technology Adoption

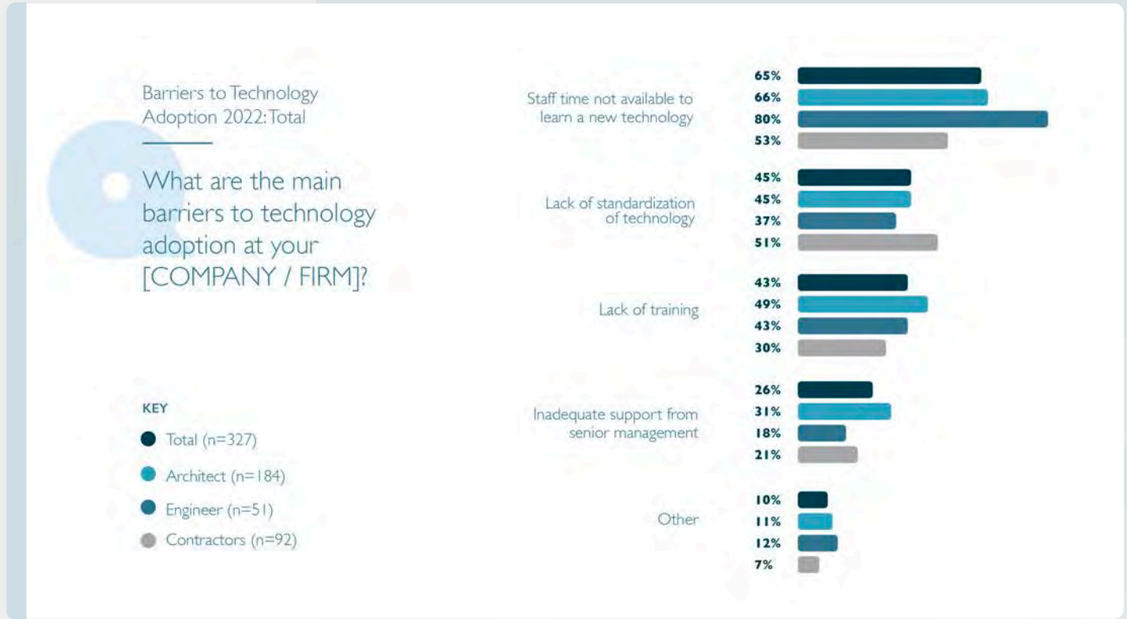
We also explored the primary barriers for technology adoption. The main obstacle to new technology adoption is lack of staff time to learn new systems. We made the distinction between lack of time for training, and lack of access to training.

For many (65%) respondents, the lack of time for training to learn new technology is the number one barrier to technology adoption. This is much more often named by engineers (80%). This issue may be impacting firms with high turnover with staff.

In addition, lack of standardization of technology ranked high with more than half of contractors and 45% of architects. This barrier also correlates to barrier for lack of time for training to learn new technology, as lack of standardization of technology can increase the number of new applications employees are required to learn.

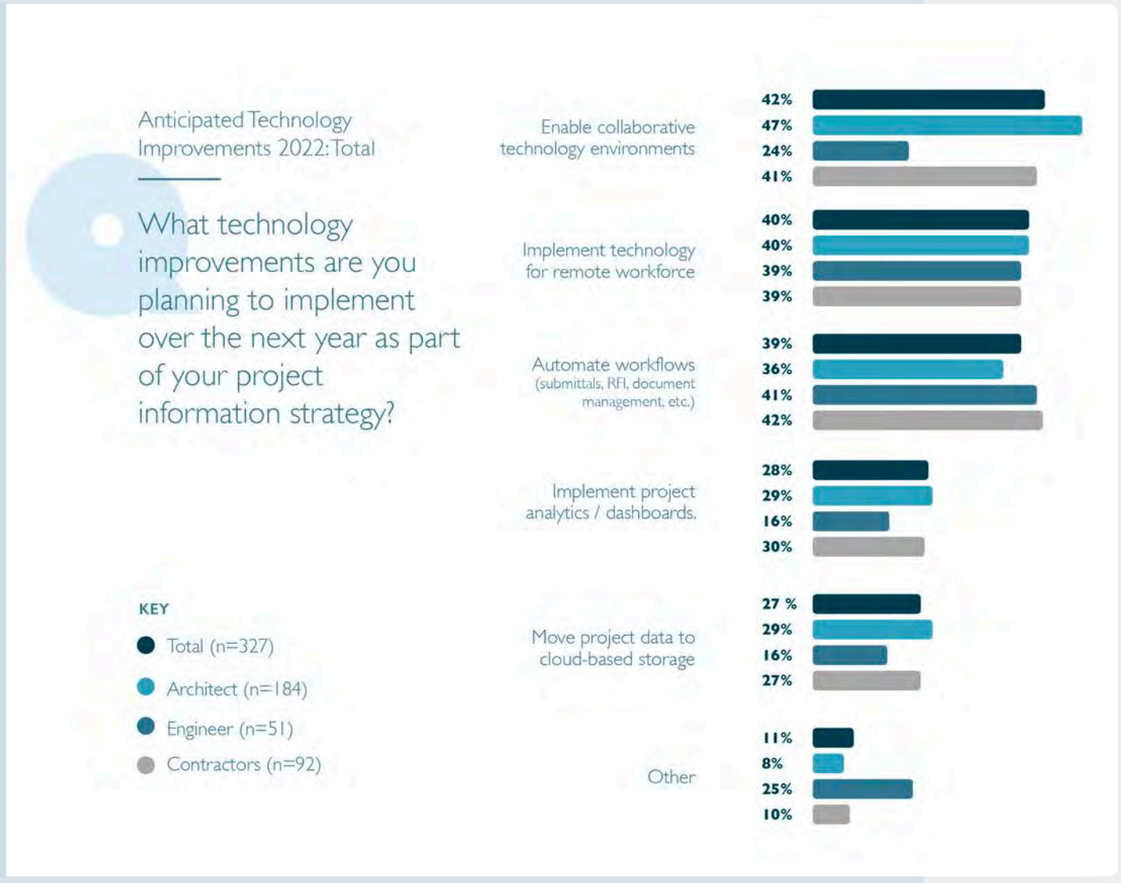
Lack of training is also an issue for many firms especially architects (49%). These issues overlap when multiple software applications are required for a given project and adequate training is not provided.

Some architect respondents (31%) also cite lack of support from senior management as a barrier to technology adoption.



Planned Technology Improvements

In support of business objectives, technology improvements most often cited for implementation in the next year as part of a firm project information strategy are enabling collaborative environments and facilitating a remote workforce. However, responses are closely aligned.



Information that Should be Managed

Given that critical communication including project decisions, and submittal and RFI reviews are processed through email, it is not surprising that 83% of respondents cite email as the top information type that should be managed as part of an overall project information management strategy. Most (92%) of engineering respondents chose project email as the most important type of information that should be managed. Contractors also most often selected managing project email as part of the overall project information strategy.

Most architects (90%) name Building Information Modeling (BIM) as information that should be managed. Surprisingly, engineering counterparts cite the need to manage BIM information significantly less (37%). There is somewhat of a gap between responses for architects regarding having a BIM process in place (88%), and architects who have a BIM coordin ation and collaboration platform (66%). In addition, many times BIM information is stored in specific design-related applications, making it difficult to associate with other project record items such as emails and RFIs.

"A more collaborative delivery model between project stakeholdvers."

"If all project management software systems could communicate with each other."

"Project collaboration software needs to be intuitive so anyone can use, regardless of computer skills."

"Better software sharing that is consistent. Too many different sharing services."

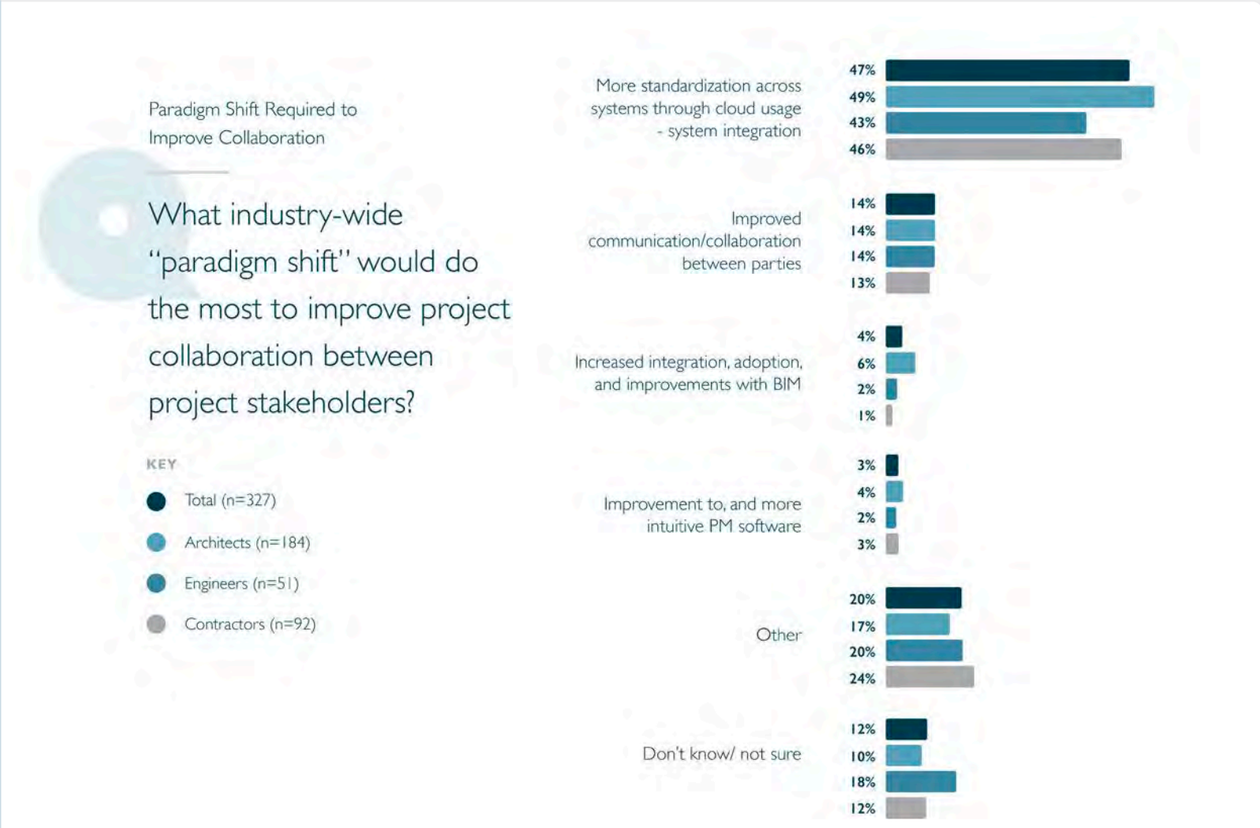
"Interoperability of competing software so that no matter which provider firms choose to work with they can all communicate easily."

Responses from open-ended survey question

Paradigm Shift Required to Improve Collaboration

Almost half of respondents (47%) shared that more integration between software applications, consolidation of applications, and more real-time sharing of information through cloud technology would shift the industry to a more collaborative environment for all stakeholders.

> *It is surprising that the need to improve communication and collaboration between parties ranked low among all respondents. This suggests that the expectation that technology will solve collaboration issues vs. human interaction.*



Conclusion: Finding Common Ground

This year's study was designed to dig deeper into the role that effective management of project information plays in helping teams improve collaboration for successful project delivery. Everyone agrees that a greater focus on sharing information aligns with the common goal of delivering excellent projects.

But how do we get there from here?

Having a comprehensive strategy for managing project information will certainly help firms focus on the information workflows that most impact collaboration and sharing.

What does a Project Information Management Strategy Look Like?

A comprehensive strategy for managing project information is about people, process, and technology. This is cliché; however, many organizations have invested in technology and are not recognizing a return on their investment.

This year's survey results, and roundtable panel insights provide more direction on what is needed to move the industry forward.

People: Building Relationships Through Transparency

The people part is a bit more difficult to address given that it can be difficult to change behaviors. Nevertheless, this year's roundtable panel had some great advice; "take the path of least resistance." The conversation centered around not worrying about changing work styles but instead focusing on automating key workflows that primarily impact an organization's ability to share information externally.

In addition, the panel discussed the benefits of bringing all parties together at the start of the project to agree on what information will be shared, how it will be shared, and when. Panelists agree that improving communication and transparency and setting expectations up front in the project will help build trust resulting in better relationships.

Process: Common Sense Approach to Standardizing Workflows

Many of the challenges that construction industry professionals face today are process related. Not being able to find information to make better decisions, and delays in getting accurate and timely information out to external team members can be attributed to flaws in existing workflow processes.

This year's finding reveals that lack of standard processes for managing project information result in a lack of consistency from one project to the next, loss of productivity due to manual administrative tasks, and increased learning curves as staff members transition projects.

Standard processes can be as simple as establishing a consistent way to save project information across the organization. Regardless of the project, standards, or rules for storing and saving project information can reduce the amount of wasted time teams spend trying to find information. Standard processes for storing and accessing information also benefit firms struggling with time limitations for training new staff.

"It's about the current dilemma between needing everyone on the same page but wanting to each do it our own way. Technology gives us the ability to 'have our cake and eat it too', but only when we spend the time upfront map out how to seamlessly translate information."

Nathan Wood, Construction Progress Coalition

"I think trust in teaming is something that the industry needs to really focus on to build better relationships. Because at the end of the day, everyone is going to be better off if we build this kind of trust."

Dan Smolilo, Walsh Group

In addition, defining what information needs to be stored or associated with the project is also part of a comprehensive project management strategy. This year's survey findings show the critical project information is primarily communicated via email. Firms who have incorporated email management as part of the overall project information strategy benefit from having a complete picture of all project decisions made throughout the lifecycle of the project.

Survey respondents also identified document issuance and tracking, and the submittal and RFI review processes as areas causing the most pain. It might be time to revisit the associated workflows to find opportunities to eliminate outdated or manual processes that were created for issues that have already been resolved. As one panelist suggested, "don't automate bad workflow processes."

Some of our roundtable panelists discussed how digitizing their Standard Operating Procedures (SOPs) and storing them in a common place for everyone to access, provided a way to track procedures that were being followed – or not. It may be time to think about the SOP concept for managing project information.

Technology: Focus on Integration

The industry continues to struggle with software integration and interoperability issues. Although some suggest that having everyone use the same platform and same set of tools will resolve issues, it may not be practical. Integration of applications does not necessarily require all project stakeholders to use the same centralized system.

Newforma has partnered with the Construction Progress Coalition for the Common Data Exchange initiative and the 2022 AEC Integration Summit. The main goal of these initiatives is to work with AEC professionals and technology providers to identify workflow pain points and map out the common information that needs to be shared across organizations.

This effort, in conjunction with Newforma's Connector strategy, takes advantage of open Application Programming Interface technology, to automate the flow of information across applications and platforms. This strategy enables teams to use the applications that are best suited for their work while automating the sharing of common information.

The automation of information flow also removes the manual administrative work required to transfer information between systems. Issues reported this year with incomplete, unclear, and untimely flow of information between external stakeholders are also addressed with automated workflows.

"Regardless of what project teams decide to call an RFI, it's a piece of data that needs to be managed in multiple systems for risk management and record keeping purposes. But at its core, it's a structured piece of data. The architect may only care about certain elements, while a GC likely cares about different elements. Ultimately, when there's a common set of elements to select from, there's no reason for people to be duplicating entries at the basic element level."

Slater Latour, Chief Marketing & Product, Newforma

Recommendations for Practitioners

Trends from last year's survey show that several firms have recognized the need for a comprehensive project information strategy. As digitization across the industry increases, not only does the volume of information increase, but also the complexity.

It is difficult to implement change particularly in today's fast-paced construction environment. There are many factors to consider for effective project information management, but by focusing on improving the common pain points, all project stakeholders benefit. The following recommendations for practitioners should help all firms improve their project information management capabilities.

Finding Information to make informed decisions

- Determine what information needs to be shared across external teams and what information needs to be saved as part of the project record. This may include email communication, meeting minutes, and related contractual documents such as RFIs, field reports, change orders, etc.
- Develop a standardized way to organize this information across the firm through higher level folder structures and folder naming conventions.
- Implement a solution for easily searching and accessing project information.

Improving Sharing and Collaboration

- Communication from the start of the project is key. All stakeholders including owner teams, contractor teams, and the design team can contribute ideas and suggestions for sharing project information that should reduce friction as the project progresses.
- Identify common elements of information that need to be shared across external team members. Not all information needs to be shared. Determine the best method and structure for sharing this data and standardize processes.
- Determine when, and how often information is shared in various stages of the project will also help with collaboration and sharing. Teams may consider how to set expectations for sharing information that is not fully developed early in the project.

Rethinking Workflow Processes to Reduce Manual Administrative Efforts

- Start simple with one workflow process such as RFIs. Document the workflow process and ask the question "why are we doing this?"
- Automating key workflow process between systems through common APIs, for example, the method for sending and receiving submittal and RFI information, eliminates manual intervention which can introduce errors and delays in the process.

Addressing the main challenges for managing project information is about taking the path of least resistance. It may not require everyone on the project team to use the same set of tools or work the same way. However, by focusing on the areas that can be changed such as outdated or manual workflow processes or using technology to automate the exchange of information between external parties, firms can make incremental improvements. It also may necessitate changing only things that need to be changed by prioritizing areas such as the submittal and RFI workflows, that will have the biggest return on investment.

Incorporating best practices for managing project information into daily practices for access, storing, and sharing information starts with talking to each other. Newforma is happy to start this conversation.

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