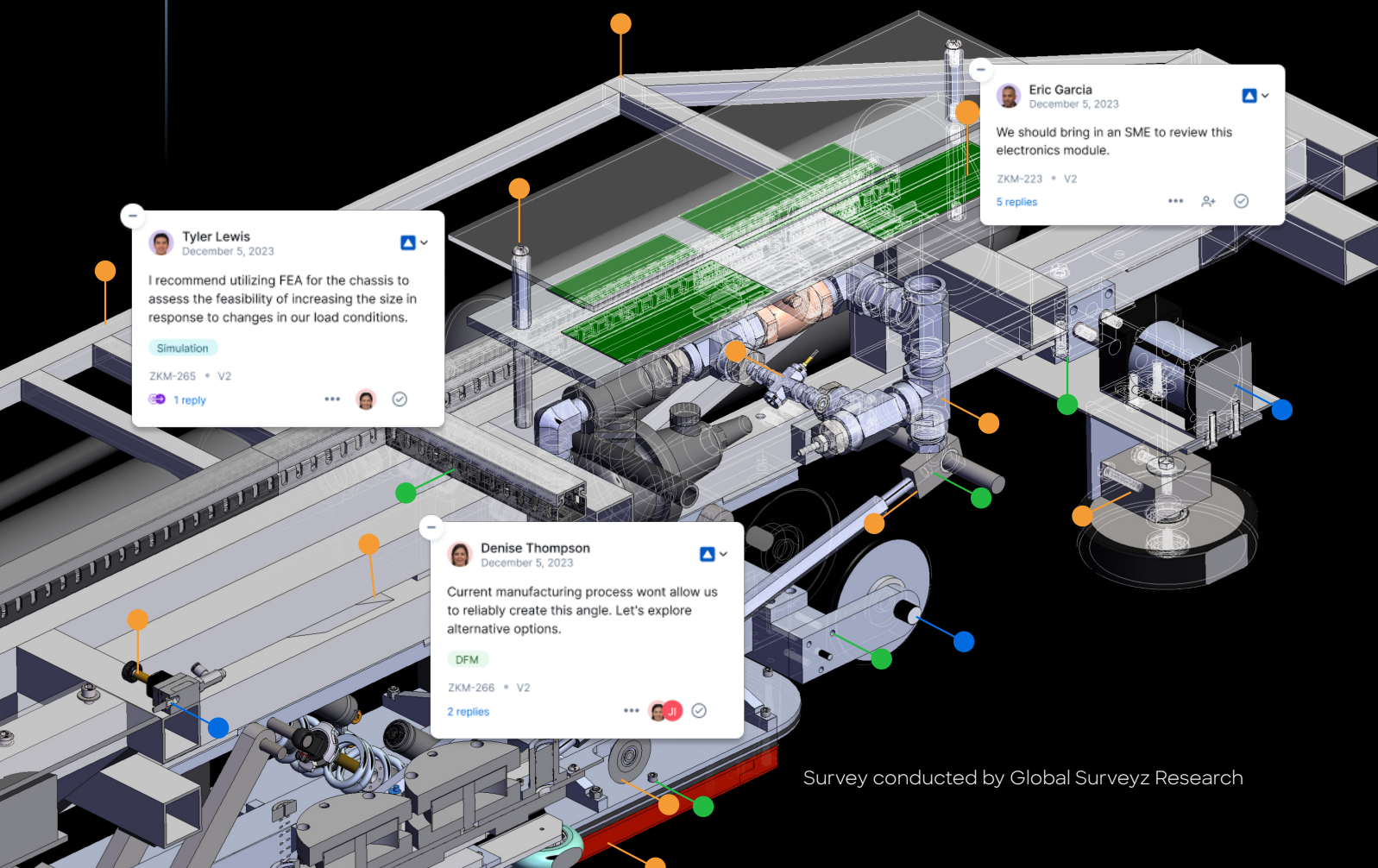# CoLab

Quantifying the Impact of Design Review Methods on New Product Development

Tyler Lewis
December 5, 2023

I recommend utilizing FEA for the chassis to assess the feasibility of increasing the size in response to changes in our load conditions.

Simulation

ZKM-265 • V2

1 reply

Eric Garcia
December 5, 2023

We should bring in an SME to review this electronics module.

ZKM-223 • V2

5 replies

Denise Thompson
December 5, 2023

Current manufacturing process wont allow us to reliably create this angle. Let's explore alternative options.

DFM

ZKM-266 • V2

2 replies

Survey conducted by Global Surveyz Research

Contents

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Introduction

Engineering executives know that one failed product launch could set them back years. Design errors lead to quality mistakes, which leads to warranty claims and erosion of customer trust. Unfortunately, for hardware teams building the most complex products in the world, it's too easy for these errors to slip through the cracks.

Throughout a new product development project, hundreds of subject matter experts will make thousands of design decisions. In 2024, there's more pressure than ever for engineering teams to deliver new, higher quality products at a lower cost. As expectations continue to rise, businesses must engage larger teams of experts with more specialized skills. That means more complex decisions, more people whose opinions matter, and more feedback to capture and resolve. Are the processes and tools that hardware teams use to collaborate ready for all of this?

If you ask the average mechanical engineer, the answer is probably "no." Engineering teams feel like they are drowning in administrative tasks and non-value-added work. As a result, teams don't have the time or the energy to truly analyze complex tradeoffs and lock in the best design decisions. We believe that there's a solution. By solving for several key process and technology bottlenecks, leaders can free up their teams to refocus on the work that matters and deliver better products faster.

In this report, we examined the current state of design review to understand what is causing miscommunication and delays. We did a deep dive on how companies evolve designs from concept to production validation, then surveyed 250 engineering leaders to quantify the impact of different approaches on overall NPD outcomes. What would make a difference to the engineering teams in the trenches; the ones that are building complex products? How can they avoid development and launch delays, and get great products to market sooner? What gaps need to be closed to improve the negative sentiment around design work? This report answers all of these questions and more, and uncovers the trends that will help you to place the right technology bets and significantly improve your own outcomes in 2024.

Methodology

Quantifying the Impact of Design Review Methods on New Product Development 2023/2024

To get greater insight into the state of complex product development processes, we commissioned a survey of 250 full-time employees, 50% of which are Engineering Managers or Directors, and 50% of which are VPs or C Level Executives. Respondents work in the manufacturing industry, specifically in industrial equipment, heavy machinery, automotive, and consumer hardware, and are split across the US, the UK, and Western Europe. All respondents work at companies with 1,000+ employees that have already invested in a PDM or PLM system.

This report was administered online by Global Surveyz Research, a global research firm. The respondents were recruited through a global B2B research panel, invited via email to complete the survey, with all responses collected during October 2023. The average amount of time spent on the survey was 5 minutes and 44 seconds. The answers to the majority of the non-numerical questions were randomized, in order to prevent order bias in the answers.

Who We Surveyed

Job Seniority

| Manager 21% | Director 28% | VP/Head 40% | C-Suite 11% |

Country

United States **52%**

United Kingdom **22%**

Western Europe **26%**
- Germany **10%**
- France **6%**
- Belgium **4%**
- Switzerland **3%**
- The Netherlands **3%**

Industry

- Consumer Hardware **46%**
- Heavy Machinery **20%**
- Industrial Equipment **46%**
- Automotive **46%**

Company Size

- 1,000–4,999 **63%**
- 5,000–9,999 **31%**
- 10,000+ **3%**

PDM/PLM Systems in Use

■ Using as main PDM/PLM*

■ Using, but not as main PDM/PLM**

|	Teamcenter	Solidworks PDM	Windchill	3DXperience	Enovia
Using as main	32%	24%	18%	12%	11%
Using, but not as main	27%	21%	26%	9%	8%
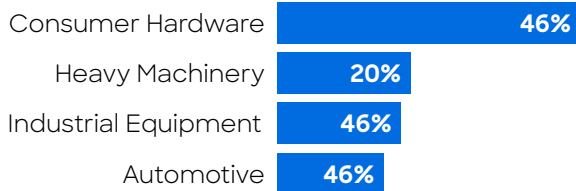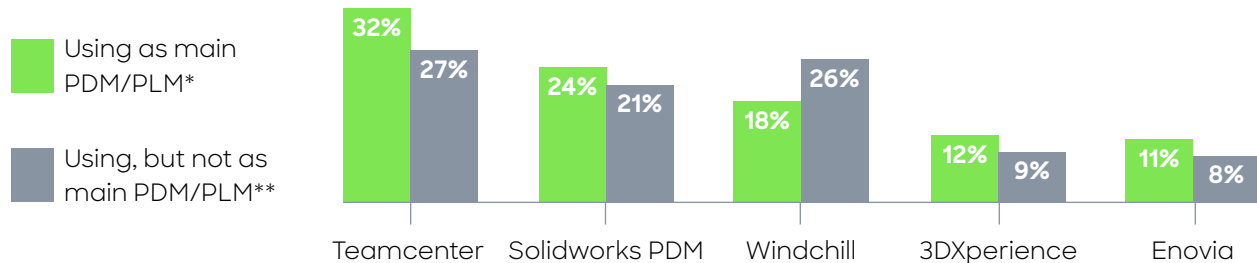
*97% of respondents are using either Teamcenter, Windchill, 3DX, Enovia, or Solidworks PDM as their primary PDM/PLM, while 3% are using another PDM/PLM not on our list of choices.

**91% of respondents are using a second PDM/PLM system, in addition to their primary PDM/PLM.

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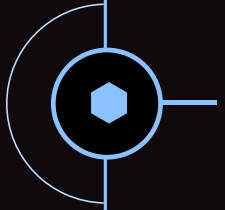
Key Findings

Quantifying the Impact of Design Review Methods on New Product Development 2023/2024

Key Findings

What's slipping through the cracks? 43% of design feedback is not documented or addressed.

Only 1% of companies are able to address all of the feedback that is identified during design reviews. On average 43% of issues are never tracked or addressed. This feedback could be anything from safety-critical issues to cost related changes that could significantly impact your margins. Ask yourself—what essential feedback have you already missed?

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② Key Findings

Will engineering teams deliver on time?
Design review quality is the #1 predictor

The most critical predictor of whether engineering teams will deliver their product development projects on time is the quality of their design reviews, chosen by 24% of respondents. This is seen as more important than resource management or requirements tracking. Design review quality is directly linked to launching high-quality products on time and without compromise.

Design Review Process

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Key Findings

3
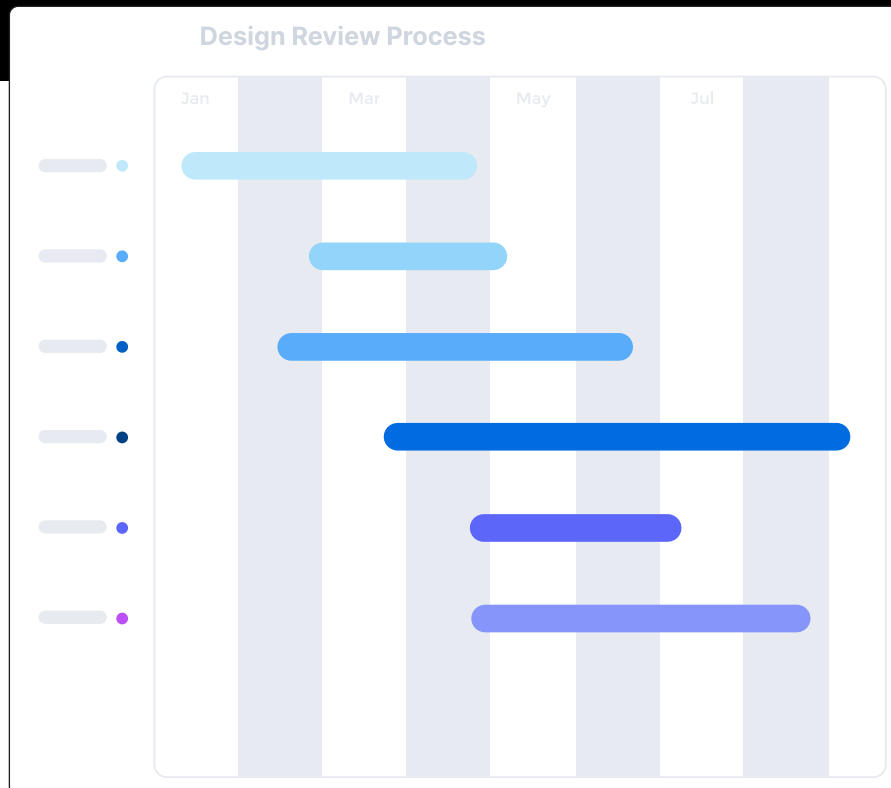
How can teams prevent miscommunication? 87% of leaders believe they need new tools, beyond PLM.

On average, 21% of product development delays come down to communication issues. When we asked respondents what would help minimize these delays, the top three answers were better tools to document design feedback (19%), better processes for managing product data (18%), and better tools to communicate design intent (15%). Just 6% say that expanding access to PLM systems would move the needle.

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Key Findings

4
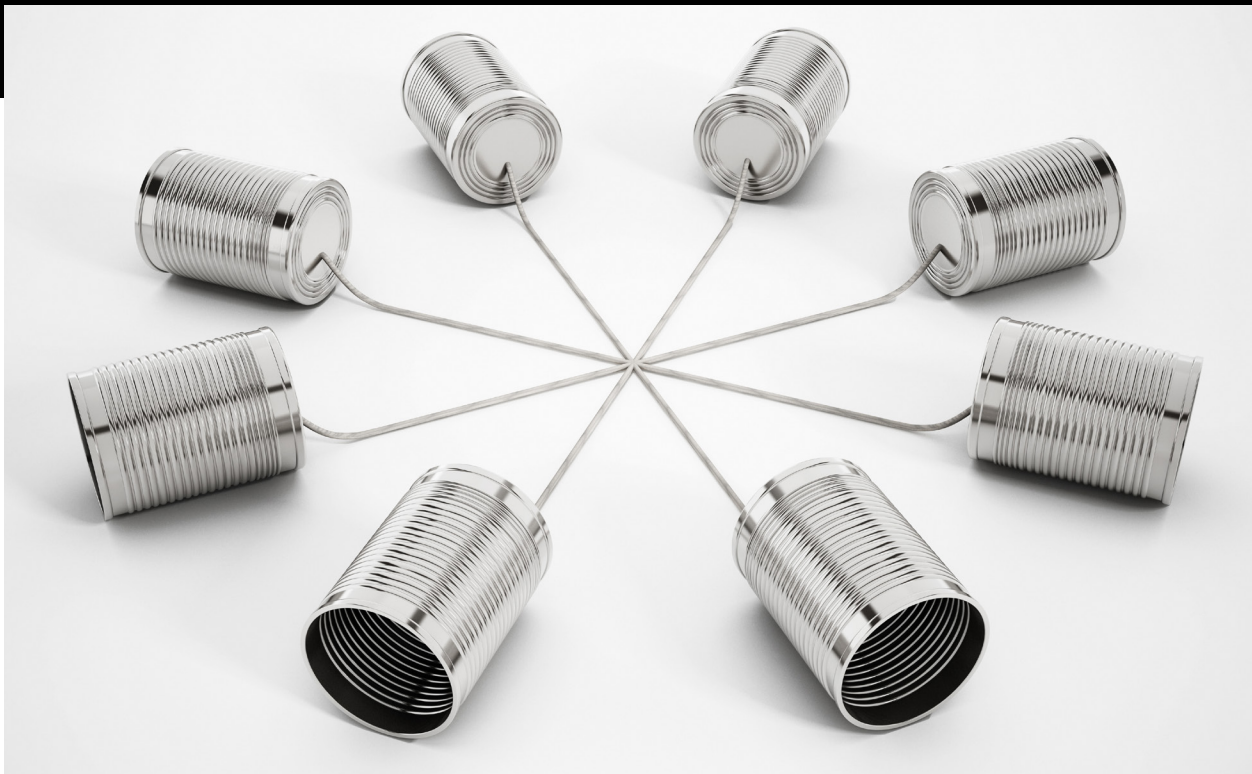
What does better product data management look like? 71% of teams don't use PLM in development

While engineering leaders believe they need to improve product data management to prevent miscommunications, just 29% of teams are using their PLM or PDM systems during product development. Because PLM and PDM systems are database products, their rigid architectures may not suit a fast-changing development environment, and instead work best for sustaining engineering post-launch.

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Late Stage Errors: Impact + Prevention

Quantifying the Impact of Design Review Methods on New Product Development 2023/2024

90% of companies are seeing product launch delays due to late-stage design changes.

On average, respondents believe that 7% of product launches in their company are delayed for this reason, which may seem like a low percentage. However, ask yourself: if an organization was experiencing consistently delayed product launches, how long would they remain in business? Most businesses could not tolerate more than 20% of launches being delayed. With this in mind, 7% is a considerable percentage of the acceptable failure rate.

It's also interesting to see that respondents generally estimate their own company to have less delays than the industry average, which they believe to be 10%.

It's not all about the launch itself. In Figure 7, we see that respondents more regularly see development milestones delayed due to late-stage design changes, in comparison to product launch delays. 33% of respondents reported that more than 1 in 10 launch milestones are delayed. However, only 19% of respondents reported a similar number of delays for overall program launches. For many companies, the launch date is set in stone, and cannot be moved. When a milestone is delayed, but the launch cannot be moved, something has got to give. Unfortunately, this can often be those crucial final stages of testing and QA, leading to errors that make it to production.

Improving design review quality to avoid late-stage errors and launch delays is critical. Errors that are caught earlier tend to be easier and more cost-effective to fix.

Launches delayed by late stage changes = 10% for Industry average vs. 7% "My Company"
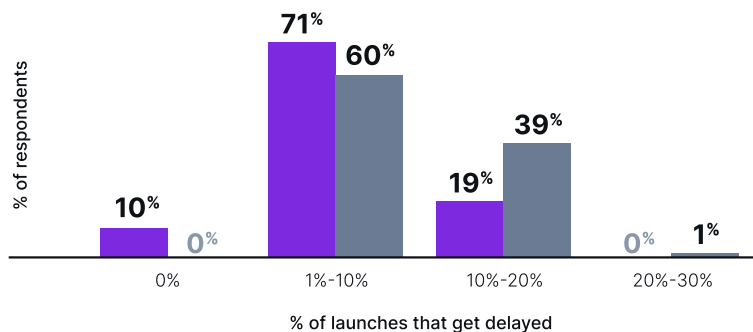

Figure 6: Percent of launches delayed by late-stage design changes (Industry vs. "My Company")

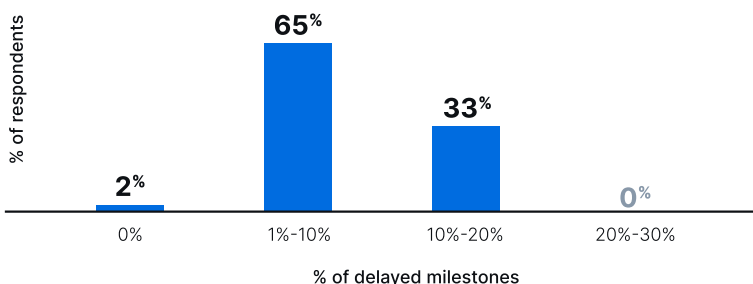**Average: 9% product development milestones are delayed**

Figure 7: Percent of development milestones delayed by late-stage design changes ("My Company" only)

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Engineering Leaders Believe That 60% of Late-Stage Errors Could Be Prevented With Better Design Review

On average, respondents say they could catch 60% of late-stage design errors with a higher quality design review process in place. Almost a quarter of respondents (23%) believe higher quality design reviews would catch between 80%-99% of errors.

The larger the company, the more likely they are to feel that better design reviews could catch more errors. In companies with more than 5,000 employees, respondents believe 72% of late-stage design errors could be avoided.

It's clear that companies do not feel that their design review processes are airtight, and recognize that there are gaps in place which, if fixed, could make a huge difference to product quality.

With so much potential for improvement, any investment you can make in improving design review quality at earlier stages is likely to drive significant downstream impact.

Average: 60% of late-stage design errors could be prevented with better design reviews
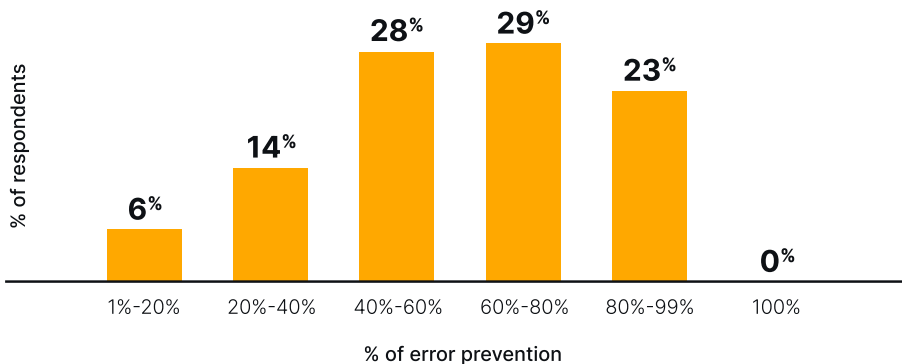
Figure 8: What percentage of late-stage design errors can be prevented by improving design review quality?
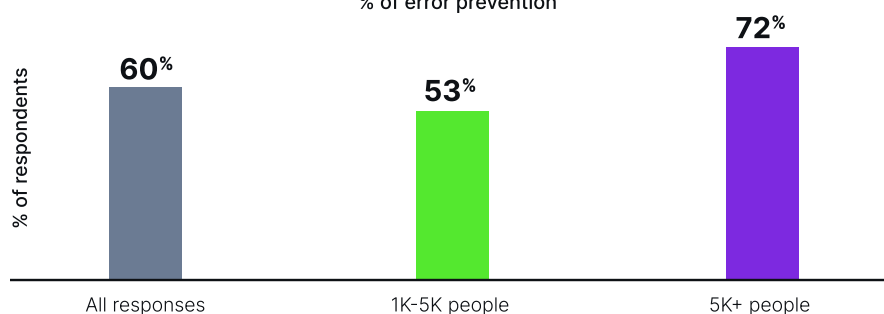
Figure 9: Average prevention of late-stage design errors, by company size

Leaders in larger companies (5K+ employees) believe an even higher percentage of errors (72%) can be prevented through better design reviews compared with leaders in smaller companies (1K-5K employees).

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72% of late-stage errors could be prevented through better design review, according to engineering leaders in companies with 5K+ employees.

Examining Design Review Methods

Quantifying the Impact of Design Review Methods on New Product Development 2023/2024

Maximizing Active Participation Improves Design Review Quality

As a team evolves a product from concept to production validation, they should strive to maximize feedback from subject matter experts (SMEs) at every stage. Feedback is the way that SMEs translate their technical expertise into product value—making feedback the very currency of engineering.

The best design reviews effectively engage most or all SMEs to maximize useful feedback. We asked respondents how effectively their process engages SMEs from different groups (the engineering team, cross-functional teams like manufacturing, suppliers, and customers). 56% of respondents feel most or all of their engineers provide useful feedback. This drops to 49% when asking respondents about cross-functional teams, 20% when considering feedback from suppliers, and just 6% for customers.

Tips to increase active participation:

For engineers, consider how well your design review process engages introverts who may be less comfortable speaking up in a public forum. Meetings are often long and dry—try providing pre-reads, which can allow for shorter, more impactful meetings.

When it comes to eliciting feedback from suppliers and customers, the challenges are different. Access to the 3D models can be one of the main issues. While engineers have easy access, cross-functional teams and external SMEs often do not, and so democratizing access to CAD becomes critical. Scheduling and engagement are also core challenges when thinking about gathering external feedback, as timelines are already compressed, suppliers and customers are often in different regions and time zones, and most companies don't have a robust process for gathering feedback and effectively capturing design intent outside of a meeting.

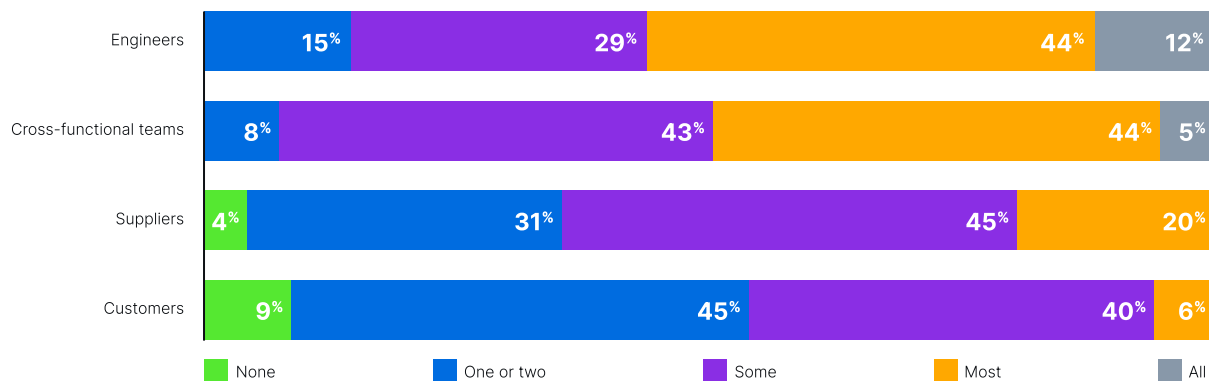**How many members of each of these groups participate and provide useful feedback during reviews?**

Figure 10: Number of participants providing useful feedback during design reviews, by group

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Most Teams Still Rely on Outdated Tools for Documenting Design Feedback

How are teams documenting design feedback? By far, the top choice is spreadsheets (64%), which is no surprise. However, spreadsheets can generally only accommodate text, which can make it difficult to capture and convey design intent. Without the context of a 3D model, engineers may need to spend a lot more time describing feedback. More commonly, they skip a thorough explanation which makes it difficult to put the feedback into action.

55% of respondents use emails, which can easily get lost, and have no version control in place. Email chains are static and don't keep up with new revisions of a CAD model, leading to miscommunications and delays.

To solve these challenges, 52% use a free CAD viewer, which provides the context of a 3D model. However, in general free CAD viewers do not allow multiple people to comment and provide feedback in parallel. Each reviewer must check out a file individually and add comments in sequence, which creates bottlenecks. Because each markup is typically stored as a separate file, there is the potential for a lot of clutter in PLM. If there are hundreds of annotations, it can be challenging to pinpoint the high priority feedback.

The ideal solution is to have the context of the model that you get with a CAD viewer, and the summary view of a spreadsheet to see what's essential. Of course, doing both concurrently adds a lot of administrative overhead.

A strong solution is a dedicated review tool where comments are tracked and stored automatically, so that comments can be given in context, and at the same time action items are prioritized and tracked in a spreadsheet format.

Top methods to document design feedback

Method	%
Annotating models or drawings using a free CAD viewer with markup features (ie eDrawings)	52%
Offline or physical methods, like sticky notes or notepads	50%
PowerPoint presentations with images and screenshots of CAD models	44%
Annotating models or drawings using a paid CAD viewer with markup features (ie CreoView)	11%
Conducting reviews in a dedicated design review software (outside of PLM), with comments tracked and stored automatically	8%

*Question allowed more than one answer and as a result, percentages will add up to more than 100%
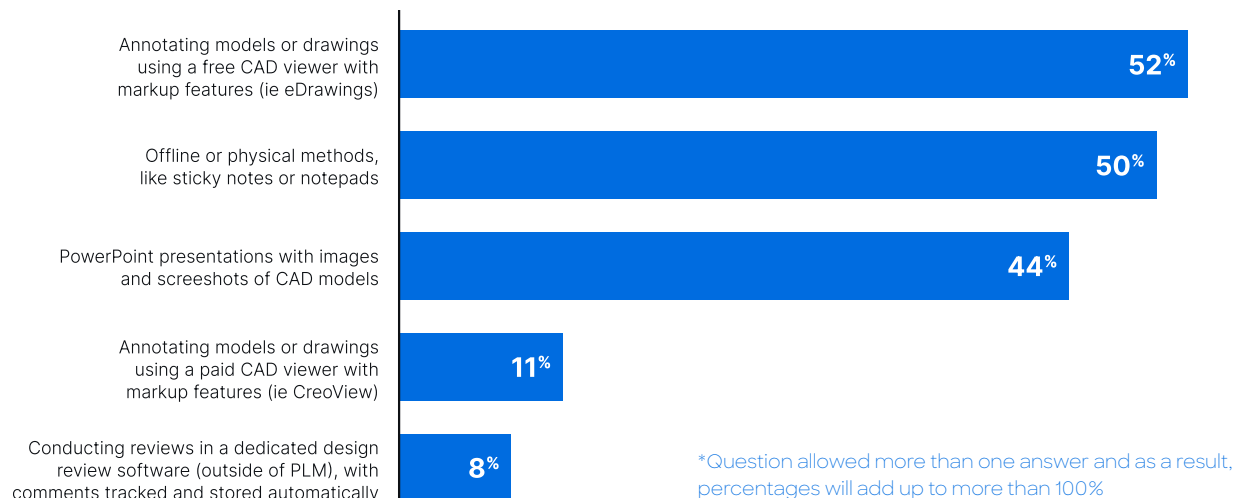
Figure 11

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Issues and Errors Identified in Reviews are Slipping Through the Cracks

On average, 57% of issues identified during design reviews are tracked and later addressed. That means **43% of issues are never tracked or addressed**. Only 1% of companies are able to address all of their feedback.

Feedback is the currency of new product development, and yet despite all the time and effort put into gathering feedback, 43% is lost. This feedback may come up later in production, leaving teams thinking "someone **did** catch this, it just got ignored."

Ask yourself, what's sitting in that 43%? Is it safety-critical issues? For automotive and heavy equipment manufacturers, this is a real risk. Is it unnecessary cost left in the product that's impacting margins? Could it be an idea that if tracked and addressed would be the next big competitive advantage for your business?

Average: 57% of issues discovered in design reviews get tracked and addressed
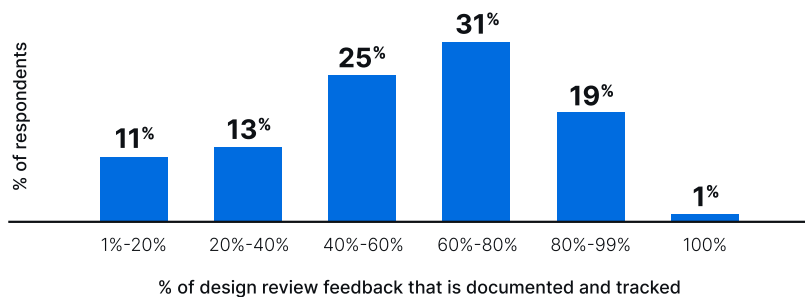

Figure 12: Percentage of issues from design reviews that get tracked and addressed

Larger companies (5K+ employees) are significantly more likely to capture and resolve feedback generated in reviews, and on average document 70%, compared with 50% in companies with between 1-5k employees.

What are larger companies doing right? We believe larger companies are more likely to:

· use free or paid CAD viewers to document feedback
· have a well-defined process in place for design reviews
· rely on additional processes outside of meetings to evolve designs

Larger companies track and address more issues (70%) compared with smaller companies (50%)
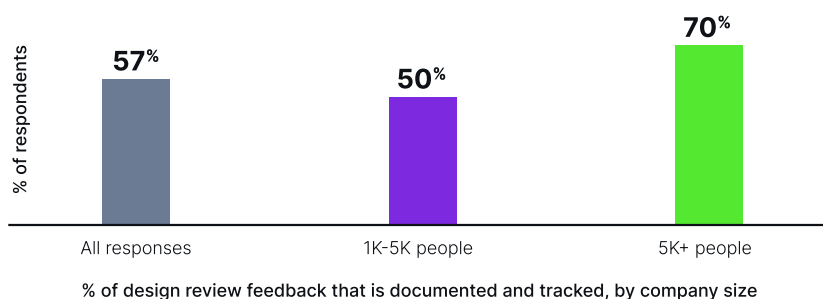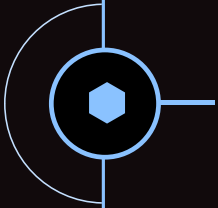

Figure 13: Average of design review issues tracked and addressed, by company size

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Because of outdated methods for documenting and tracking feedback, **43% of issues and errors** identified in design reviews **are lost and never actioned.**

Where Time is Being Wasted

Quantifying the Impact of Design Review Methods on New Product Development 2023/2024

Engineers Spend Hours or Days to Understand the Rationale Behind Decisions

How long does it take for engineers to find answers? Teams often need to understand why a specific design decision was made. For example, understanding decision rationale can be relevant during an audit, when onboarding new employees, when reviewing lessons learned, or simply during day to day activities. Just 13% of respondents say they can find the information they need within a few minutes.

In contrast, 65% of respondents say that finding the right data will take several hours, and a further 22% say it will take several days.

We only asked respondents how long it would take to understand why a single decision was made. If this takes hours or days, seeking to understand multiple decisions could easily add up to weeks. As a result, managers often spend an unreasonable amount of time preparing to onboard new employees. The administrative burden is heavy, and especially problematic for fast-growing companies in industries such as renewable energy and electric vehicles.

The challenge of finding theright data or information also has a marked impact on teams who would like to effectively leverage lessons learned.

The admin involved in reviewing past design decisions is often prohibitive. If it were easier, you might see teams reviewing lessons learned more often, and as a result, preventing past mistakes from recurring in new projects.

65% say that finding the right data will take several hours, another 22% say it will take several days.

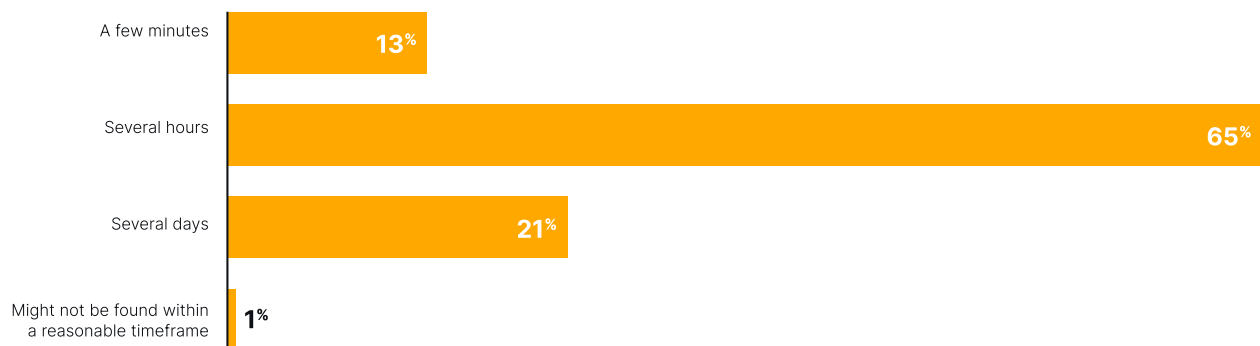**Time spent finding relevant information about a specific design decision**

Category	Percentage
A few minutes	13%
Several hours	65%
Several days	21%
Might not be found within a reasonable timeframe	1%

Figure 14

COLAB

Non-Value-Added Work Consumes Significant Engineering Resources

We often hear engineers complain that they didn't go to school to become PowerPoint engineers. Engineers are highly skilled employees, and yet spend a lot

of time in unnecessary meetings, completing admin work such as documenting feedback, searching for lost information, and other tasks that don't directly contribute to the quality and performance of the end-product.

Looking at the data, respondents reported that on average, about a quarter (23%) of their engineering team's time is wasted on non-value-added work.

Talented engineers are hard to come by, and organizations need to stop and think about how their time is being utilized.

There is a lot of opportunity to automate some of the administration around engineering processes, which could lead to engineers unlocking more than a quarter of their time to focus on higher value tasks.

Almost a quarter (23%) of engineering teams' time is wasted on non-value-added work.

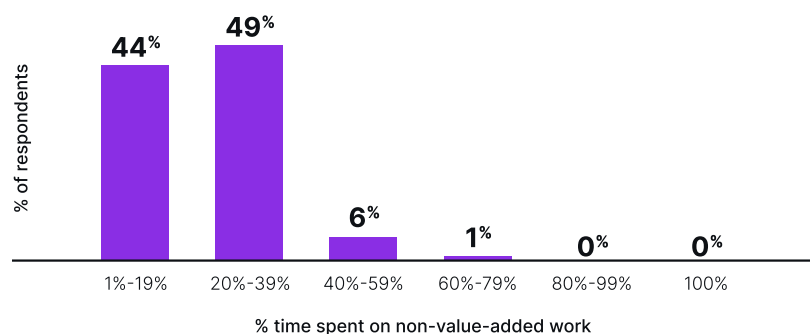**Average: 23% of my engineering team's time is wasted on non-value-added work**

Figure 15: Time spent by engineering team on non-value-added work

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Miscommunication and the Role of PLM

Quantifying the Impact of Design Review Methods on New Product Development 2023/2024

The Impact of Miscommunication on Product Development Delays

Miscommunication is a major issue, causing downstream business impact of all kinds. This could be product development delays, crunching the testing timeline to avoid these delays, missing milestones, or accepting sub-par design decisions as a necessary evil to launch version one of a product on time.

43% of respondents say at least 1 in 5 of their delays come down to communication issues.

Nearly half (43%) of respondents say 20% or more of their delays come down to communication issues.

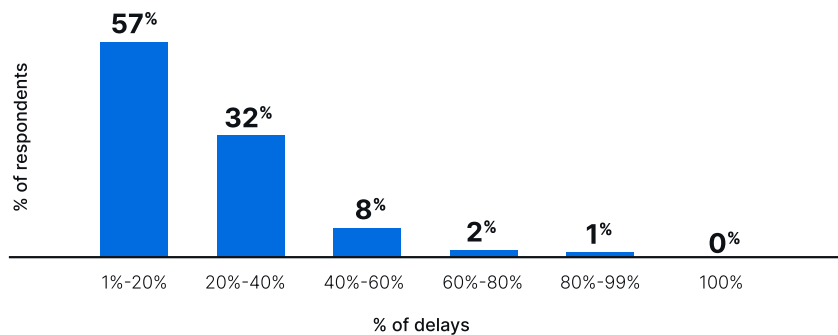**Average: 21% of delays are due to miscommunication**

Figure 16: Percentage of product development delays due to miscommunication

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Engineering Leaders Believe that Proper Use of PLM will Prevent 53% of Miscommunication Errors

All respondents to this survey utilize a Product Data Management or Product Lifecycle Management solution, both of which help prevent some forms of miscommunication. For example, when used properly, a PDM system ensures that engineers are referencing up to date product data and documents through check in/check out functionality. However, engineers still believe that miscommunication is a major challenge. According to engineering leaders, 21% of product launch delays are a result of miscommunication (Figure 17).

We need to ask, can PLM and PDM systems eliminate miscommunication completely? Or will there always be gaps, even in companies that are using their PDM or PLM to its full potential?

Our data suggests that the latter is true. Leaders believe that, when used to the extent of its capabilities, PDM and PLM can address a little over half of miscommunications. As for the remaining 47%? These require other solutions.

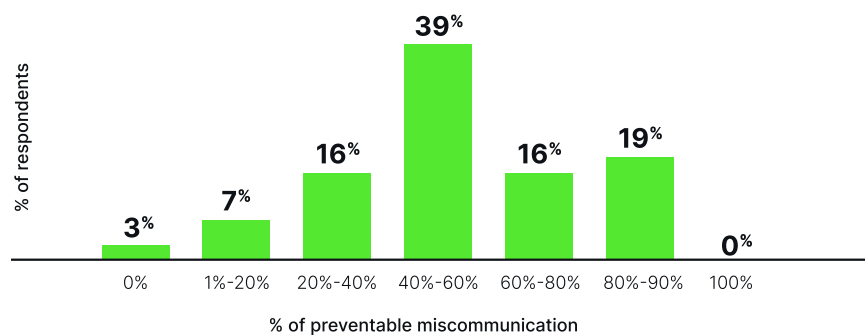**Average: 53% of miscommunication errors can be prevented through proper use of PLM**

Figure 17: Percentage of product development miscommunication that can be prevented through proper use of a PLM system

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What Do Product Development Teams Use PDM/PLM For?

While all respondents have a PLM system, most (71%) don't use PLM for product development at all.

In our conversations with engineering teams, we've seen that PLM systems are primarily used for sustaining engineering. After a product launch, teams rely on PLM to manage design changes and their downstream effects throughout the rest of a product's lifecycle.

Think about the pace of change during new product development. A single CAD file might go through multiple revisions in a single day.

The architecture of a PLM system resembles a database, with prescribed workflows in place. This is the ideal set-up for managing lifecycle changes for mature products, where changes happen less often, and formal management processes are critical for avoiding errors. However, for teams that are frequently updating designs during NPD, these formal processes may feel cumbersome. A multi-step workflow for every single design change can't help but slow teams down.

It makes sense that most product development teams (71%) are operating outside of PLM until later in Stage Gate, or even until after New Product Introduction. We have already quantified that 64% of teams use spreadsheets and 55% use emails to document design feedback for example (Figure 11).

However, this approach creates risk, as issues that are usually solved by PLM, such as people reviewing outdated data and files, may pop up in NPD processes, even with a PLM in place.

Functions for which new product development teams use PLM

*Question allowed more than one answer and as a result, percentages will add up to more than 100%

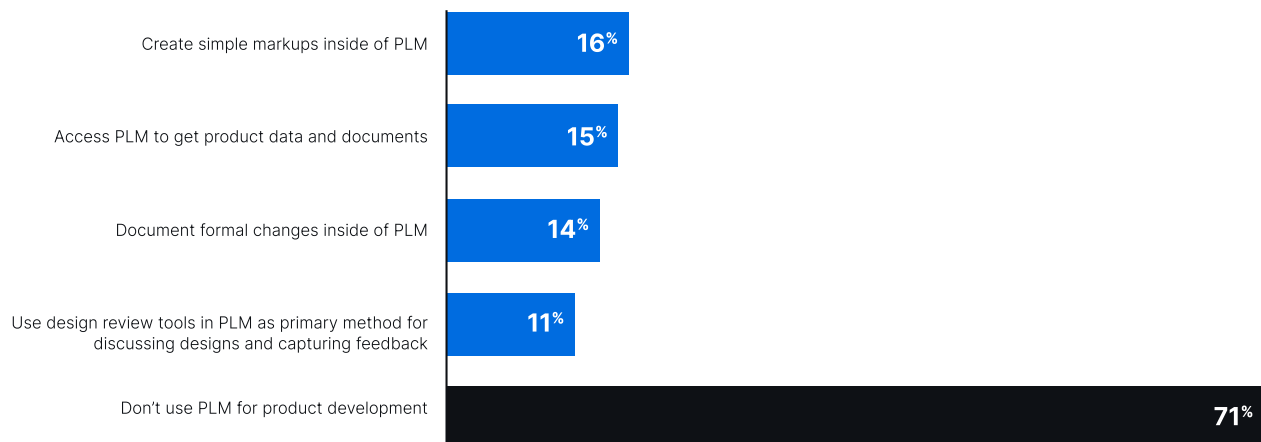|	
Create simple markups inside of PLM	16%
Access PLM to get product data and documents	15%
Document formal changes inside of PLM	14%
Use design review tools in PLM as primary method for discussing designs and capturing feedback	11%
Don't use PLM for product development	71%

Figure 18

COLAB

Strategies to Prevent Miscommunication and Avoid Product Development Delays

We've already seen that engineering leaders don't believe they can solve all miscommunication by using their PLM systems. So, how can teams prevent delays?

The #1 answer, at 19%, is better tools for documenting design feedback. As noted earlier in this report, existing tools to document feedback excel either at providing context (like free CAD viewers) or providing a high level overview of multiple issues (like spreadsheets). The ideal solution would solve for both, without creating additional administrative work.

Better processes for managing product data was the second most popular answer. Even though new product development teams are operating outside of PLM, staying up to date on the latest product data is still important to them. We believe this points to a need for a system that can manage rapidly evolving product data for NPD teams, without slowing them down.

10% of respondents think more frequent meetings would support better communication, and yet this number drops to 5% on average when speaking to leaders in larger companies. It would appear that larger companies are more aware that it's about managing the output and impact of meetings more effectively, rather than increasing the number of meetings where design issues are discussed.

It's interesting to note the least popular answers, which reiterate the idea that expanding access to PLM and providing more training on PLM won't solve all product development challenges. Instead, better tools and processes need to be put in place.

#1 way to prevent miscommunication related delays during product development
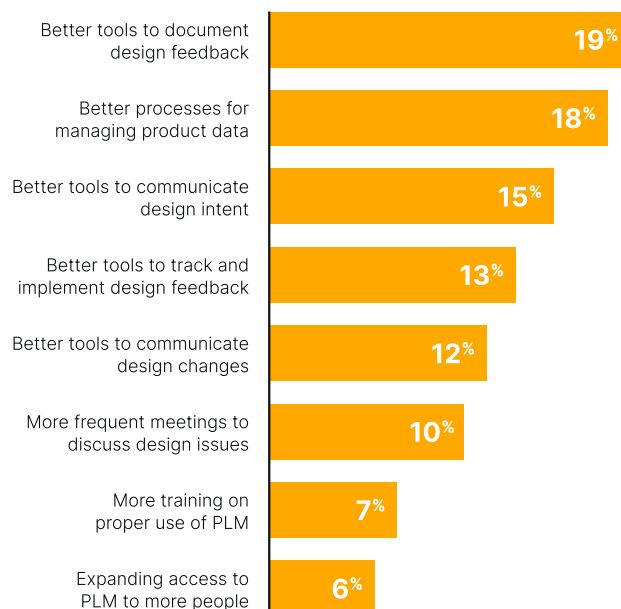

Better tools to document design feedback	19%
Better processes for managing product data	18%
Better tools to communicate design intent	15%
Better tools to track and implement design feedback	13%
Better tools to communicate design changes	12%
More frequent meetings to discuss design issues	10%
More training on proper use of PLM	7%
Expanding access to PLM to more people	6%

Figure 19

Percent of respondents who selected "more frequent meetings", by company size

1,000–5,000 people	13%
5,000+ people	5%

Figure 20

COLAB
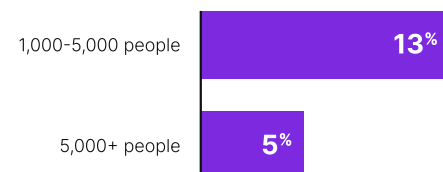
Improving Outcomes in 2024

Want to Deliver More NPD Projects on Time? Here's the #1 Predictor of Success

Given the following definitions, we asked engineering leaders to select the #1 predictor of their team's ability to deliver an NPD project on time:

Term	Definition
Design review quality	Teams' ability to generate thorough feedback and catch mistakes
Requirements tracking	Teams' ability to track and respond to shifting requirements
Design review speed	How fast the team can thoroughly complete required reviews
Resource management	Are the right people and subject matter experts assigned to the project?
Project management	Teams' ability to track progress and visibility into next steps
Product data management	Structured data with clear ownership, version control, and release status

Design review quality emerged as the #1 answer, selected by 24% of respondents. Thorough reviews, especially early in the design process, prevent rework and expensive downstream changes. Late-stage errors and changes are more likely to delay product launches, compared with issues that are caught early.

That's why it is essential to engage key stakeholders—including cross functional team members and suppliers—to maximize useful feedback.

17% of respondents rated Design review speed as the top factor in meeting product launch deadlines. Non-value-added work is a significant burden for engineering teams, consuming around 23% of their time (Figure 15), so it's no surprise that leaders see speed as a major opportunity.

Across this survey, one point is clear: design review speed and quality have a direct impact on business outcomes. By improving reviews, engineering teams can launch more products on time, while preventing errors and quality issues downstream.
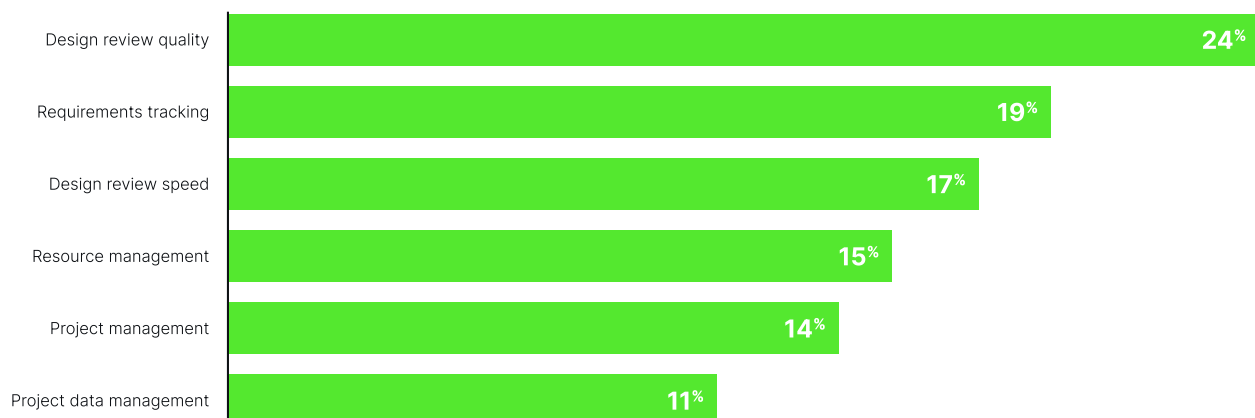
#1 predictor of on-time delivery in product development

Design review quality	24%
Requirements tracking	19%
Design review speed	17%
Resource management	15%
Project management	14%
Project data management	11%

Figure 21

COLAB

17% of respondents rated design review speed as the top factor in meeting product launch deadlines.

About CoLab

CoLab is a cloud based platform purpose built for fast, effective design review. Using CoLab, multiple engineers, designers, and other stakeholders can review designs together and build off one another's feedback.

CoLab makes it easy to review the right data (including CAD) with all the right people, capture useful feedback, and track issues through to action. CoLab pulls together design discussions previously lost in emails, spreadsheets, and notebooks into a single platform that integrates back into PLM. We call it a Design Engagement System.

With PLM, CAD, and CoLab, customers can easily communicate design intent, make decisions together quickly, and release those decisions to the rest of their organization. Mechanical teams using CoLab for complex review have accelerated design cycles 2x, achieved 8-figure cost reduction targets, and tapped into more supplier design expertise.

See how companies like yours are using CoLab at

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