IMPROVING SYSTEM DESIGN PROCESSES

GETTING THE MOST FROM SYSTEM MODELING AND ANALYSIS

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Executive Overview

There's no doubt about it: Today's products are changing fast. Their hardware is increasingly complex, and software and electronics play increasingly important roles in their functionality. Even today's common household items are equipped with smart features that require the integration of mechanical, electrical, and software components. It's no surprise, then, that companies are searching for ways to effectively manage rising product complexity in their design and development processes. Many have turned to systems modeling and systems analysis to aid in those efforts and have realized value from their adoption. Those that integrate these processes have experienced even more pronounced benefits, including a significant reduction in post-release change orders and a corresponding per-project savings averaging $1.62 million.

To gain a clearer understanding of how adoption of these solutions has improved organizations' processes and performance, Lifecycle Insights conducted the 2022 MBSE Study. The study surveyed respondents from companies of varying sizes and from a range of industries, including off-highway, construction, and agricultural equipment; aerospace; automotive; consumer electronics; industrial equipment or heavy machinery; high tech and electronics; and consumer products. Its findings reveal significant differences between the most progressive respondents' performance outcomes and those of their least progressive counterparts.

This report details the study's findings and provides insights into the benefits and advantages of mature systems engineering, model-based systems engineering (MBSE), and systems analysis approaches. The report also explores the impact of integrating these approaches. The publication contains three sections:

- Drivers of Systems Engineering Adoption: This section explores the factors driving companies to adopt systems engineering solutions and discusses the reasons that such initiatives appeal to today's organizations.
- Benchmarking Systems Engineering Initiatives: This section details the benchmarking methodology used to separate respondents into groups and contrasts the maturity of their systems engineering adoption efforts.
- Strategies and Tactics of the Most Progressive: This section compares the systems engineering and systems analysis practices and solutions of the most progressive respondents to those of their moderately and least progressive peers, explores the shortcomings of traditional solutions, explains the appeal of utilizing systems modeling and systems analysis, and explores the advantages of integrating those approaches.

Many companies are pursuing systems engineering solutions to address their product design and development challenges, and this report offers clear insight into how they can derive value from such investments.

DRIVERS OF SYSTEMS ENGINEERING ADOPTION

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Product design and development has become exceptionally challenging in recent years. As products have grown more complex, it has become less and less tenable to resolve systems issues late in the process. At one time, doing so might have been possible without significant risk to business outcomes. Systems engineering allows companies to mitigate these risks by more effectively coordinating work across engineering domains from very early in the design and development process. Some organizations continue to pursue systems engineering using traditional office tools, such as documents and spreadsheets, but these tools have limitations. Organizations that integrate systems modeling and systems analysis into their systems engineering approach yield even greater benefits, completing more projects on time and on budget than their peers.

This section of the report explains:

- the effects that rising product complexity have had on the design and development process;
- how this complexity creates congestion at the point of systems integration; and
- why integrating systems modeling and systems analysis into the product design and development process is an appealing method of addressing those difficulties.

RISING COMPLEXITY

Products manufactured today are more complex than ever. They often involve mechanical components, electronics, and software that can feature millions of lines of code. Engineers in each of these domains have typically worked in isolation on components within their areas of expertise. But this siloed approach can create challenges when integrating those components in the later stages of product development.

This level of complexity may once have been isolated to the aerospace and defense and automotive industries, but that is no longer the case. Consider the number of everyday household products, from mattresses to coffee makers, equipped with software, electronics-driven features, and smart functionality. This reality also applies to product lines as well as the variations in manufacturing environments. Products in any industry can quickly achieve unprecedented levels of complexity.

Manufacturers in a variety of industries are mitigating these challenges by implementing systems engineering practices and processes, which allows work to be more effectively coordinated across domains.

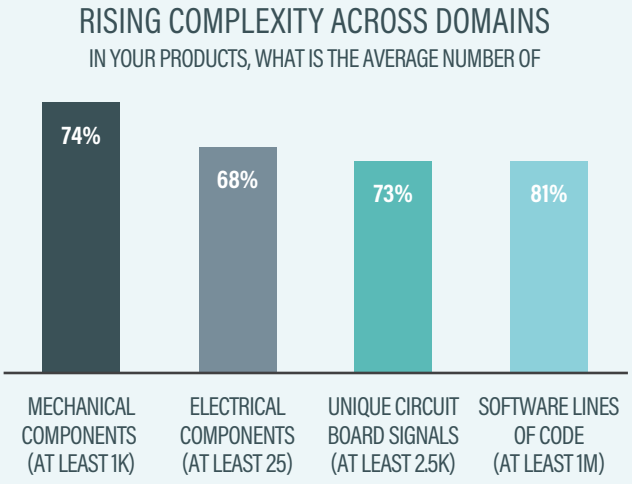


Figure 1
The complexity of today's products, many of which include extensive amounts of mechanical and electrical components, circuitry, and coding requirements, is increasing rapidly

THE SYSTEMS INTEGRATION CHALLENGE

Rising product complexity has introduced new difficulties that previous generations of engineers did not often have to consider. Historically, cross-domain collaboration during the product development cycle was rarely necessary because few products required electrical, mechanical, and software components to be merged in the way they often are today. A product's elements could be integrated later in the production cycle without much issue. That is no longer the case.

The combination of more complex products and siloed engineers relying on traditional processes leads to major challenges when work from different domains must be integrated. At that stage, prototype circuit boards, prototype mechanical assemblies, and newly developed software are merged, often for the first time. Then, the product's behaviors, requirements satisfaction, and performance are validated through prototyping and testing.

But when work on a complex product is not coordinated throughout the development process, its first, second, or even 10th prototype is likely to fail. And the greater the number of discrete elements that need to be designed, integrated, and tested, the more detrimental that lack of coordination is likely to be. As a result, the prototyping and testing phase tends to devolve into a costly, time-consuming cycle of experiencing failures, identifying their root causes, and attempting quick and sometimes slap-dash fixes to achieve a fully functional prototype.

THE EFFECTS OF SYSTEMS ENGINEERING

Systems engineering addresses the problems that now often arise at the point when systems integration occurs. This ensures that contributions to a product's development are coordinated and integrated more efficiently.

Industry standards define systems engineering as a process and a manner of thinking used to develop systems, but that definition doesn't capture the breadth of its effects. More precisely, systems engineering is a set of processes, practices, and tools that allow companies to support a variety of crucial steps throughout the product life cycle.

Regardless of a company's particular approach to systems engineering, it must develop systems built from several tightly interrelated sets of information:

- Requirements: These textual or numerical statements represent needs that must be fulfilled.
- Functions: These generically defined capabilities fulfill requirements, acting as a solution.
- Logical architecture: A representation showing the logical behavior of a system.
- Physical architecture: A representation of the system implemented as hardware and software.

Requirements are allocated to functions, functions are assigned to aspects of the logical architecture, and aspects of the logical architecture are allocated to items in the physical architecture. The effects of altering any one of these will necessarily be felt by the others. Systems engineering provides traceability from requirements to those physical items, making those changes easier to manage and providing several other advantages and benefits, including:

- Product architectures are more clearly and effectively defined at the beginning of the design process.
- Engineers and others working in each domain coordinate their work and any product changes more closely.

Most importantly, implementing systems engineering practices helps stakeholders manage complexity, leads to fewer rounds of prototyping and testing, minimizes redundant work, lowers production costs, and reduces time to market.

The cumulative impact of these benefits is a more streamlined design and production process that allows viable products to be developed more quickly and efficiently.

BENCHMARKING SYSTEMS ENGINEERING INITIATIVES

BENCHMARKING SYSTEMS ENGINEERING INITIATIVES

To explore the progress companies have made in pursuing systems engineering initiatives, Lifecycle Insights conducted the 2022 MBSE Study, which surveyed more than 285 respondents from numerous industries, including off-highway, construction, and agricultural equipment; automotive; consumer electronics; industrial equipment; and aerospace and defense. Respondents' company revenues varied widely, but most were between $50 to $250m (18%), $250 to $500m (27%), or $500m to $1b (21%).

This benchmark research separated respondents into groups to reveal variations in their use of progressive practices, processes, roles, responsibilities, and technologies.

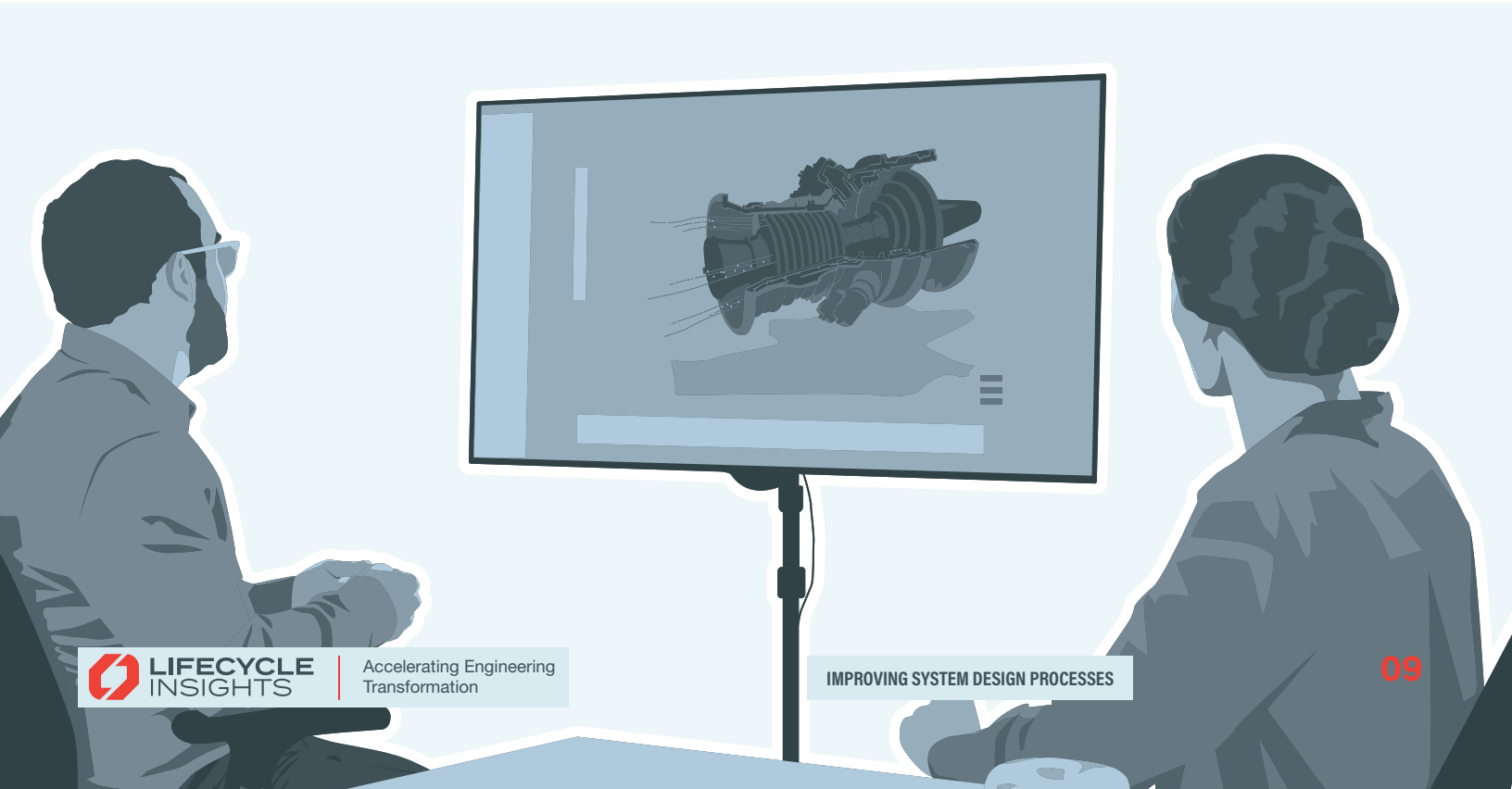
This section explains:

- how the study categorized respondents and analyzed group performance; and
- how the maturity of MBSE initiatives varied across groups.

SEPARATING RESPONDENTS INTO GROUPS

Survey respondents were asked about their pursuit and use of systems engineering to manage multiple aspects of product design and development tasks, including system requirements, architectures, and designs. Lifecycle Insights then segmented the respondents into three designated groups based on their use of systems engineering—including integrated systems modeling and analysis—to manage these tasks. These three groups—least, moderately, and most progressive—capture the maturity of companies in their pursuit and implementation of systems engineering initiatives. The most progressive companies are those whose efforts are most mature.

Evaluating the 2022 MBSE Study findings in this way reveals the extent to which the most progressive companies experienced key benefits of systems engineering practices (including integrated systems modeling and systems analysis), which include hitting full design release and full systems delivery on time, controlling costs, and beating systems quality targets.



THE MOST PROGRESSIVE SATISFY COMPETING METRICS

Respondents identified as the most progressive perform better across the aforementioned range of metrics. Nearly two-thirds of highly progressive organizations' projects (65%) hit full design release on time, which is critical to the efficiency of materials procurement and other critical manufacturing tasks further along the product lifecycle. A similar number of these organizations' projects (63%) hit full systems delivery on time. At the same time, more than half of the most progressive companies' projects (58%) met or beat systems cost targets, and the same percentage of their projects met or beat systems quality targets.

By themselves, these figures would be impressive, but when compared to the rates at which the least progressive and moderately progressive companies hit their project timeliness, cost, and quality targets, the benefits of adopting progressive practices become even more obvious.

The least progressive companies' projects achieved full design release on time in just 45% of cases and met full systems delivery targets only 43% of the time—a full 20 percentage points lower than their most progressive counterparts. Even moderately progressive companies struggled to meet cost and quality targets when compared to the most progressive. Moderately progressive companies reported that just over four in 10 projects meet or beat systems cost targets, a full 17 percentage points lower than highly progressive companies. Similarly, moderately progressive companies reported that 42% of their projects met or beat systems quality targets compared to 58% of projects at the most progressive companies.

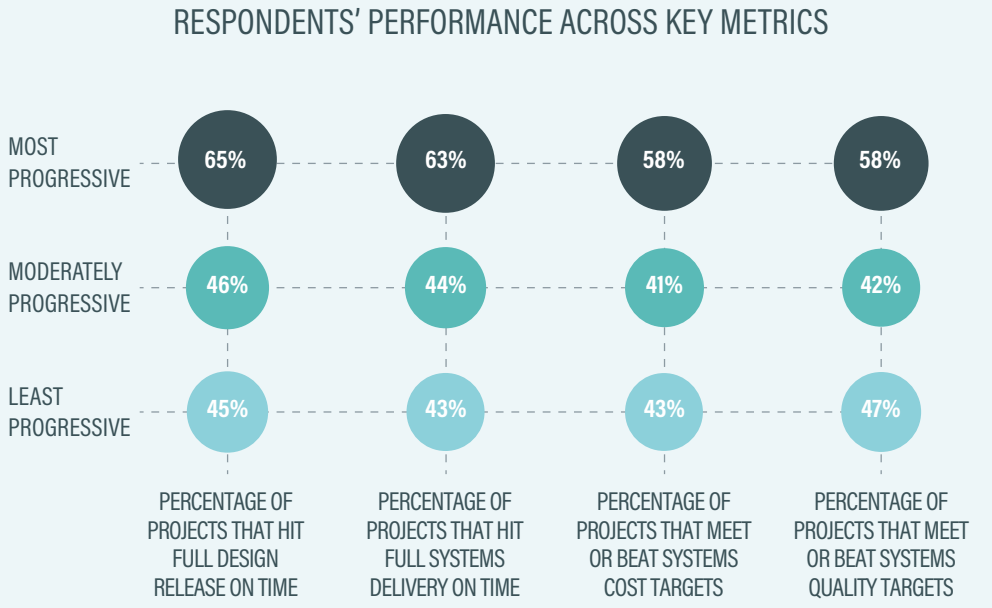
THE MOST PROGRESSIVE EXPERIENCE FEWER POST-RELEASE CHANGE ORDERS

In addition to completing more projects on time and meeting or beating cost and quality targets for those projects more often than their less progressive counterparts, the most progressive companies also execute fewer costly, time-consuming post-release change orders. Producing highly complex products often results in a high number of these change orders, delaying project completion and creating budget overruns.

As the study illustrates, progressive initiatives can be instrumental in limiting these costly overruns. Consider the following:

- Study respondents reported an average change order cost of $11,000 .

Figure 2
Highly progressive companies' projects achieve key performance goals at a rate significantly greater than their less progressive counterparts.



NUMBER OF RESPONDENTS' POST-RELEASE CHANGE ORDERS

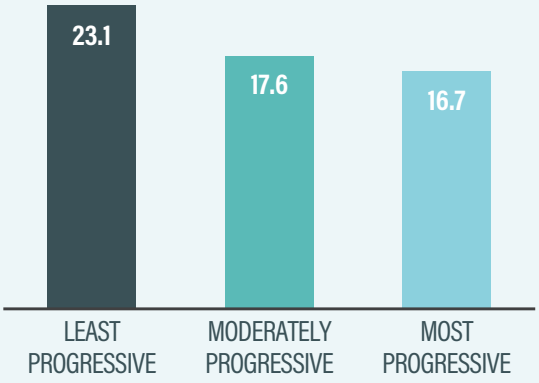


Figure 3
On average, the most progressive companies perform fewer systems-related post-release change orders than the least progressive.

- The most progressive companies execute 6.4 fewer post-release change orders than their least progressive peers—a 28% improvement.
- Lifecycle Insights' research over the past three years indicates that the average company undertakes 23.2 development projects per year.

Using these figures (6.4 fewer change orders at $11,000 apiece, multiplied by 23.2 projects per year), the most progressive companies enjoy an average savings of $1.62 million.

As the table above demonstrates, the range of potential savings for companies of all sizes is enormous. Companies that execute a high number of projects and make extremely complex products can save as much as $2.7M per year by reducing the number of post-release change orders they carry out. Companies with far fewer projects per year that make low-complexity products may enjoy less in savings, although reducing costs by $27K per year over the course of several years is by no means insignificant.

PROGRESSIVE COMPANIES' POST-RELEASE CHANGE ORDER SAVINGS

Figure 4
Highly progressive companies' projects achieve key performance goals at a rate significantly greater than their less progressive counterparts.

TOTAL AVERAGE AMOUNT OF MONEY AN ORGANIZATION SPENDS ON CHANGE ORDERS

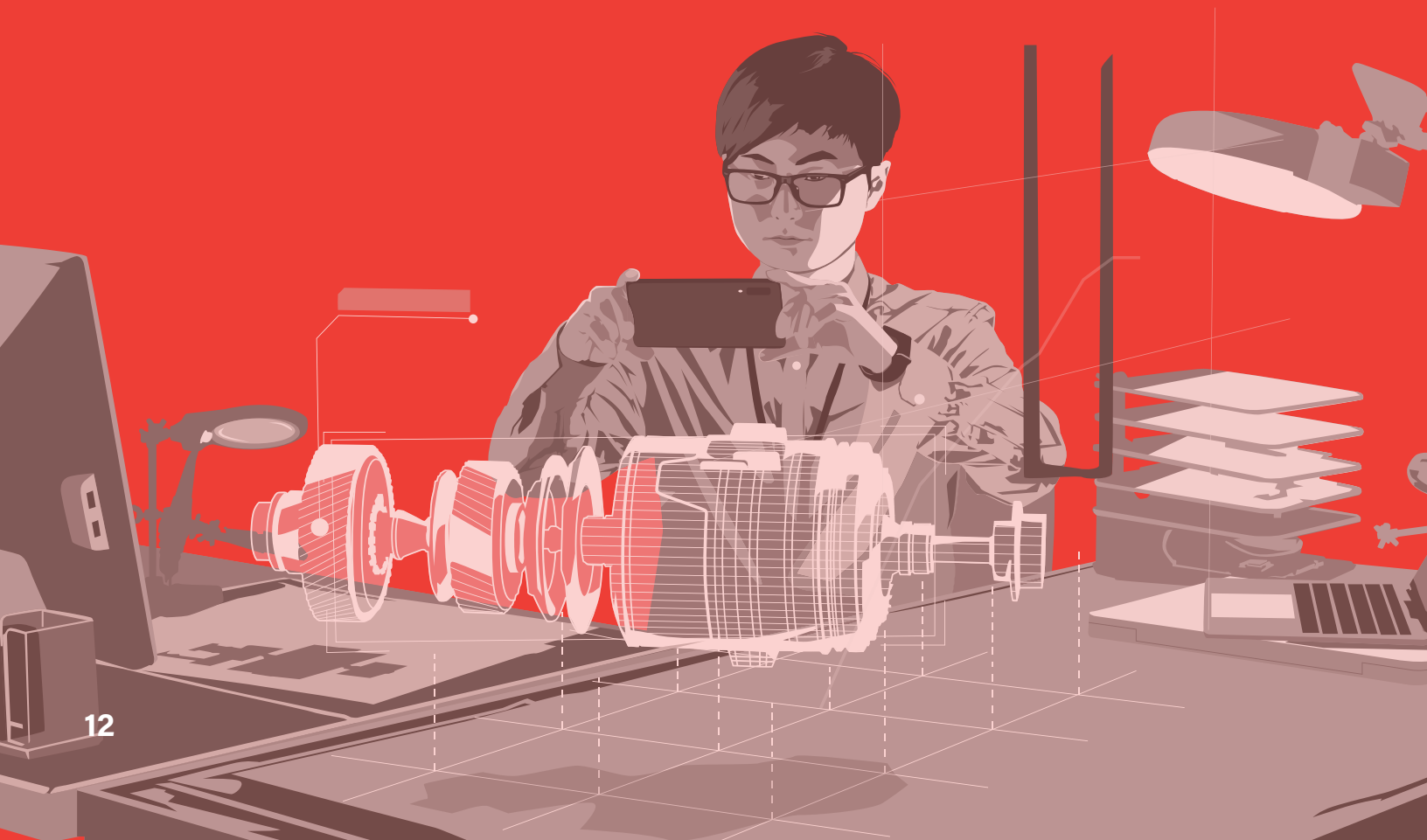
		Average # of projects per year*			
		10	20	30	40
AVERAGE NUMBER OF CHANGE ORDERS PER PRODUCT**	1	$198,400	$396,800	$595,000	$793,600
	3	$595,200	$1,190,400	$1,785,600	$2,380,800
	10	$1,984,000	$3,968,000	$5,952,000	$7,936,000
	25	$4,960,000	$9,920,000	$14,880,000	$19,840,000

TOTAL AVERAGE AMOUNT OF MONEY THE MOST PROGRESSIVE SAVES OVER THE LEAST PROGRESSIVE ON CHANGE ORDERS

		Average # of projects per year*			
		10	20	30	40
AVERAGE NUMBER OF CHANGE ORDERS PER PRODUCT**	1	$27,471	$54,942	$82,412	$109,883
	3	$82,412	$164,825	$247,237	$329,649
	10	$274,708	$549,415	$824,123	$1,098,831
	25	$686,769	$1,373,538	$2,060,308	$2,747,077

*average of 23.2 across six LCI studies in the past three years, 1650+ respondents' that states
** average cost of a change order is $11,000 per the 2022 MBSE Study

STRATEGIES AND TACTICS OF THE MOST PROGRESSIVE



STRATEGIES AND TACTICS OF THE MOST PROGRESSIVE

Recognizing the potential value of systems engineering and implementing it effectively are, of course, different propositions. The most progressive companies tend to have the most experience pursuing systems engineering initiatives and, unsurprisingly, have realized more of its benefits. These companies also tend to employ specific systems engineering, modeling, and analysis practices and solutions that allow them to realize more value from their initiatives on those fronts. This section explains:

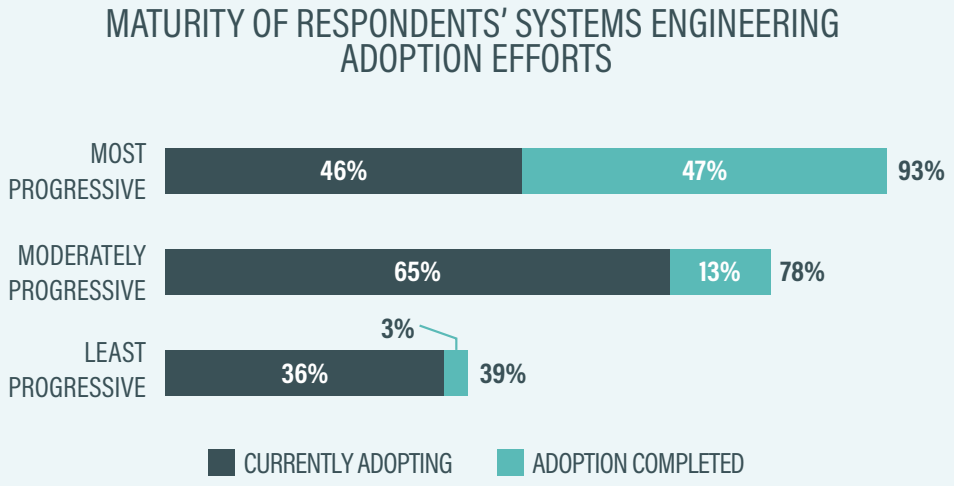
- the level of experience the most progressive companies have in implementing more advanced systems engineering initiatives;
- the systems engineering practices and solutions employed by the most progressive respondents in comparison to their peers;
- the shortcomings of traditional design and development solutions, such as documents and spreadsheets;
- the specific appeal of integrating MBSE and systems analysis to optimize the product design and development process and identify problems earlier, reducing the need for change orders; and
- the systems analysis practices and solutions used by the most progressive respondents in comparison to their peers.

INITIATIVE MATURITY AND LENGTH OF ADOPTION

It's clear that the most progressive companies derive myriad benefits from systems engineering initiatives in general and the integration of systems modeling and systems analysis in particular. The study's findings suggest that their experience is the key to these rewards. The survey respondents identified as the most progressive have pursued these initiatives more heavily and for a longer period than less progressive companies.

As with any new undertaking, it takes time for companies to gain their footing when implementing systems engineering. They must assess the ways in which systems engineering initiatives, including integrated systems modeling and analysis, may be applied in their organizations and determine how

Figure 5
Nearly half of the most progressive companies have completed adoption of systems engineering processes, far outpacing even moderately progressive respondents.



to get the most value out of new approaches. To realize the value of these initiatives, they also must bring employees up to speed on new processes and figure out how to make those employees as productive as possible through training and other support. Because the most progressive companies have more experience with systems engineering—integrated systems modeling and systems analysis in particular—and have fully adopted more new processes, they have naturally realized more advantages and benefits.

SYSTEMS ENGINEERING PRACTICES

The most progressive companies tend to adhere to certain tactics that improve their chances of success. More than three-quarters (76%) of the most progressive respondents reported having roles dedicated at least half-time to systems engineering. Only 45% of moderately progressive companies and 26% of the least progressive companies can say the same. Having engineers who can spend such a substantial amount of time on systems engineering tasks makes a company's efforts on that front more successful. Without roles devoted specifically to systems engineering, companies may find themselves struggling to consistently accomplish tasks related to it.

Using systems-oriented metrics is another common practice among the most progressive respondents. Among other things, they may measure the length of time it takes to break down customer requirements into functions, define physical architectures, and allocate functions to physical items. More than two-thirds (70%) use these measures, compared to one-third (33%) of their least progressive counterparts. Such metrics are vital because they provide insight into the effectiveness of the companies' systems engineering initiatives. Without metrics, that effectiveness (or a lack thereof) would be invisible. But by targeting specific metrics, companies can determine the impact on performance of even minor adjustments, such as a role change or a process change. Then they can move forward with only the most effective changes.

Finally, well over half of the most progressive companies (59%) use a formalized, documented systems engineering process. That figure compares closely to the percentage of moderately progressive respondents who use such a process (58%). Only 40% of the least progressive companies do so, however. Clear documentation of responsibilities and timelines provides clarity to all stakeholders. It also ensures compliance with the process, which is especially important when deadlines approach, potentially tempting some stakeholders to return to a previous approach.

Figure 6
More than four in 10 of the most progressive respondents have practiced systems engineering for at least a year.

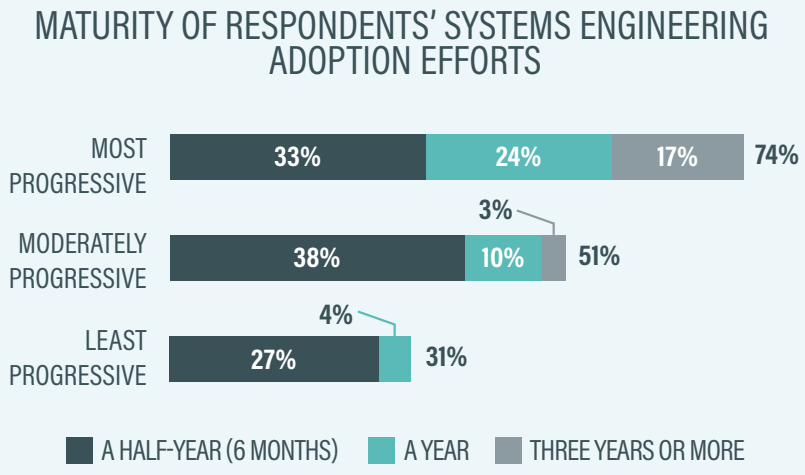
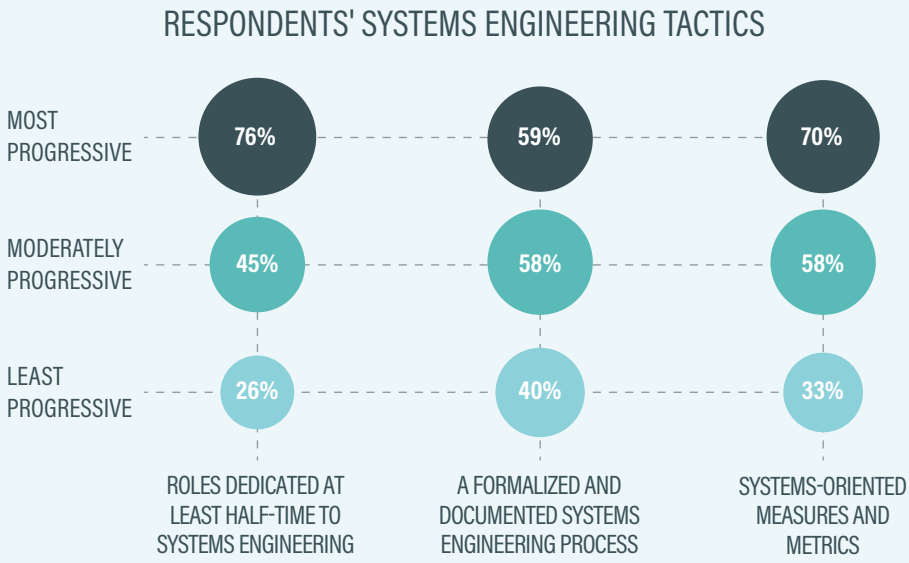


Figure 7

The most progressive employ several specific tactics more frequently, enabling them to realize more benefits from their system engineering initiatives



SOLUTIONS FOR SYSTEMS MODELING

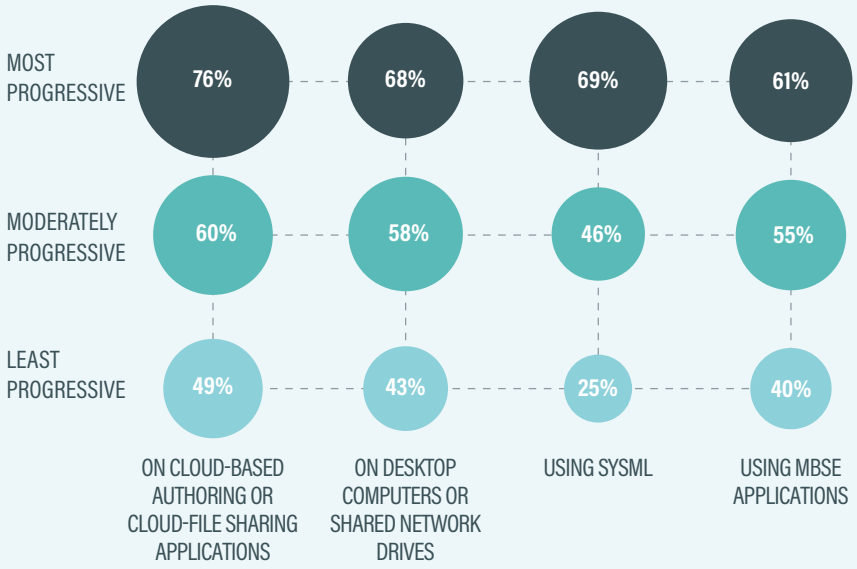
Technology solutions are vital to supporting the systems engineering practices progressive companies use to design and manufacture their products. These solutions can help companies address difficulties that arise from growing product complexity and reduce friction at the prototyping and testing stages.

Traditional tools, such as spreadsheets and documents, can facilitate a certain level of coordination between engineering domains during design and development, but they are limited in important ways.

Cloud-based systems engineering solutions have inherent advantages over these traditional tools. They allow stakeholders in different engineering domains to access and collaborate on systems definitions, which makes every phase of development more efficient. And for large companies that outsource some systems development responsibilities to their supply chain, being able to collaborate is especially valuable.

Figure 8

The most progressive enable their system engineering initiatives with solutions ranging from cloud-based file sharing applications to MBSE applications.



TRADITIONAL SPREADSHEET AND DOCUMENT APPROACHES

Systems are essentially composed of requirements, functions, logical abstractions, and physical structures. Traditionally, systems engineers have relied on general purpose applications that can create diagrams, spreadsheets, and documents to describe a systems model. But this approach has significant drawbacks.

Chief among those drawbacks is the manual effort required by these traditional tools. Experimentation and iteration are essential to the design process, as is the assessment of potential changes. Engineers using documents and spreadsheets to manage these efforts assume the burden of propagating changes themselves, an unsustainable approach that makes keeping up impossible. As a result, engineers are unable to make fully informed decisions during the development process and simply document changes when that process ends.

Relying on spreadsheets and documents can also cause design errors to proliferate. When engineers make a design change in one document or spreadsheet, the change does not propagate to other representations and analyses of the system, so they must be made manually. Not only are these manual changes time consuming, they also increase the likelihood of errors and uninformed engineering decisions, all of which creates the potential for production delays and added costs.

UTILIZING MBSE

MBSE leverages digital models of systems to allow organizations to create better product architectures, assess them earlier and more effectively in the production cycle, and provide more complete and less disruptive work-in-process systems changes.

To do this, MBSE replaces traditional documentation practices with a system architecture model (SAM). A SAM is a conceptual model that defines the structure and behavior of multiple components and subsystems within a system. The most progressive respondents created this digital model, which accounts for the interrelatedness of requirements, functions, logical architectures, and physical architectures throughout the production cycle, using a descriptive language, such as SysML. The model allows organizations to track and incorporate changes during the design and development process, reducing the burden on engineers and preventing many of the challenges that can otherwise occur at the integration chokepoint.

Furthermore, such models can accommodate greater product complexity as needed. State machines, for example, allow for different functions to be active and allocated, supporting start-up cycles, shutdown sequences, and far more. These models can also include interfaces, the definitions of how two or more subsystems interact with one another.

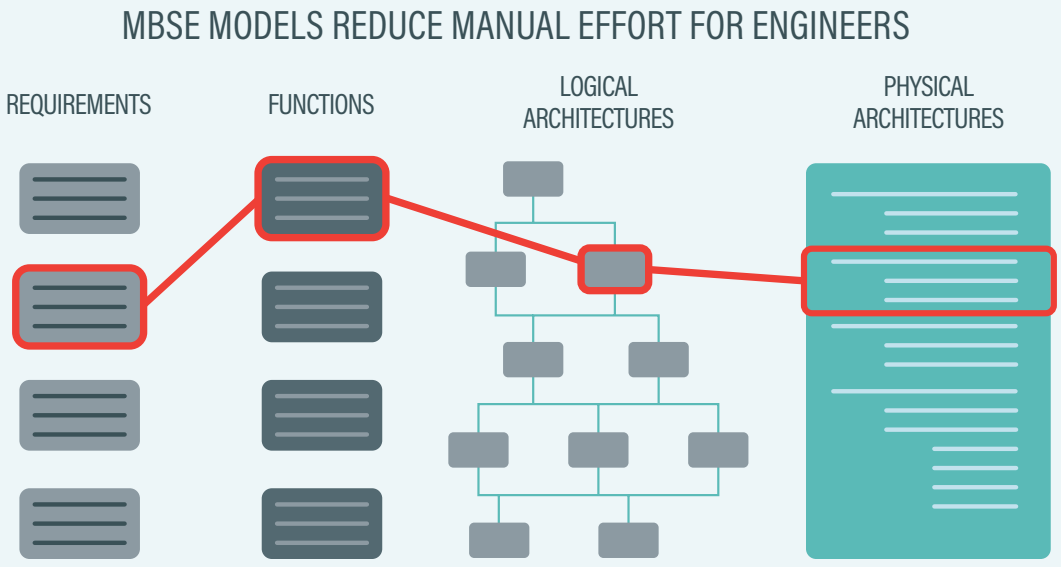


Figure 9
MBSE models automate initial definitions, changes, and traceability for systems engineering, eliminating the manual work associated with document-based approaches.

By providing an authoritative source of truth demonstrating the effects these interrelated elements have on each other during a product's design and development, MBSE allows engineers and product developers to overcome the challenges detailed in previous sections, including:

- Product architecture planning and tradeoffs: Before specific engineering disciplines start detailed design or development, they can connect the system model to simulation. This critical step allows engineers to build out and assess a range of product architectures, as well as verify requirements fulfillment, predict systems performance, and uncover systems behaviors. Early analysis of various alternatives dramatically increases the likelihood of passing a good architecture to detailed design and reduces the number of prototyping and testing rounds (as well as their associated costs).
- Assessing work-in-process system changes: The work-in-process phase of design can be chaotic, and at times, two or more disciplines may need to adjust an interface or product architecture. An MBSE system architecture model can be used to mock up a proposed change so everyone in the company can understand its impact. Engineers can use systems analyses to check performance as they explore different options. With a complete view of the implications of such a change, engineering teams can make informed decisions.

SYSTEMS ANALYSIS PRACTICES

MBSE ensures that stakeholders are more targeted and efficient in their work, and it allows them to coordinate their efforts throughout product design and development. When practiced in conjunction with systems analysis, its value only increases. Systems analysis makes it possible for engineers to digitally verify systems requirements, systems performance, and behaviors earlier in the design process, which means they do not have to rely entirely on physical prototyping and testing. They can also assess the viability of a system throughout the design process, even as changes are made and requirements evolve throughout. This approach offers greater insight into products' performance well before prototyping and testing occur, which allows development to happen more quickly and efficiently.

According to the study's findings, the most progressive companies use specific practices to amplify the benefits systems analysis provides. About three-fourths of them (74%) have roles dedicated at least half-time to performing systems analysis. As with systems engineering, having resources devoted specifically to carrying out these tasks increases accountability and keeps already busy engineers from becoming overloaded.

Nearly nine in 10 of the most progressive companies (87%) have a formalized and documented systems analysis methodology. For comparison, less than two-thirds (61%) of the least progressive companies employ such a methodology. The overwhelming number of highly progressive companies that have clearly delineated their practices in this area suggests that it is all but a necessity in the implementation of strong systems analysis practices.

Similarly, high percentages of the most progressive respondents employ a team dedicated to verification and validation of systems (82%) and have a single set of IT solutions for systems analysis (76%). Both figures are more than 50 percentage points higher than for the least progressive respondents.

SYSTEMS ANALYSIS SOLUTIONS

Companies use a variety of solutions to support the development and execution of systems analysis. There are, however, clear differences in how frequently the most and least progressive respondents use particular solution types.

Similar percentages of the most progressive (48%) and the least progressive companies (40%) use spreadsheets in a formal manner required by their internal processes. In contrast, the most progressive respondents (74%) formally require the use of systems analysis applications, compared to only 40% of the least progressive companies.

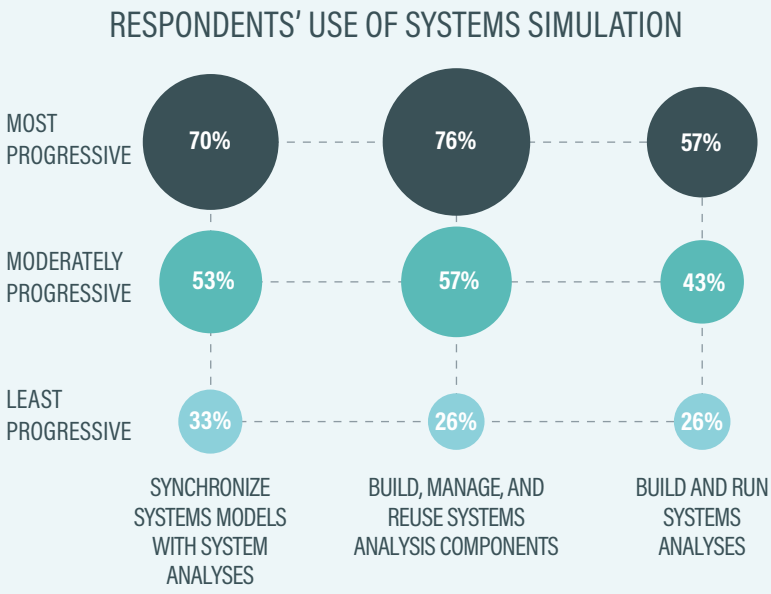
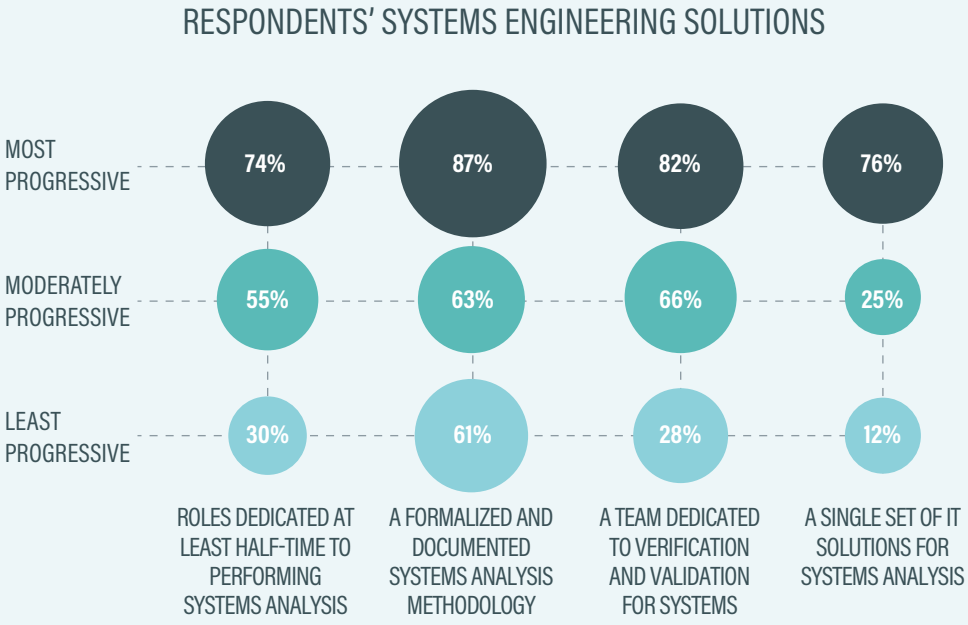


Figure 10

Study findings show that the most progressive companies employ systems analysis practices far more frequently than the least progressive.



Though spreadsheets and documents are easily accessed and shared among stakeholders inside and outside an organization, they also present important drawbacks. Companies that utilize systems analysis applications in addition to these traditional tools can reuse components and refine the accuracy of simulation components throughout the process, providing them with more reliable results. Furthermore, engineers can use systems analyses throughout the process, from the earliest concepts all the way through to verification, to ensure requirements are fulfilled.

INTEGRATING MBSE AND SYSTEMS ANALYSIS

Similar to systems modeling, progressive systems analysis can help companies overcome the challenges presented by traditional document- and spreadsheet-based approaches. Solutions that focus on analysis allow engineers to build a systems analysis model and eventually establish a library of analysis components. They can then use these components to quickly assemble and analyze a model of the system, then verify the system.

Another benefit of this process is that, in the event of a change to the system, engineers can update the system model and run the analysis again. This can be repeated as frequently as needed as the system definition matures. The components can also be correlated to real-world data, representing the physics or performance of a given component with incredible accuracy, giving stakeholders more confidence in simulation results. As with MBSE, progressive systems analysis allows companies to make changes to a model and observe the ways in which the system's performance changes. The speed and volume of new iterations made possible through this approach fuels more rapid innovation as well.

Integrating the system architecture model and system analysis keeps any changes to the model in sync with the analysis and vice versa. This prevents engineers from acting on out-of-date or inaccurate information, which can prevent such errors from having negative ripple effects throughout the design and development process. Additionally, systems analysis can be incorporated throughout the design process, allowing engineers to verify requirements even as they or the system design changes.

Summary and Recommendations

Today's companies face an array of challenges during the product design and development process. To address these challenges, many companies are turning to systems engineering and systems analysis. Lifecycle Insights conducted the 2022 MBSE Study to gain insight into companies' efforts on these fronts and the outcomes of those efforts. The study's findings indicate that the most progressive companies—those that have adopted advanced systems engineering initiatives, such as MBSE, and have more experience with those initiatives—have realized significant benefits.

SUMMARY

- Contemporary products are increasingly more complex, making design and development more challenging than ever before.
- MBSE allows companies to coordinate engineering work across multiple domains, mitigating the congestion that often occurs at the point of systems integration.
- The most progressive respondents' projects met or exceeded budgetary and timeliness goals at a higher rate than the least progressive respondents' projects. The most progressive respondents also executed fewer post-release change orders, thereby reducing costs.
- The most progressive companies enjoy more of the benefits of MBSE in large part because they have completed adoption of more MBSE processes and have been engaged in them for a longer period. They also tend to employ systems analysis alongside MBSE and to implement specific tactics that make their efforts more successful.
- Using cloud-based MBSE solutions in place of labor-intensive traditional tools allows stakeholders to coordinate work across domains and more effectively manage changes during product design and development. It also allows companies to scale up projects effectively as they add stakeholders and become more complex.
- Integrating MBSE solutions and systems analysis allows engineers to test product behaviors more accurately and earlier in the design process, which means they can iterate on a product's design more rapidly.

RECOMMENDATIONS

- Companies should implement MBSE initiatives to improve cross-domain collaboration and reduce their reliance on physical prototyping and testing.
- To maximize the effectiveness of their systems engineering practices, companies should adhere to proven tactics, such as having roles dedicated at least half-time to systems engineering, utilizing cross-functional engineering teams, and conducting dedicated systems engineering training.
- Using cloud-based solutions to perform systems engineering tasks can improve coordination between engineering domains. Companies seeking to facilitate systems engineering practices more efficiently should adopt such a solution.
- Along with practicing MBSE, companies should adopt systems analysis practices, such as having a formal, documented systems analysis methodology and teams dedicated to verification and validation. These kinds of practices allow companies to digitally verify requirements satisfaction, systems performance, and behaviors without relying entirely on physical prototyping and testing.
- Companies that want to get the most out of their systems analysis practices should adopt a systems analysis application that frees them from the drawbacks of documents and spreadsheets.

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