

PRODUCT LIFECYCLE TRENDS AND THEIR IMPACT ON PROFITABILITY AND TIME TO MARKET



In industries where change is a continual occurrence, understanding the needs of users is essential. In a research study conducted recently by *Machine Design/Industry Week* in partnership with aPriori, respondents report a reasonable curve in how product design-to-delivery schedules have changed over the past three years. This research confirms that there is significant pressure on product development teams to innovate, detail, test, and release new designs to manufacturing in less time than ever before.

Another important finding of the survey is the percentage of subsystems purchased from outside suppliers. This trend indicates a continued trend toward segmentation, where component and subsystem manufacturers are finding their niche so that they can stay ahead using the latest technologies. These companies offer greater benefits to equipment manufacturers that outweigh in-house designs. Our research indicates that 52 percent of those who responded are experiencing an increase in outside purchases for components and subsystems. This creates a higher potential for profit leaks in the supply chain. Currently, buyers have few details about the most efficient way to manufacture a product as well as the associated costs.

With a clear understanding of the high percentage of outside suppliers being used, it should be no surprise that cost estimates on new product designs are taking longer. Sixty-eight percent of respondents report that it takes more than a week to get a cost estimate. This figure directly contradicts a company's efforts to accelerate design-to-delivery, and makes



68%

*of respondents report that it takes **more than a week** to get a cost estimate. This figure directly contradicts a company's efforts to accelerate design-to-delivery.*

it difficult to compare multiple design alternatives that could ultimately yield a higher value product.

Challenges to Delivery

The more complicated items to research are the obstacles related to delivery within a projected timeline. Answers are often based on who's answering the question and what their perspective is. An engineer may suggest that it's a CAD software problem, where a manager might suggest it's a manpower problem. Our research found that organization and lack of communication between design and manufacturing was at 44 percent, which indicates that a single database for cost and manufacturing analysis would greatly improve this collaboration. Other key information from research indicated that late or multiple change orders were



another obstacle, at 34 percent. The change orders, related to manufacturability or cost overrun, could be eliminated in the early stage of design if the right simulation software were being used. Supply and demand (especially in volume situations), came in at 38 percent. The need for product certification and testing necessary only for specific industries was at 37 percent. All of these obstacles tend to crop up in either the manufacturing stage at 56 percent or the design and prototyping stage at 61 percent as would be expected.

This is where digital manufacturing simulation software could provide a lot of transparency—in seconds—to cost of design changes. Users would be able to achieve target costs

more consistently and eliminate delays due to long lead time quote response.

Let's go back to budgets and corporate capital being available when needed. Two in three respondents say that their product design-to-delivery costs increased over the past three years due to increases in material costs (68 percent), excessive burden on the product development team (48 percent), and the discovery of manufacturing issues and cost overruns late in the design cycle (27 percent). We've found that the majority of companies do not have a strategic Digital manufacturing simulation system in place that spans the product development team in order to combat rising costs while developing

new products. This can continue to erode profit margins. A modern, physics-based, mechanistic simulation tool would help improve material utilization and aid in the identification and elimination of manufacturability issues early in the design stage.

Even though some 70 percent of respondents suggest that costs are often or always top-of-mind in the evaluation process, this could easily be a false positive. Through many years of experience, it has been found that although everyone says they consider costs, they seldom actually do. Even when costs are evaluated, it's based on comparisons to older designs, which is fraught with problems considering the volatility of materials, labor, overhead, and logistics costs.

Along these lines, only 25 percent actually reported that costs are considered too late. Interestingly enough, the number of times costs are viewed at key milestones indicated that only 23 percent perform the operation every step of the way. Thirty percent only do so sometimes, 6 percent rarely, and another 5 percent don't do so at all. In all, 60 percent report that engineering change orders are related to product costs exceeding target costs.

Potential Manufacturing Issues

When asked how a product design team identifies potential manufacturing issues, respondents indicated that it was while running through a prototype sequence for evaluation (67 percent) and/or during regular manufacturing reviews (63 percent). Both of these approaches are expensive and time-consuming. Simulation software would



60%

Sixty percent report that engineering change orders are related to product costs exceeding target costs.

allow the user to quickly identify the issues quickly during design, and costs a fraction of either of the other two methods. Only 34 percent are presently using simulation software. Other answers to the question swung from doing on-floor reviews to interviews with the manufacturing team.

Product design teams only use simulation software a third of the time they could to identify potential quality, manufacturability, and/or cost issues. A higher level of use could reduce end-stage design churn, accelerate Time to Market (TTM), and improve profitability. When it comes to using simulation software, 17 percent never do so at all, while another 23 percent uses it less than 10 percent of the time. Only 10 percent use it all the time.

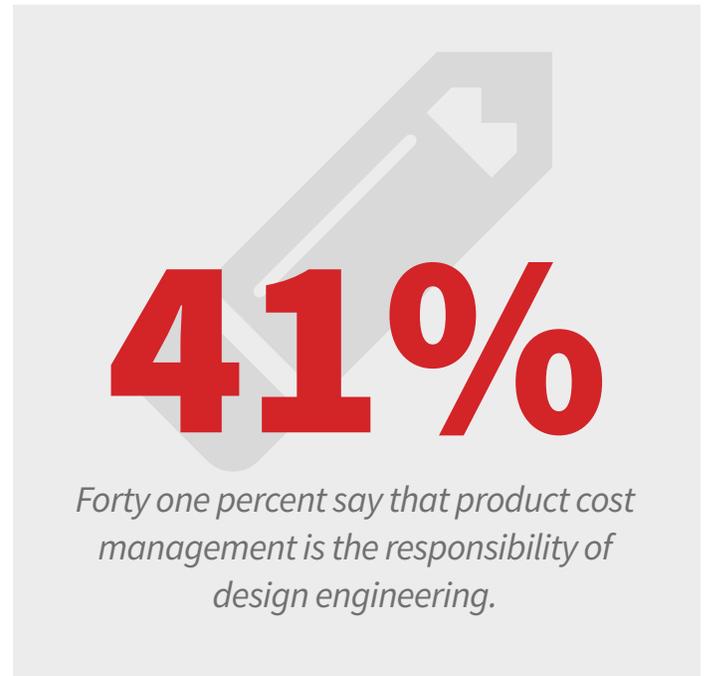
The divide between engineering experience and expertise and manufacturing experience and expertise is indicated by asking about the degree

of manufacturing experience in the product design team. It's important to remember that people often think they know more than they do. This is because manufacturing has become more sophisticated over the past ten years, and very few engineering programs graduate people who will be spending a lot of time studying or working in a manufacturing environment. Add to this the increased outsourcing to suppliers, and the exit of the baby boom, this is only getting worse. Keeping these facts in mind, still only 39 percent of respondents suggested that their degree of manufacturing experience in product design was good, and 20 percent say that it's either somewhat or severely lacking.

So, at the end of the day, whose responsibility is product cost management? According to our survey, 41 percent of respondents say that it's a function of design engineering, 29 percent suggest that it's part of the business strategy, and 18 percent believe it to be a manufacturing evaluation function.

Suggested Solutions

Research is the one method companies use to learn what's going on in the industry and to stay current and relevant when it comes to offering proper solutions to the needs of customers. aPriori, as the sponsor of this research project, provides a wide range of tools and software to help leading manufacturing and product companies to improve overall financial performance. This is highly important particularly with large multi-national manufacturing organizations that have product design, supply chain partners, and manufacturing centers distributed across the globe. In this type



of environment, tens of millions of dollars leak out of the system due to lack of visibility to the costs associated with early design as well as an inability to truly understand such costs when negotiating with supply chain partners.

Simulation-driven costing enables companies to quickly compare design alternatives early in the lifecycle of a new product design. aPriori provides an entire line of solutions for an extensive selection of manufacturing cost models including sheet metal fabrication, injection molded plastics, many different types of machining operations, numerous types of casting processes, and more. Through their patented understanding of how product design, materials, and manufacturing processes translate into product costs, they are able to provide design for manufacturability and cost solutions that can help improve product profitability and accelerate time to market.

aPriori considers product cost management to be a business strategy where companies achieve early visibility into how to hit target costs without slowing down the engineering process, how to negotiate more effectively using detailed cost and manufacturing data, and how to increase the accuracy and speed of RFQ responses. As part of aPriori's digital manufacturing simulation software, one of its capabilities is a platform that provides early visibility to cost, consistency of costing practices across all members of the product team, and higher throughput of cost optimized parts. Their goal is to help customers achieve a more cost-conscious culture where everyone considers profitability with each decision they make.

Research Methodology and Respondent Review

When it comes to **collecting data**, questions matter in that they must be clear and easily understood, they must aim to gaining facts in an honest manner, and they must stick to the subject. Similarly, methodology matters. To gain data that is useful and applicable to a subject there are certain rules of conduct, shall we say. The information in this research and analysis product, **Product Lifecycle Trends: Design to Manufacturing Delivery**, used methods that conform to well-established and accepted marketing research practices and procedures.

To encourage prompt response and increase the overall rate of response, email invitations were sent to **35,167 active users**. The invitations as well as the survey were branded with the Machine Design and IndustryWeek names and logos to capitalize on user affinity to these products. Responses were collected June 14, 2018, through July 31, 2018, and resulted in more than 600 completed surveys (271 of which were qualified), for an overall response rate of 1.7%.

There are two primary focuses you can take when performing research and analysis. You can move to understand a **broad spectrum of industries** to gain knowledge on what is of major concern with a lot of people (horizontal) or focus on a particular group whether that includes only the aerospace industry or only design engineers (vertical).

In this research, the goal was to learn as much as possible about a broad range of industries and job titles. Finding out where **lifecycle challenges** occur and who is affected was the primary purpose. But let us not forget that proper methodology is needed as well.

Respondents report that they are involved in discrete manufacturing industries by **100 percent**, continuous and batch manufacturing by **21 percent**, and **21 percent** in mixed mode manufacturing.* Of all of the discrete manufacturing industries served, **37 percent** were in industrial equipment, **35 percent** in automotive and other

vehicles, **31 percent** in fabrication and assembly, and **25 percent** in aerospace and defense. Electronics equipment and heavy machinery made up another **36 percent** in total.

The sample **included a variety** of job functions, leading with design engineering at **48 percent**. From there, job functions drop quickly with research and development at **15 percent**, operations and production at **12 percent**, and product development at **12 percent** before dropping off again.

Along those same lines, respondents' **primary job levels** included individual contributor at **54 percent**, manager at **26 percent**, and director at **10 percent**. This can probably be best understood when you focus on the fact that **46 percent** of organizations surveyed have over 10,000 employees and **35 percent** of respondents said their organization's size was fewer than 500 people.

*Responses that add up to more than 100 percent are because multiple answers were given.