LIFECYCLE INSIGHTS

2022 ENGINEERING STRATEGIES FOR SMALL AND MID-SIZED COMPANIES STUDY

How to Formulate Successful Strategies to Improve Engineering and Shift Towards a Profitable Future

GROWING BEYOND DISRUPTION

The challenges of the last two years significantly disrupted many organizations' plans for future growth. Manufacturers saw scrambled development schedules, upturned supply chains, and changed work norms. Executives in small and mid-sized companies are now looking to the future with high hopes of profitable growth. Achieving that goal comes down to a two-pronged, time-proven approach: Organizations must mitigate threats while capitalizing on opportunities.

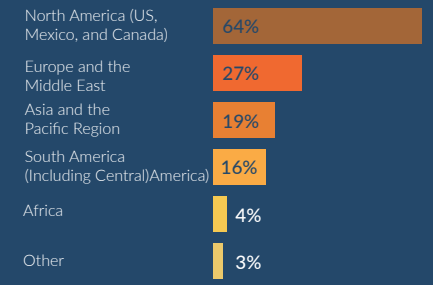
To gain clearer insight into this shift for small and mid-sized companies, Lifecycle Insights conducted the 2022 Engineering Strategies for Small and Mid-Sized Companies Study, a survey-based worldwide research project. The study's findings reveal organizations' biggest challenges and their plans for the future. They also highlight the major drivers inspiring executives from manufacturing organizations with annual revenues under $500M to pursue changes in design and engineering.

This eBook shares the study findings along with recommendations about how to formulate successful strategies to improve engineering and shift towards a profitable future.

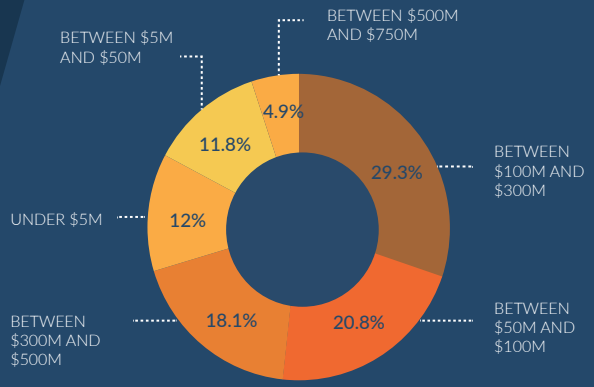
STUDY DEMOGRAPHICS

300
PARTICIPANTS

BREAKDOWN BY GEOGRAPHY



BREAKDOWN BY COMPANY REVENUE



BREAKDOWN BY INDUSTRY

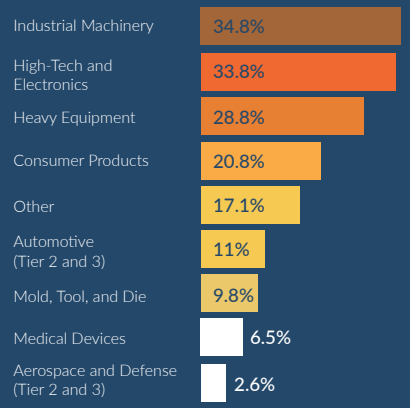


Figure 1: The 2022 Engineering Strategies for Small and Mid-Sized Companies Study had 300 participants.

RECOVERING LOST PROFITABILITY

Business disruptions of the last two years forced many small and mid-sized companies to forfeit profitability. Some organizations were able to mitigate the issue to some extent, thanks to the temporary reprieve of government help. Today, however, executives are looking to return to fundamental, proven approaches to boost margins.

Results from the survey support this notion. More than four out of 10 respondents stated that boosting profitability was the top objective of their improvement initiatives, and 86% named it a top-three goal.

This is not a surprise. Engineering has a clear role to play in achieving this goal, both in terms of controlling costs and increasing revenue.

Design choices, including material selections and the integration of specific components, directly affect recurring costs in product development. The innovation in today's products, inspired by the latest consumer demands and the need for competitive differentiation, has the power to impact top-line growth and market share.

So it's no wonder that executives expect engineering improvement initiatives to mitigate threats and capitalize on opportunities for growth.

TOP REASON TO IMPROVE MECHANICAL DESIGN

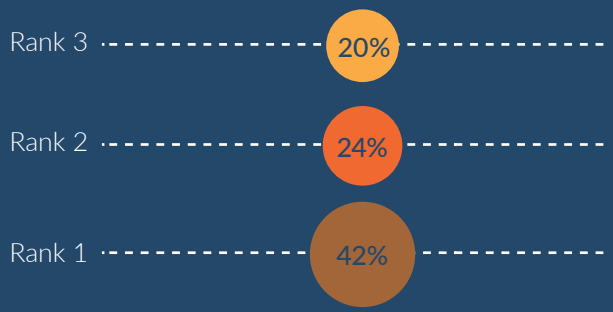


Figure 2: The study showed 42% of the respondents were looking to increase their company's profit margins by improving their mechanical design.

FINDING AND RETAINING TALENT

One of the greatest concerns around designing products is finding competent engineers to do the work. Between the retirement of boomer engineers and the Great Resignation—the new trend of individuals leaving the workforce to reassess career choices—finding and retaining strong talent is a challenge.

Survey results demonstrate that executives have taken notice. Forty-five percent of study respondents reported that finding and retaining the right talent affects their ability to improve engineering. It was ranked as a top issue specifically for mechanical design.

Many small to mid-sized companies, however, are finding ways to make their workplaces more attractive to potential and current employees. One approach is to offer a flexible workplace environment. Many engineers appreciate coming into the office, but the flexibility of hybrid set-ups that permit work from home can support a wide range of employees with different needs. From a technology perspective, such flexibility requires that companies provide employees with remote access to solutions for design, simulation, data management, and business processes. And as it happens, several cloud solutions with powerful capabilities are emerging in each of these areas.

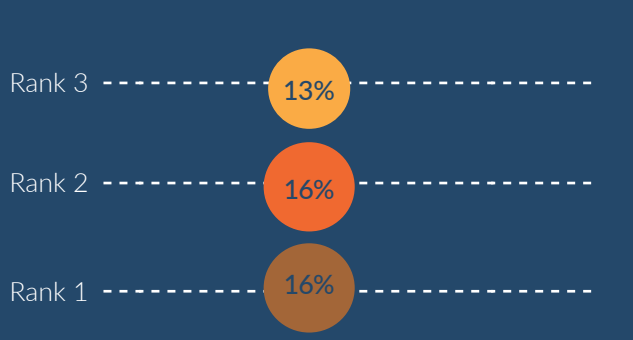


Figure 3: Hiring quality talent and expertise ranked #1 in affecting improvements in mechanical design.

THE RISING COMPLEXITY OF MECHANICAL DESIGN

Today, practically every product is smart and connected and contains some intelligence to react to its environment or user. This "software-is-eating-the-world" trend means that more features and functions in products are delivered by electronics and software. Given such innovations, one might think mechanical design is becoming simpler.

That is not the case. In fact, survey respondents reported that mechanical design is getting more complex. Forty-nine percent of respondents noted that the number of mechanical components in each product has increased or increased greatly over the past two years. Fifty-four percent stated the complexity of designing mechanical hardware has increased or increased greatly. So it's clear that some of the new product functionality is enabled by new mechanisms and new mechanical hardware.

Fortunately, computer-aided design (CAD) solutions with robust large assembly performance can help engineers handle many components without affecting productivity. In addition, the use of simulation early in the design process helps engineers more easily verify and validate complex requirements. Finally, model-based definitions (MBD) empower comprehensive documentation of designs in the context of the CAD model, giving other functional departments the materials they need to do their jobs.

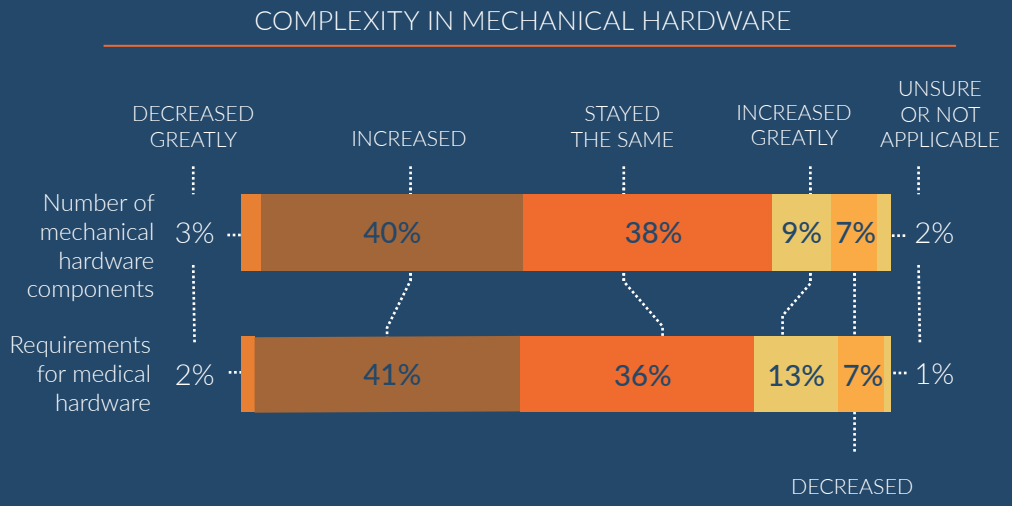


Figure 4: A good majority of study respondents indicated that the number of components and requirements in mechanical hardware has increased.

ELECTRONICS AND SOFTWARE FOR SMART, CONNECTED FEATURES

Given that smart-connected features require more software and electronics, it stands to reason that the number of requirements in each of these design domains would grow. The study shows this is, indeed, the case.

Fifty-nine percent of the study's respondents stated the amount of electronics in products has increased or increased greatly. Fifty-seven percent said the same about electrical power and signal distribution systems, while 61% noted that there is more software. This rising complexity presents some real problems for cost-effective design. Engineers need to be able to properly integrate electrical systems and electronics into mechanical hardware early in the design stage to avoid potential product failures.

Addressing these issues is no small feat for small and mid-sized organizations, which often outsource design for different engineering domains. They can mitigate the challenges involved, however, when they have tools like mechanical CAD-electrical CAD (MCAD-ECAD) integration and cloud solutions, which allow them to collaborate more closely with suppliers and partners. An additional benefit of these tools is that they can hasten an organization's ability to bring currently outsourced design work back in-house over time.

COMPLEXITY IN ELECTRICAL, ELECTRONICS, AND SOFTWARE

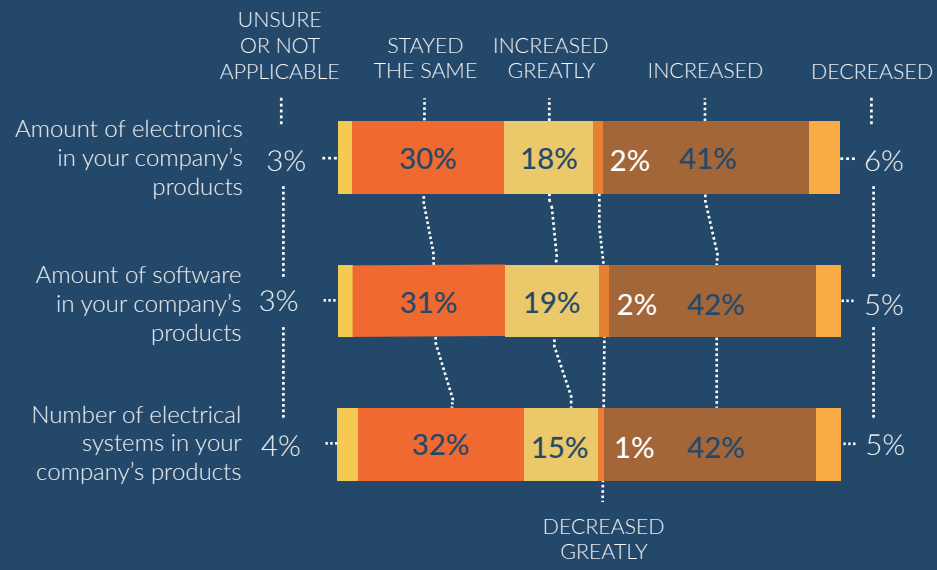
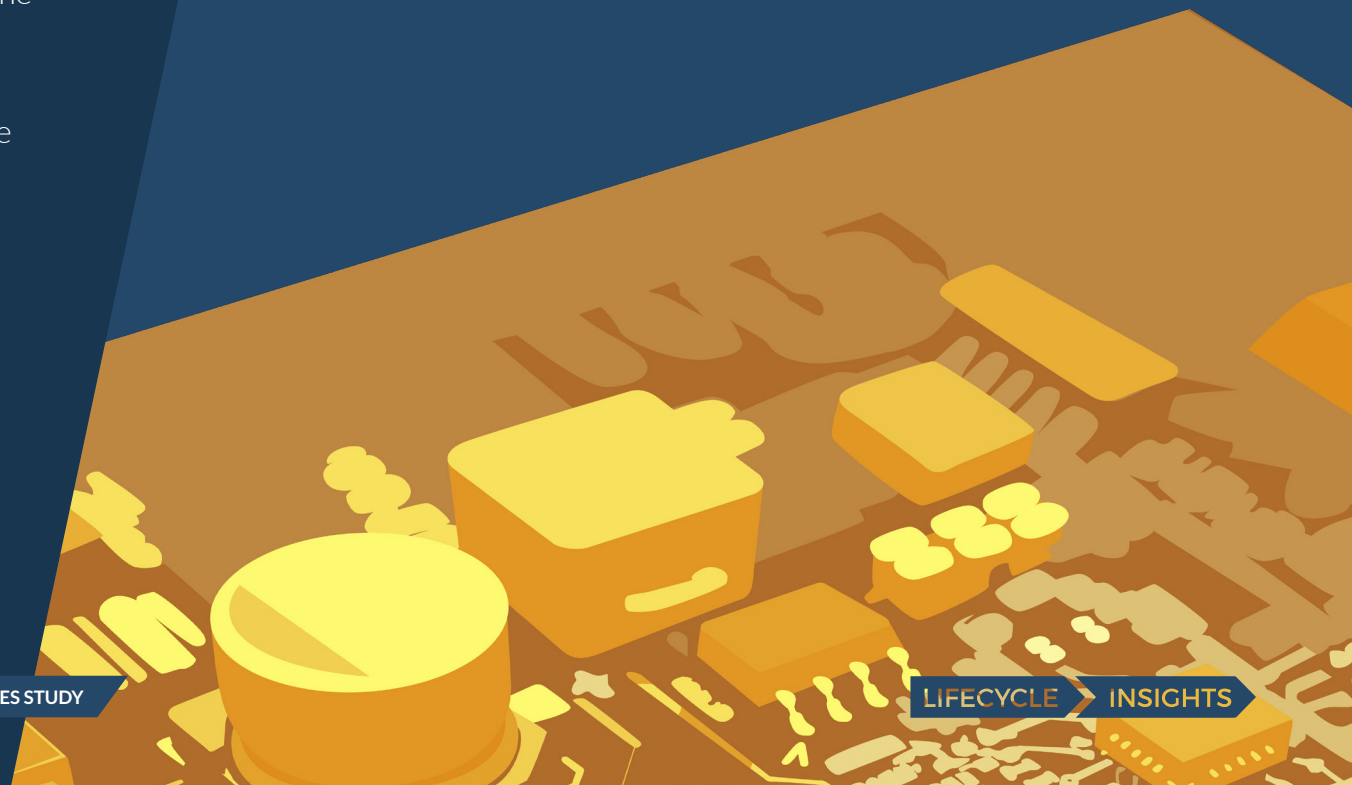


Figure 5: Many respondents indicated that complexity in electrical systems, electronics, and software has increased.



GROWING DEMAND FOR CUSTOMIZATION

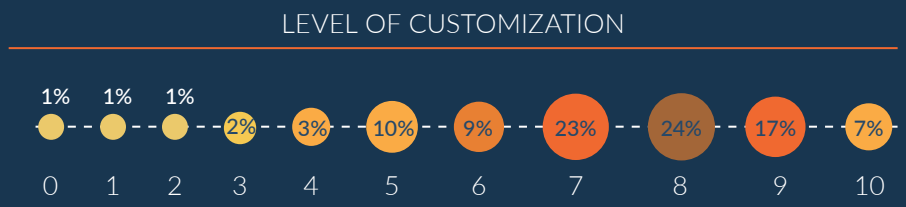


Figure 6: Lifecycle Insights' study found that many companies build products that need high level of customization.

Increasingly, customers want to modify products to specific tastes or uses. When asked to score the degree of customization of their products on a scale of 0 to 10, companies responded with an average of a little more than seven. It's clear that companies need to be able to customize their products to meet the needs of a diverse set of customers and expand into new markets.

Providing customization, however, is not a simple task. In many industries, it is not feasible to custom-design a product for each individual customer. So it's no surprise that solutions that allow engineers to automatically configure designs to specifications are becoming more and more appealing to executives.

Today, engineers can use configuration automation capabilities in their CAD solutions to customize designs. They can also leverage product lifecycle management (PLM) solutions to manage configurations and accurately generate a bill of materials (BOM). These automated capabilities can support models with embedded configuration logic.

The models can be fitted with simple web interfaces that allow the sales team to configure products for customers. Manufacturing can then create the correct products from the sales forecast without having to go back to design, because the digital tools automatically generate the right drawings and BOM.

THE OPPORTUNITY IN ADDITIVE MANUFACTURING

The modern product design landscape is studded with challenges, but also contains improvement opportunities for small to mid-sized organizations. Additive manufacturing, an approach where material is added in layers, has fascinating implications for design. Engineers in companies that employ this technology face fewer geometric constraints than those required by traditional machining processes.

There is already significant movement towards additive manufacturing in small and mid-sized companies. Seventy-five percent of engineering executives reported that their company plans to use additive manufacturing moderately or significantly in the next two years. Another 71% of the respondents said they have already been using it for the past two years, with 27% of those saying they use it significantly. To realize value from this approach, however, companies must ensure their designs are ready to be printed by addressing issues like support design, build preparation, and nesting.

There are solutions with powerful capabilities on these fronts, including topology optimization, generative design, latticing, slicing, nesting, designing supports, and additive process simulation. These digital tools help engineers adopt additive manufacturing and save the company time and money by 3D-printing their components without wastage

ADOPTION OF ADDITIVE MANUFACTURING

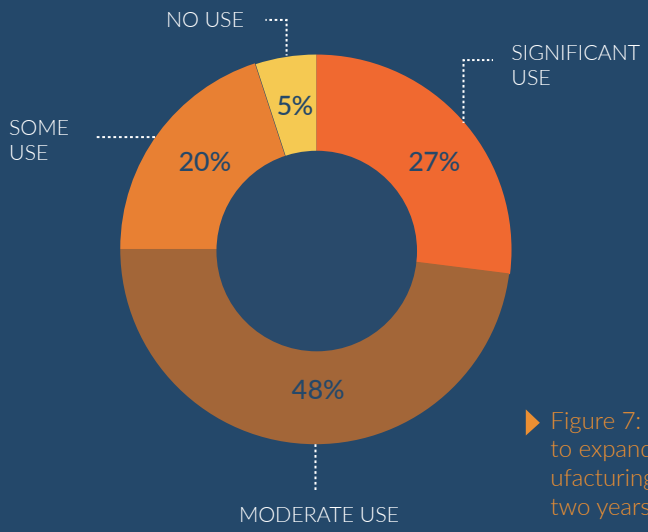
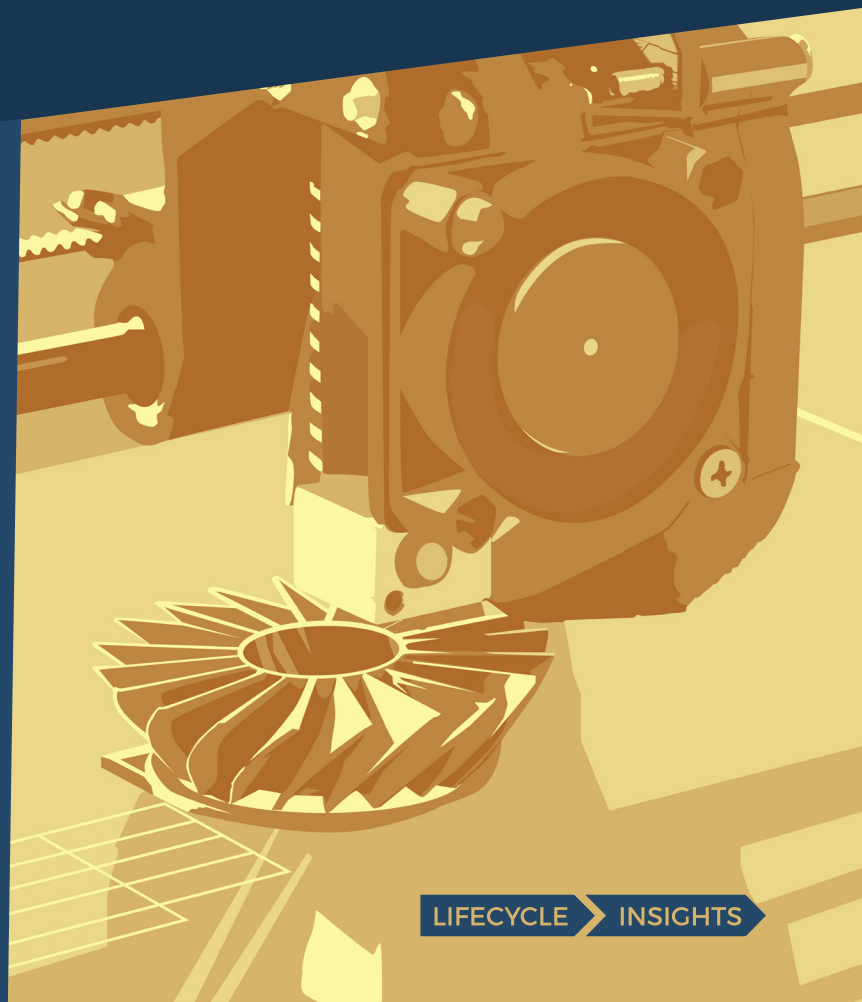


Figure 7: Many SMBs are planning to expand the use of additive manufacturing significantly in the next two years.



RECAP AND CONCLUSIONS

After two years of unprecedented disruption, small and mid-sized manufacturing organizations are looking toward the future, seeking improvement opportunities that will help them realize profitability and growth. Results from Lifecycle Insights' 2022 Engineering Strategies for Small and Mid-Sized Companies Study demonstrate that smaller organizations face unique challenges as they consider future growth, and that they are hoping to address these challenges through digital improvements across their design and engineering departments.

Some of the major drivers behind digital transformation investments include:

- Recovering lost profitability. Eighty-six percent of respondents said that boosting profitability after several years of profound business disruption was a top-three goal.
- Finding and retaining talent. DX initiatives can support a more flexible, attractive work environment that, in turn, will help organizations address challenges in finding and retaining engineering talent—particularly in mechanical design areas.
- Rising complexity. State-of-the-art CAD solutions and model-based definitions are helping engineering teams and other functional departments more effectively manage the rising complexity of smart, connected products.
- Electronics and software. The integration of MCAD-ECAD solutions can help organizations collaborate with suppliers to manage the influx of electronics and software into modern products.
- Customization. More customers are asking for customized products, and engineers can leverage automated capabilities in CAD and PLM solutions to help create new configurations and accurately generate a BOM for those new variations.
- Additive manufacturing. As more organizations harness 3D printing technologies, modern CAD solutions are helping engineers realize the full potential of additive manufacturing technologies.

It is clear that successful organizations must adopt new tools that can help them mitigate threats while capitalizing on new opportunities. Modern CAD and PLM solutions are helping the most progressive organizations with revenues under $500 million to do just that while shifting towards a brighter and more profitable future.