



**CHAPTER
ONE**

SOLIDWORKS

TAKING AN INTEGRATED APPROACH FROM CONCEPT TO MANUFACTURING WITH SOLIDWORKS

Chapter 1: HOW TO WIN IN 2020 AND BEYOND

**BRING DESIGN AND
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CHAPTER ONE

ADVANTAGES OF INTEGRATING CONCEPT TO MANUFACTURING

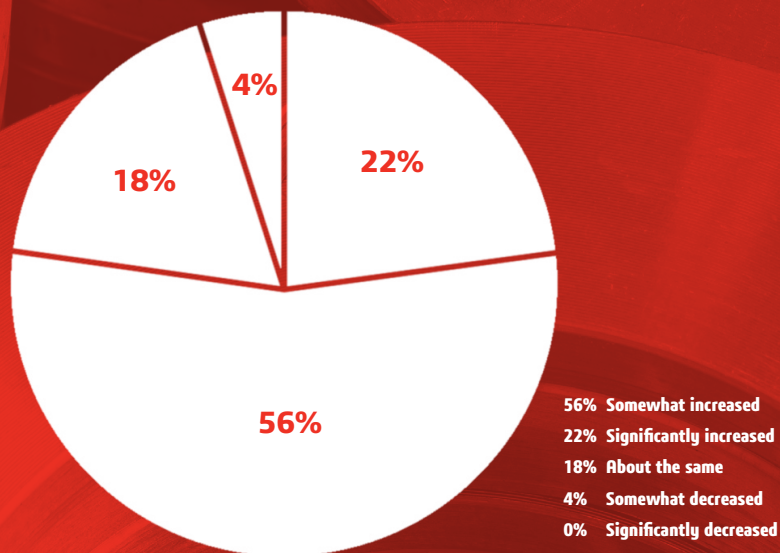


Figure 1: Business Risk and Disruption Increase Over Last Five Years

BRING DESIGN AND MANUFACTURING TOGETHER

Agility is required to succeed in today’s market.

As we enter a new decade, we are in an era of significant disruption and change. Modern technologies create new opportunities for innovation, yet the pressure from global competition, including new entrants and even startups, makes it harder than ever to stand out. On top of that, customers have higher expectations and want top-quality innovation at a low price. This environment has created so much turmoil, over three-quarters of executives responding to a Tech-Clarity survey said that they have faced increased business risk and disruption over the last five years (Figure 1).¹

As many companies adopt strategies such as digitalization, Industry 4.0, and Europe 2020, they face significant change, yet they are also able to achieve efficiencies that give them a considerable advantage. Observing the impact, Accenture CEO Pierre Nanterme commented, “Digital is the main reason just over half of the companies on the Fortune 500 have disappeared since the year 2000.”

We have now reached an era where companies who stick with the status quo will struggle to survive. John Chambers, executive chairman at Cisco Systems, predicts, “At least 40 percent of all businesses will die in the next 10 years ... if they don’t figure out how to change their entire company to accommodate new technologies.” This requires investments in new development approaches that enable companies to rapidly respond to evolving market needs. Says Amazon founder Jeff Bezos, “In today’s era of volatility, there is no other way but to reinvent. The only sustainable advantage you can have over others is agility, that’s it. Because nothing else is sustainable; everything else you create, somebody else will replicate.”

By achieving this agility, you can boost profitability by improving efficiencies, reducing errors, and lowering costs to quickly bring high quality, innovative products to market. This ebook will unveil how to accomplish these goals by adopting an integrated approach from concept to manufacturing.

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Do not get left behind.

Technology is creating opportunity while driving fundamental changes. A Deloitte and MAPI study found that 86 percent of manufacturers believe in five years, smart factory initiatives will be the main driver of manufacturing competitiveness, and 83 percent agree smart factory initiatives will transform the way products are made.² These changes have already started. An SME study found that 43 percent say the manufacturing industry is already seeing significant changes due to digital technology solutions.³ Further, a PwC/Manufacturing Institute study found that manufacturers expect the transition to smart manufacturing to accelerate as 73 percent are planning to increase their investment in smart factory technology.⁴ Digital technology delivers the agility and efficiency required to respond to today's market. You do not want to be left behind, but how do you support smart manufacturing and ensure technology will create a competitive advantage for you?

To establish the right foundation, you need to make sure that what you send to manufacturing is accurate and manufacturable. Errors often occur due to poor collaboration between design and manufacturing. Unfortunately, disparate tools and the lack of a common, unified platform lead to miscommunication between teams. Plus, different tools require translation to communicate, which wastes time and often results in a loss of information. Consequently, these disconnects are a significant source of errors, wasted time, and higher costs.

You can overcome this with a unified platform that connects product development and manufacturing participants so that they can collaborate, problem-solve, and communicate. A unified platform also enables a seamless transition from industrial design to engineering to manufacturing. As a result, there is less miscommunication, which will boost productivity, reduce costs, and improve product quality. It also supports concurrent engineering. Research finds that concurrent engineering leads to a 20 to 90 percent reduction in time to market, up to 75 percent less scrap and rework, up to 40 percent lower manufacturing costs, and 200 to 600 percent higher overall quality.⁵

The result? The greater time savings, increased efficiency, and improved collaboration provide companies with more bandwidth to meet innovation goals. You are then in a more powerful position to avoid the costs seen in Figure 2.

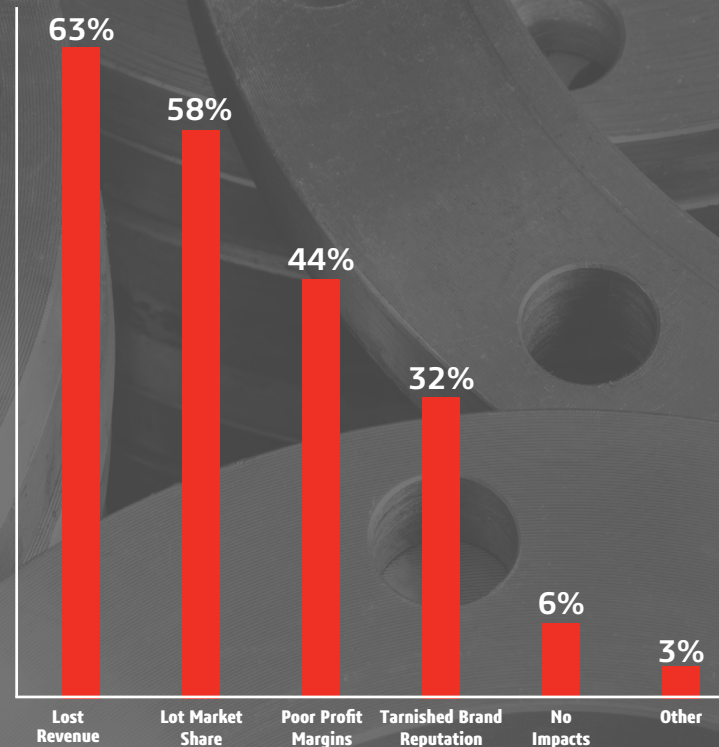


Figure 2: Impacts If Your Company Doesn't Meet Its Innovation Goals⁵

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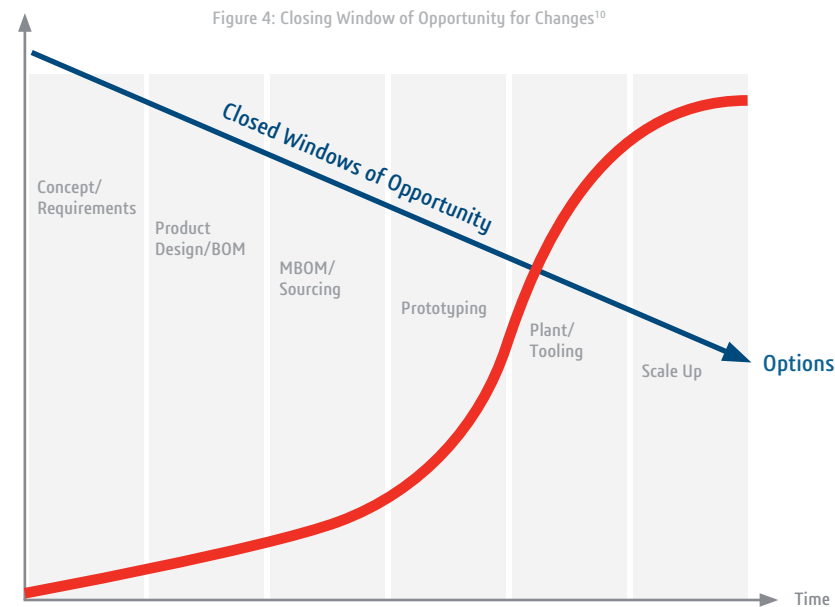
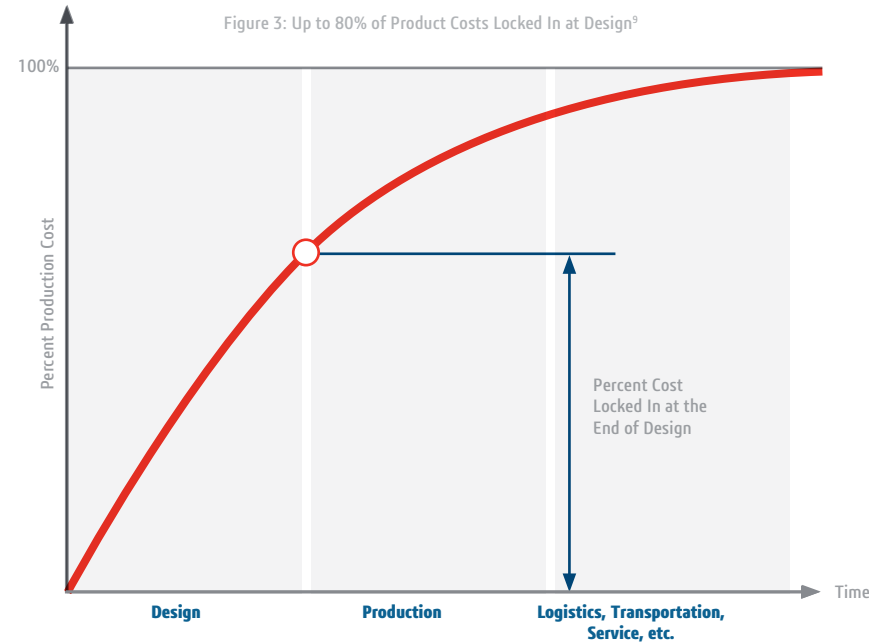
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USE DESIGN AND MANUFACTURING TIME EFFECTIVELY

The sooner you find problems, the better.

Improved collaboration across design and manufacturing has other advantages too. Numerous studies have shown that design decisions have a significant impact on production costs and product quality.⁷ By the end of the design phase, you've determined 70 to 80 percent of the final production costs and 80 percent of the work impacting product quality⁸ (Figure 3). On top of that, the further along you are in the development cycle, the more expensive it becomes to make changes (Figure 4). As the design evolves, more of it is locked in and there are dependencies across components. This means even small changes can impact multiple components and before long, small changes become extremely complicated. Once you order steel and have tooling in place, the cost implications skyrocket. At this stage, you quickly get to the point where any change means costly scrap and rework.

As a result, if manufacturing doesn't have insight into the design until after design release, options to improve manufacturability are minimal. Changes become far more difficult and costly. However, since design decisions impact 80 percent of production costs, without early manufacturing input you could be missing lots of opportunities to cut costs and improve quality. Also, any problem found on the production floor becomes extremely costly to correct. To avoid this, engineering and manufacturing teams need to collaborate. In fact, when they do not, it often comes at a significant cost to the company.



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Don't create a competitive disadvantage.

While collaboration is important, it is also abstract, so it's difficult to measure its impact on cost. However, when industrial design, engineering, and manufacturing operate in silos, problems arise, and there are bottlenecks. Figure 5 shows the business cost of poor collaboration.

Silos between industrial design and engineering hurt productivity. It is a waste of engineering time and effort to recreate the hard work done by industrial designers. However, this is often what ends up happening. Industrial designers and design engineers have different modeling needs, so their tools are typically separate. When the industrial design is handed off to engineering, the surfaces are either recreated or imported as "dumb geometry," making it difficult to make changes. A far more efficient workflow allows collaboration between industrial designers and engineers with the flexibility to make changes without recreating work.

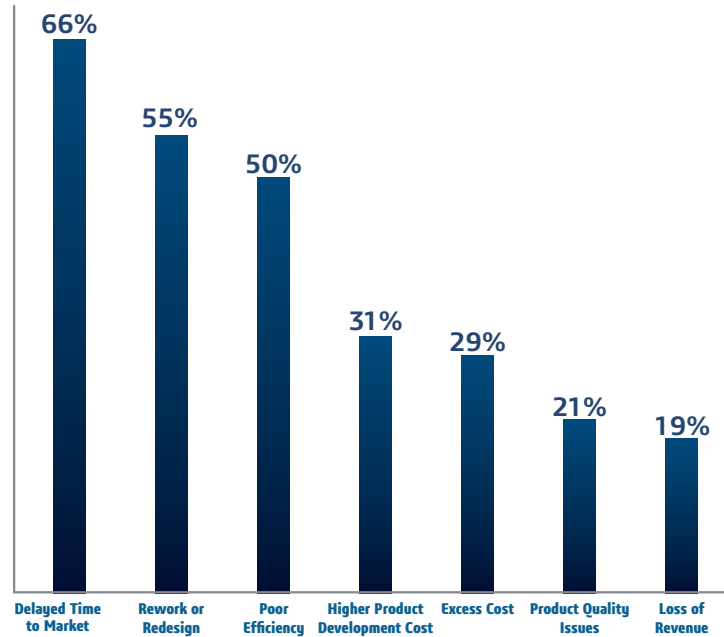


Figure 5: Top Impacts of Poor Collaboration¹¹

The very nature of releasing design data to manufacturing requires collaboration. Engineering and manufacturing must share and exchange design information. Usually, that data needs to be imported and repaired, which is not only tedious and time-consuming, but the translation process can introduce errors.

Any design problem found during production can cause further delays. Perhaps there isn't enough clearance to drill a hole, or maybe tolerance stackup has created a misalignment with the mounting holes. Whatever the problem, it takes time to come up with a solution. This puts schedules at risk and can delay time to market. On top of that, bad parts need to be scrapped or reworked, adding even more cost.

Involving the engineering department in the solution adds to development cost and takes them off other work, hurting productivity and potentially delaying other new projects. To minimize delays and cost, the fix will often be whatever is quick and easy. Unfortunately, that may hurt quality, which can impede market success and may mean lost revenue opportunities. Extended delays may give competitors time to beat you to market and steal market share, further limiting your revenue potential.

By supporting better collaboration between engineering and manufacturing, you can greatly reduce the risk. You can avoid added costs by finding these problems earlier. To make this possible, you must overcome some obstacles.



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Prepare for the future.

Even if you are managing ok without good collaboration between engineering and manufacturing, industry trends will make it even more crucial than ever before. Companies who are thinking about this and preparing for the future will be better positioned to be industry leaders.

As the most experienced design engineers approach retirement, much of their manufacturing knowledge will be lost. Consequently, newer engineers will need to rely on manufacturing input as they develop that expertise. Without it, there will be even more risk of manufacturability issues that will further drive up costs and waste time.

Further, with new manufacturing techniques, such as 3D printing, the old rules of thumb for manufacturing get thrown out, opening up new options for design. But to truly take advantage of the benefits of these new technologies, close collaboration between design and manufacturing will be required as the impacts on both design and manufacturing become better understood, and new rules of thumb are developed.

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“The improvements to our product development process that SOLIDWORKS® has enabled have helped us to support growth of more than 500 percent.”

— Jorge Smart Cruz Arenal,
Director General, DCF Mexicana, S.A. de C.V.

WHY IS COLLABORATION SO HARD?

Integrate engineering and manufacturing to enable better collaboration.

While collaboration between engineering and manufacturing is important, the lack of integrated software tools across the organization creates a fundamental barrier. Unfortunately, this is commonly the top challenge of today’s engineering environments (Figure 6¹²).

Manufacturing planning typically involves translating and converting design data to production information, such as NC toolpaths. Plastic parts are especially problematic because they involve multiple translations to design the mold core and cavity, bring in the mold base, and then create NC toolpaths. Each translation requires importing and repairing data, which eats up valuable time. Then, every time the designer introduces a change, the cycle of importing and exporting information repeats itself.

Segregated engineering and manufacturing systems create a host of problems. Not only do those data translations add extra steps, but they can also introduce errors. Also, you now have to determine which system holds the “master” representation. Plus, maintaining and training people on multiple systems is expensive.

The result is many missed opportunities for improved efficiency because colleagues can’t work concurrently. They have to wait until one process is complete to begin the next. With any change, downstream work, such as tooling and fixture creation, inspection documentation, shop floor assembly instructions, in-process drawings, and NC toolpath data have to be recreated entirely or updated manually. Either option is time-consuming and often error-prone.

The good news is that you can avoid these challenges by integrating design and manufacturing systems.

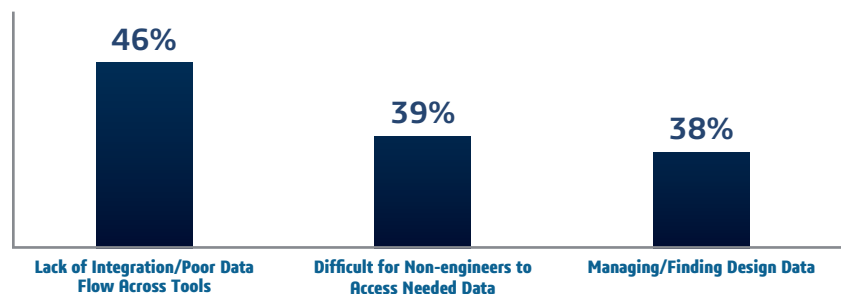


Figure 6: Top Impacts of Today’s Design Environments⁷

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Provide a collaborative platform that enables faster and easier sharing of manufacturing data.

When you integrate from concept to manufacturing, design changes automatically propagate to manufacturing, so you can incorporate last-minute design changes and minimize the need to push out delivery dates.

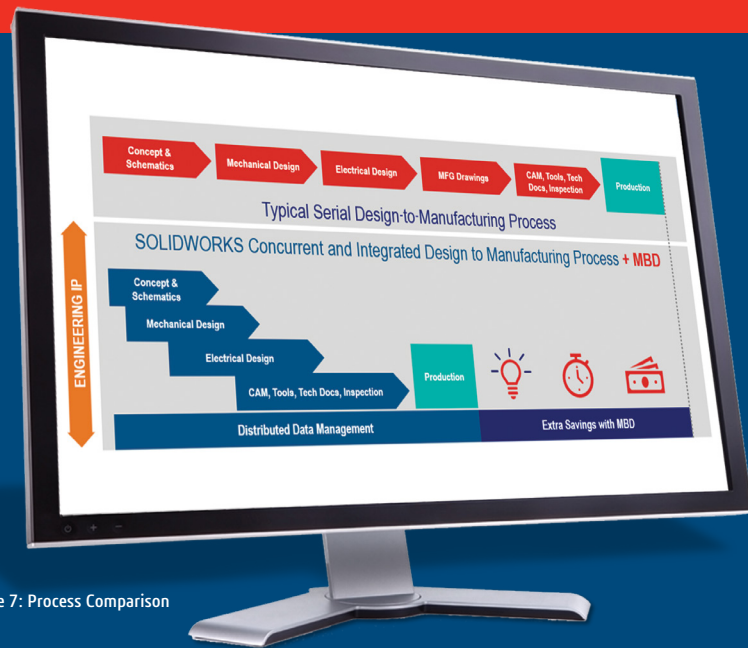


Figure 7: Process Comparison

An integrated platform streamlines workflows and enables concurrent design and manufacturing.

By integrating design and manufacturing systems, teams can share design information seamlessly and avoid the excess costs, delays, and quality issues that arise with poor collaboration. An integrated platform streamlines workflows and enables concurrent design and manufacturing, so you can do the following:

- Accelerate time to market by 20 to 90 percent, catch problems sooner, reduce scrap by up to 75 percent, and lower manufacturing costs by up to 40 percent.
- Save time by avoiding the need to import/export/repair model data.
- Avoid errors introduced during data translation.
- Lower software maintenance costs due to fewer systems and reduced training.

You accomplish this by integrating a manufacturing software application (e.g., mold design software, quoting software, inspection software, and 2D and 3D CAM software), with product design (CAD) software.

An integrated concept-to-manufacturing system allows all departments to use the same software system, eliminating the need for data translation. Plus, you can easily make late design changes without significant impact on product delivery. Because changes propagate from design to manufacturing, you can incorporate them and minimize the need to push out delivery dates. So if you must make last-minute changes—for design, competitive reasons, new features, or to accommodate suggestions from manufacturing or industrial designers and stylists—you are covered!

By working collaboratively, you can catch problems impacting manufacturability much sooner, avoiding excess cost and wasted time. This way, companies can focus more of their energy on the qualities that will make their products more competitive.

However, one of the biggest challenges holding companies back is their current tools. Most of the tools in use today were developed a couple of decades ago or more. These tools took advantage of the technologies in place at the time. They supported the traditional siloed approaches very well. However, times have changed and technologies have evolved. To support modern times, modern tools are needed that take advantage of current technology and infrastructure rather than rely on dated technology.

Due to the limitations of dated tools, Capgemini has found that 60 percent of manufacturers struggle with digital continuity. To address the problem, around 50 percent of manufacturers aim to spend more than 100 million euros in product lifecycle management (PLM) platforms and digital solutions over the next three years. However, what's most interesting is that the proportion of IT budget for maintaining legacy systems has dropped significantly, declining from 76 percent in 2014 to 55 percent in 2017.¹³ This says that to meet the demands of today, companies are replacing their older legacy systems with new modern platforms. While much effort is required to make such a transition, companies are recognizing that they cannot afford not to, or they will be left behind by their competition.

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CHAPTER 2

YOUR COMPLETE 3D DESIGN SOLUTION

Now that you've seen the tremendous advantages of integrating your concept-to-manufacturing processes and teams, be sure to download the next ebook in the "Taking an Integrated Approach From Concept to Manufacturing With SOLIDWORKS" series.. It will describe how you can design exceptional products with SOLIDWORKS solutions and the 3DEXPERIENCE® platform, while also bridging the gap between your design and manufacturing teams.

Learn more about how SOLIDWORKS solutions can take you from design to manufacturing by visiting <https://www.solidworks.com/product/whats-new>.

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