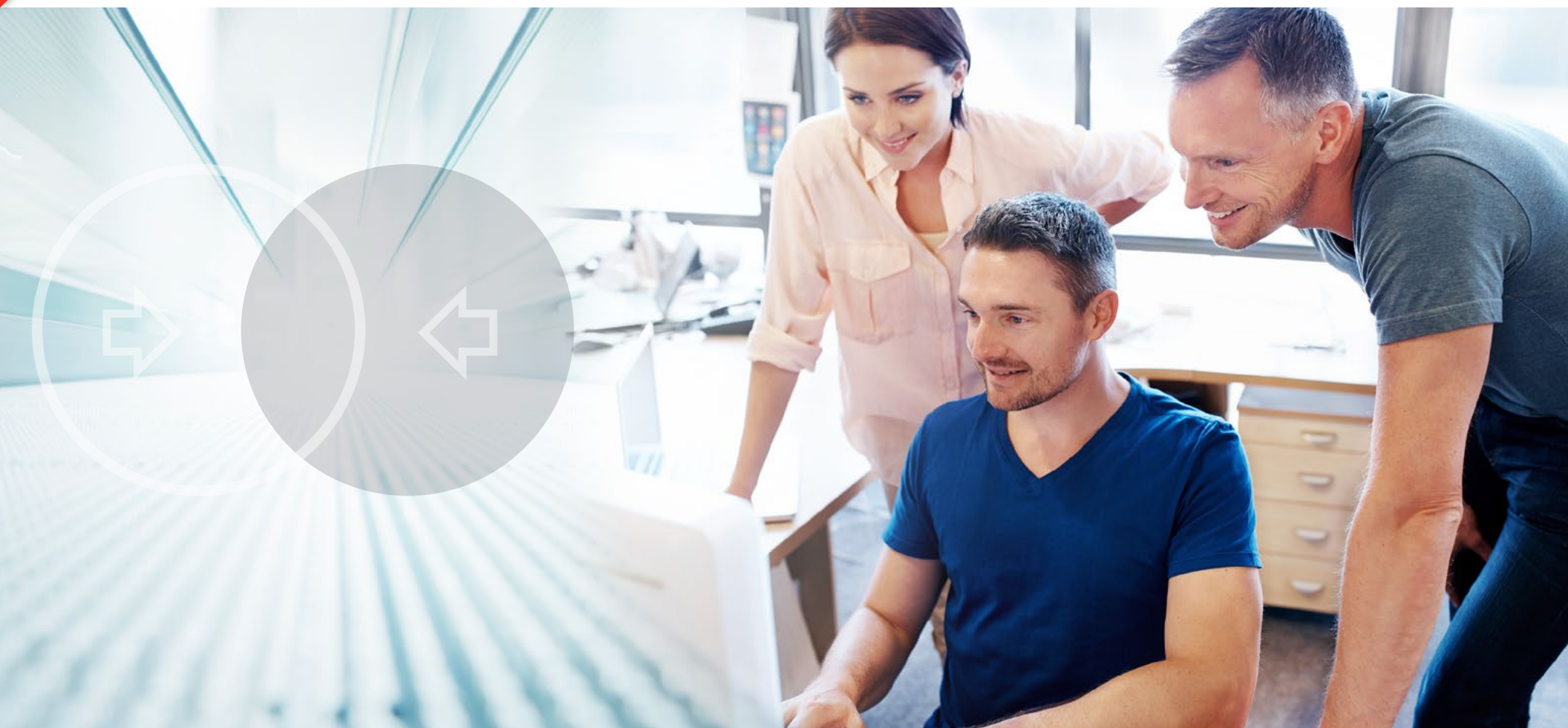




**CHAPTER
ONE**

INTEGRATING DESIGN AND MANUFACTURING WITH SOLIDWORKS:

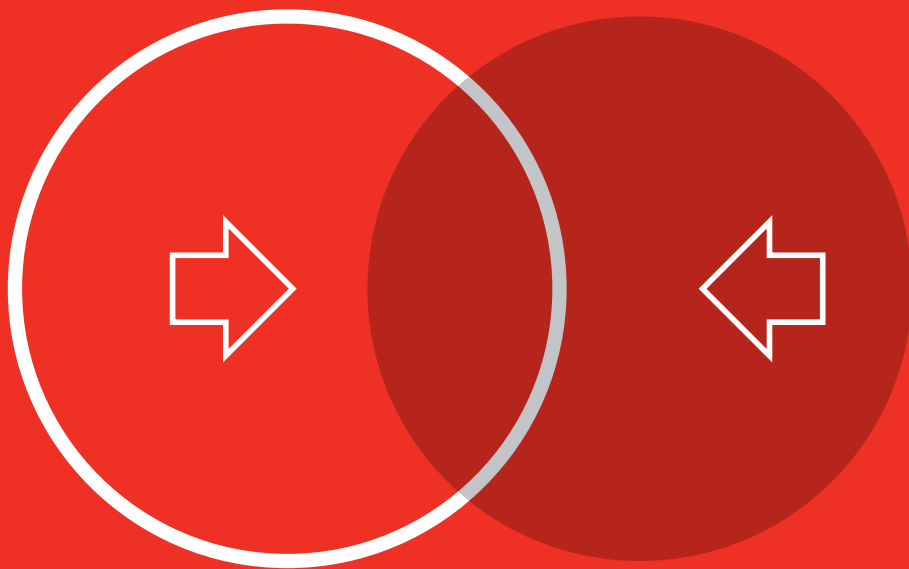
CONNECT YOUR ENTIRE TEAM AND STREAMLINE YOUR
PRODUCT DEVELOPMENT PROCESSES





CHAPTER ONE

THE ADVANTAGES OF DESIGN AND MANUFACTURING INTEGRATION



Simply put, companies must define and design
“WHAT is to be built” and manage it cost effectively
all the way through “HOW it is built.”

BRINGING DESIGN AND MANUFACTURING TOGETHER

Most likely the best single decision
you can make to improve your product
development process.

Success in today’s global market requires more than creative and innovative products. Companies must develop products consumers want to buy, cost effectively manufacture them, and sell them at a profit while beating the competition. To achieve that, they must maintain high quality while controlling costs. Simply put, companies must define and design “WHAT is to be built” and manage it cost effectively all the way through “HOW it is built.”

Achieving these goals requires the coordinated efforts of all those involved in product development from concept to delivering a new product to market. It also requires streamlined processes that eliminate the hiccups that often occur when designs are passed from one phase of design to the next. One of these potential disconnects often occurs between design and manufacturing, a result of the fact that disparate tools are used and there is no common, unified platform through which these two valuable teams can collaborate, problem-solve, and communicate with each other.

This eBook will unveil how adopting an integrated design and manufacturing solution can help companies make the transition from design to manufacture a seamless one, with fewer errors due to translation problems and with less miscommunication between teams due to use of tools that don’t speak a common language—all of which will translate to boosted productivity, reduced costs, and higher-quality products.

INTEGRATING DESIGN AND MANUFACTURING

Ensure smoother, more efficient, and less costly product delivery.

Thanks to modern software advances, the historical divide that's existed between design and manufacturing can be a thing of the past. Integrated design and manufacturing software overcomes challenges you've likely experienced—development teams spread across multiple locations, communication barriers, and each team using their own technology that doesn't cross-communicate. It provides a common language (or tools) which enables both teams to communicate.

By providing integrated tools, even if design and manufacturing remain geographically separated, or even in separate companies, both teams share a common language that bridges the gap and keeps teams firmly on the same page throughout conceptual design, detailed development, and manufacturing. A concurrent system that enables manufacturing and design to work simultaneously can help speed up the entire process.

"The improvements to our product development process that SOLIDWORKS has enabled allow us to support growth of more than 500 percent."

— Jorge Smart Cruz Arenal, Director General



THE NON-INTEGRATED VS. INTEGRATED PRODUCT DEVELOPMENT PROCESS

THE NON-INTEGRATED DESIGN-THROUGH-MANUFACTURING PROCESS

A slower product delivery process requiring “serial” product development with limited data collection.

Typically today, design and manufacturing engineers work separately in their respective “silos”—even though they are working on the same product design. They use different tools that usually are not integrated and don’t speak the same language, which requires manufacturing to translate the design data they receive from one format to another.

Figure 1 is a typical example of a non-integrated design-through-manufacturing process. This example shows the design of a new injection mold. Here, the mold design team first receives a design part (the plastic part) that was designed in a CAD system. Because the mold design team uses a different CAD system to create the mold inserts (core and cavity) based off the plastic part design, they must first import and possibly repair that geometry.

Some companies design and manufacture internally, while others only manufacture and others only design. In the case of the mold manufacturer above, the plastic design part may be coming from an external customer. In this case, it’s very common that the mold manufacturer and the customer providing the plastic part use different CAD systems. This situation is very typical when dealing with data received from an outside customer or supplier and most times cannot be avoided. The alternative is to buy a CAD/CAM system that works with every one of your different suppliers and customers, which is not cost-effective or time efficient. The key issue becomes how to optimize what you can control inside your own company, that being the CAD and CAM steps that will be completed internally.

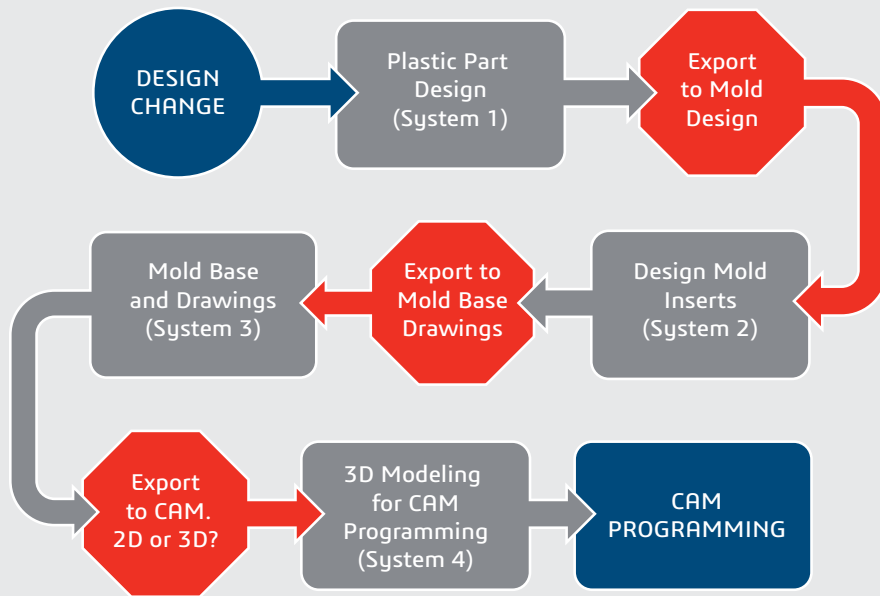


Figure 1. Example of a non-integrated, design-through-manufacturing process that was used to create an injection mold.

However, there are many cases in which design and manufacturing are done within the same company. If they are both done in-house, it's advantageous for design and manufacturing to be using the same system, if that system can provide the capabilities needed by both. Even when a company only designs or manufactures products, it should be using one system if that system can support the capabilities they need. To determine this, companies need to ask the following questions:

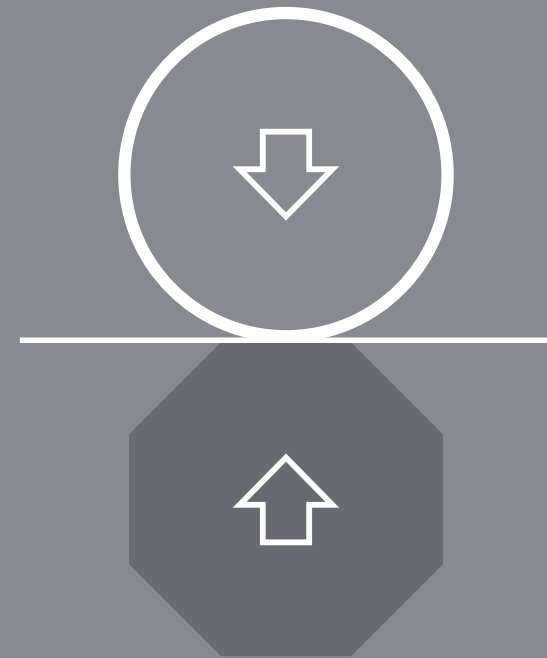
- **Does the system have all the functionality I need?**
- **Is it easy and productive to use?**
- **Is it within our budget to support the software?**
- **Is there effective support to help us when we have problems?**

Often, as shown in Figure 1, mold design is broken up over several different systems; one for creating the cores and cavities, one creating the drawings for the mold bases, and another system to create the NC toolpaths (CAM). Each system would require an import and export to be performed before the next person can begin their work.

The design and manufacturing process, however, is not a one-way street. There are many iterations of the design made by the designer and a lot of communication and changes that go back and forth between design and manufacturing. Every time the designer introduces a change, the cycle of importing and exporting information begins again.

Data translations and conversions add extra steps to the process, which can easily introduce errors. In addition, the question often arises, which system holds the “master” representation of the design. Importing and repairing data eats up valuable time. In the case of mold design, companies spend a large percentage of their design time fixing file import and translation discrepancies. In addition, maintaining and training people on multiple systems is expensive.

Since the processes are separated by different systems that require data translation, colleagues can't work concurrently on the product; they have to wait until one process is complete to begin the next. Often all downstream work, such as tooling and fixture creation, inspection documentation, shop floor assembly instructions, in-process drawings, and NC toolpath data, has to be completely recreated, or at least requires manual, time-consuming, and often error-prone updates.



Drawbacks of the non-integrated design through manufacturing process include:

- Import/export/repair of model data between processes is very time-consuming
- Data accuracy is not secured because errors can be introduced in translation and repair
- Concurrent design is not possible—you have to wait for the preceding process to be completed
- Non-integrated process is expensive to maintain and train people on several different systems

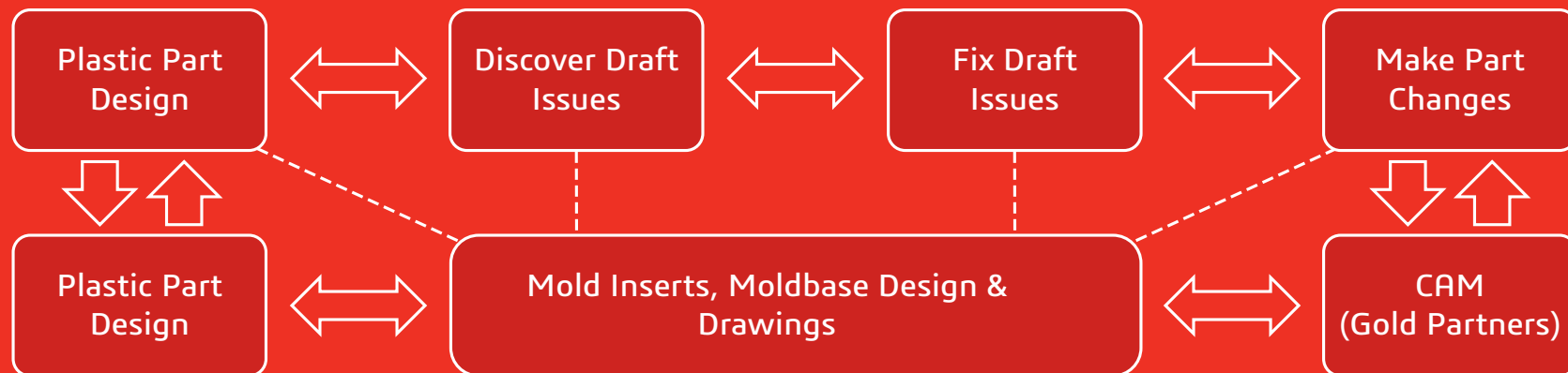


Figure 2. Example of an integrated, design through-manufacturing process that was used to create an injection mold.

THE INTEGRATED DESIGN AND MANUFACTURING PROCESS

Speed up product delivery by permitting design and manufacturing teams to work concurrently.

In contrast to the non-integrated process, an integrated design and manufacturing system can overcome the traditional disconnect between departments and put them under one integrated platform that adequately serves the needs of both (Figure 2). Communication barriers are removed and processes are smoothed out—reducing cycle times and costs and improving quality.

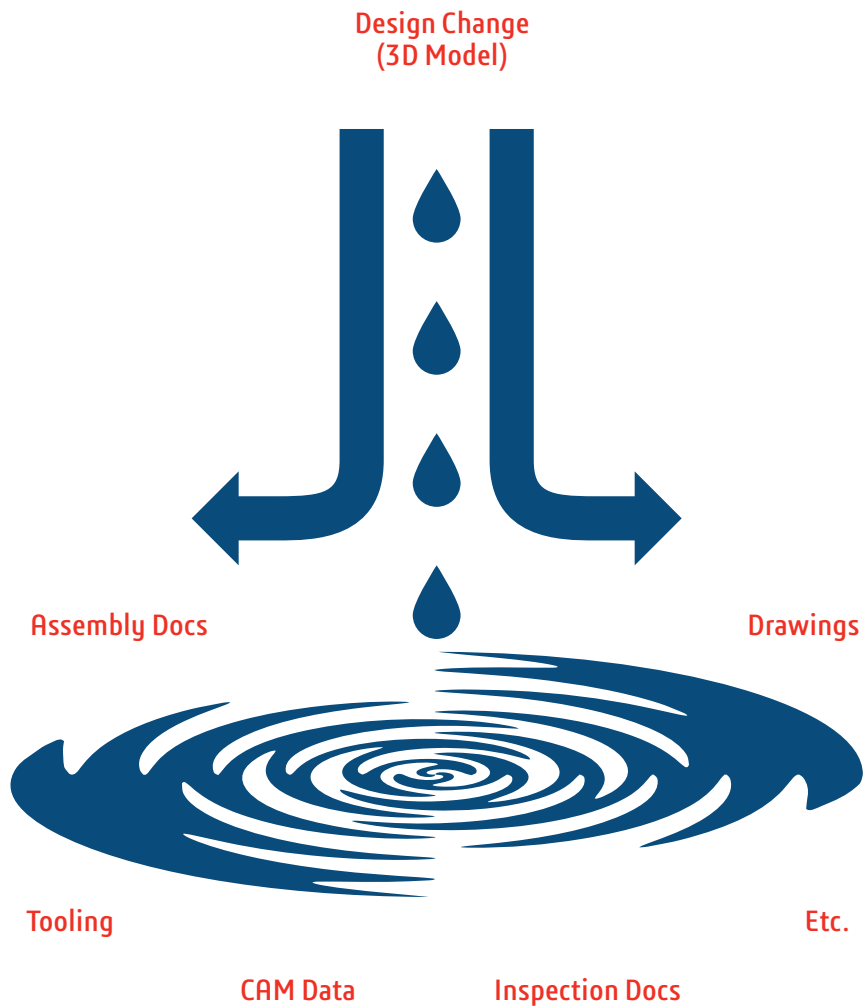
The integrated design-through-manufacturing process has several advantages including:

- No need to import/export/repair model data between processes
- Data accuracy is secured
- Concurrent design and manufacturing is promoted
- Less costly – fewer systems means less maintenance and less training

When design changes occur, an integrated design-to-manufacturing platform automates the update of all downstream deliverables, avoiding data translation issues, and helping maintain data accuracy.

In the fully integrated design-through-manufacturing process, the 3D CAD model is the “master” for the entire process. For example, the mold design references the 3D design model directly so if changes are made to the 3D design model, the mold design is updated quickly and automatically. Also, the electrodes that reference the mold design will be updated. Likewise, with an integrated CAM system, changes made to the design model will be propagated down to the NC toolpaths.

By using an integrated design-to-manufacturing platform, your teams collaborate together, trading high costs and wasted time for efficient processes and interactive communications—so you can save on costs and bring your products to market faster.



ASSOCIATIVITY

This capability of making a change to the design model and then having that change reflected in all associated tooling, drawings, NC toolpaths and other downstream deliverables is referred to as “associativity.” This associativity between the design model and all of its downstream deliverables has been the main reason that 3D CAD and CAM have grown in popularity over the last 20 years.

Associativity has enabled design and manufacturing teams to do their respective work on projects concurrently. For example, the NC programmer is able to not only begin developing NC toolpaths earlier but also to provide valuable feedback earlier in the process for how to change the part and tool design to reduce the cost of manufacturing it. A great example is an NC programmer alerting the tooling designer to change the radius of the round or fillets being used on the tool design in order to reduce NC costs by mapping to tool sizes that are available.

Since no translation is required, your data is secure from error and no time is required to export/import and repair geometry. In addition, you spend less money on maintaining and training personnel on multiple systems.

THE LINE BETWEEN DESIGN AND MANUFACTURING RESPONSIBILITIES

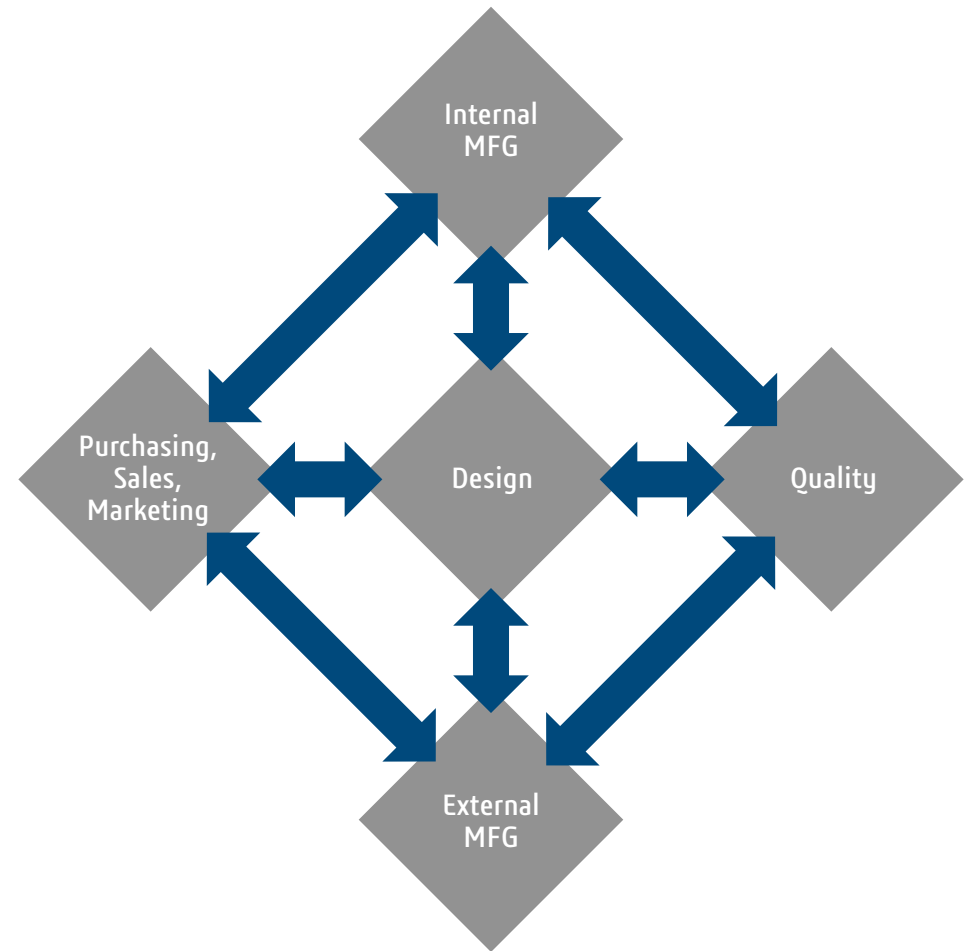
Today's often overlapping and blurring lines between departments requires a higher degree of collaboration.

The line between design and manufacturing responsibilities is becoming increasingly fuzzy. Today, it is not uncommon to find jobs that were once considered to be "manufacturing" now being performed by design, and vice versa. A great example of this is the process of designing plastic injection molded parts, as shown in the previous design-through-manufacturing process diagrams.

Responsibilities are often shared between design and manufacturing.

For example, designers can use software tools to determine instantly whether a part is "moldable," or in other words, whether it can be extracted from a mold without damaging the plastic part. 3D solid modeling allows designers to quickly determine multiple factors: where the parting line of the part will fall; if the part is properly drafted; whether there are any undercuts; and even if the plastic will fill the mold cavity, and if there will be weld lines, sink, and possible issues with discoloration of the plastic.

These responsibilities were traditionally the responsibility of the tooling designer or the toolmaker. The mold design expertise was in the hands of the manufacturer, and the design was "thrown over the fence" to await the next process. Today, however, both product designers and tooling designers have access to the same tools to help them design and modify parts to assure their manufacturability. By using the same software tools, the process is much faster because product designers, tooling designers and CAM programmers can all work on designs without having to import and export the data. Another benefit is the fact that all design data is retained in a "master" product design model, alleviating the chance that the part coming out of manufacturing is different from what was designed.



What was once a non-integrated, serial, workflow with disconnected processes, can now become a more efficient, integrated, and concurrent workflow allowing more team members to get their jobs started earlier and completed faster, while ultimately delivering a higher quality product.

QUALITY CONTROL



SIMULATION



PLM / PDM



TECHNICAL CONTENT

SOLIDWORKS MBD



**DOWNLOAD
NOW**



CHAPTER 2

INTEGRATING WITH 3D CAD

Don't miss the next eBook: **INTEGRATING DESIGN AND MANUFACTURING WITH SOLIDWORKS 3D CAD**

Now that you've seen the tremendous advantages of integrating your design and manufacturing processes and teams, be sure to download the next Integrating Design and Manufacturing eBook, which will demonstrate how design and manufacturing integration can be done easily with SOLIDWORKS CAD software.

DESIGN AND MANUFACTURING INTEGRATION WITH SOLIDWORKS

INTEGRATE YOUR DESIGN AND MANUFACTURING TEAMS AND PROCESSES

With SOLIDWORKS Solutions and SOLIDWORKS Certified Gold Partner Products, integration has never been easier.

SOLIDWORKS provides a full suite of tools that enable you to integrate design and manufacturing. These tools are specialized for everyone on your team—product designers, detailers, manufacturing engineers, tooling designers, estimators, and others—all in one software system.

In addition, SOLIDWORKS Gold Partners provide a wide selection of tightly integrated software products that provide best-in-class solutions for 2D and 3D CAM, as well as other specialized manufacturing applications. These Gold Partner products work directly inside SOLIDWORKS, eliminating the need to launch a new application or import/export files.

SOLIDWORKS provides several key tools needed to support design and manufacturing processes. Here is a summary of key capabilities related to manufacturing:

- SOLIDWORKS 3D CAD
- SOLIDWORKS 2D Drawing Functionality
- SOLIDWORKS MBD
- CAD Data Import, Export, Repair, and Collaboration Tools
- Design for Manufacturability Checks
- SOLIDWORKS Costing for Automated Cost Estimation
- SOLIDWORKS Inspection
- SOLIDWORKS Composer
- Plastic/Cast Part Design, Mold Design, and Injection Mold Filling Simulation
- SOLIDWORKS Sheet Metal Capabilities
- SOLIDWORKS Weldments Functionality
- SOLIDWORKS Electrical and Cable Routing Functionality
- SOLIDWORKS Piping and Tubing Functionality
- Print 3D Models Directly to 3D Printers
- Advanced Surface Flattening for Blank/Pattern Sizing
- SOLIDWORKS Certified Gold CAM Partners