

Machining

## How 3D Printing Prototypes Can Supercharge Your Design Process

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Prototyping is an obvious process and first step for any design cycle. Ensure your part feels a certain way, fits within an assembly, or holds up under extreme conditions. When it comes to manufacturing techniques, 3D printing prototypes remains king.

3D printing started out with a sole purpose of creating fast prototypes. In the decades that have passed since its invention, the technology has found applications in everything from dental aligner creation to jet engine part production; however, when it comes to applications for the tech even today, none is more popular than 3D printing prototypes.

In its early days, 3D printing was used primarily by large companies due to the high cost barriers but today accessibility has improved, enabling businesses of all sizes to use the technology to 3D print prototypes and much more.



**WHAT ARE THE ADVANTAGES OF 3D PRINTING PROTOTYPES?**

## REDUCE TURNAROUND TIME

Traditional manufacturing processes are suitable for mass manufacturing but largely painful for low-volume production. This is one of the reasons why prototypes were difficult to manufacture before the advent of 3D printers. Prototyping often had to be outsourced to specialized businesses, which came with additional costs and a significantly long turnaround time to receive iterations of the finished prototype. But with 3D printing, prototypes can now be manufactured on-demand and within a few hours or days. Fused Deposition Modeling (FDM) 3D printers, in particular, can quickly produce small volumes of prototypes in a range of materials.

## EXPAND YOUR MATERIAL LIBRARY

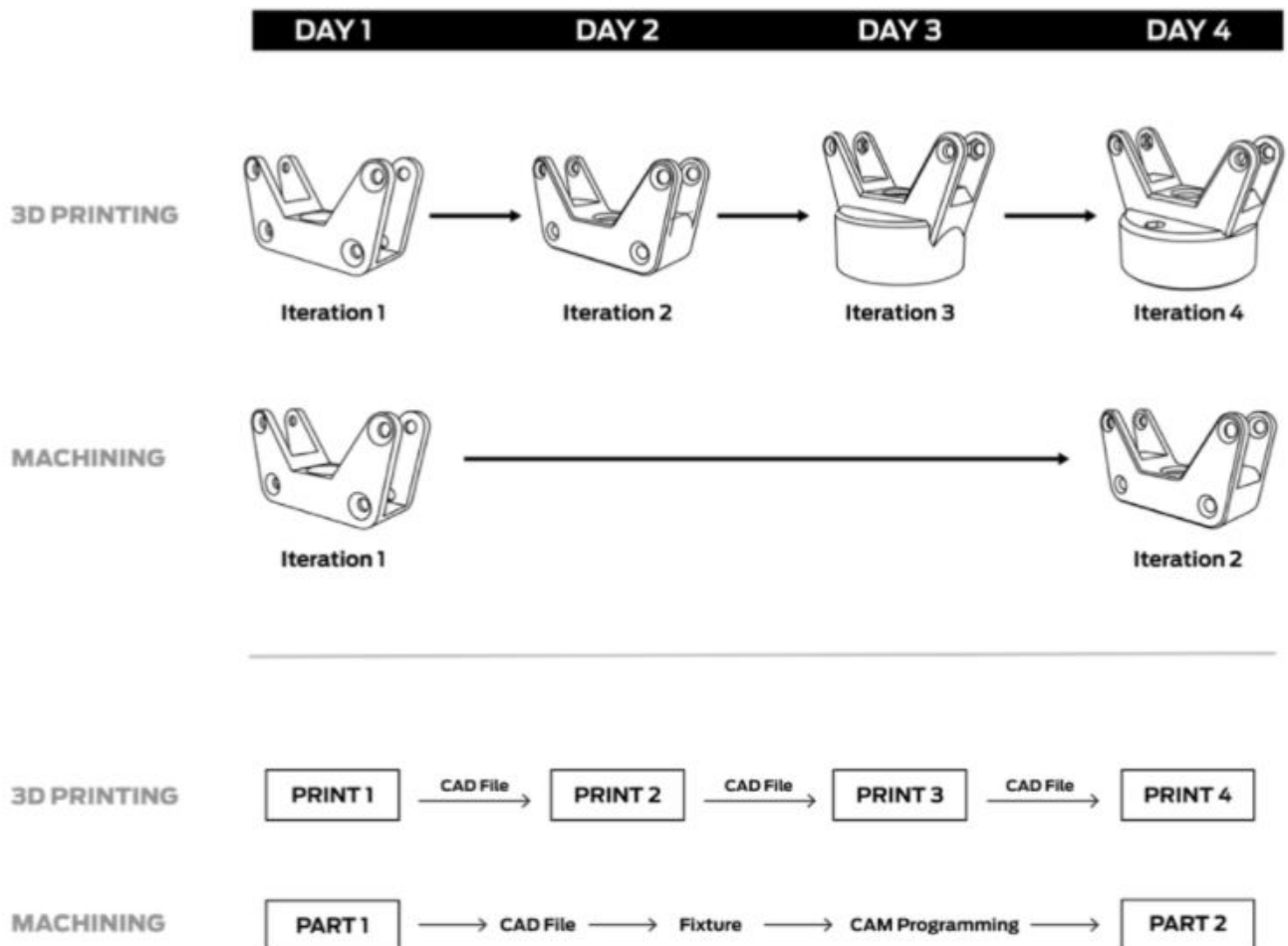
The rise of 3D printing gave way to an increase in new materials with different physical and chemical properties that can be used to produce functional prototypes. Now, manufacturers have a wide range of materials to choose from depending on their needs. In specific cases, material suppliers also work with businesses to customize their offerings and create application-specific materials.

Today, **3D printing materials** like PETG, nylon carbon fiber, PC-ABS, and many others find mainstream use in 3D printing.

## REDUCE COSTS

Over the years, the cost of 3D printing has significantly fallen, mostly attributed to the availability of 3D printers like the **MakerBot METHOD series** that offer affordability, accessibility, and the capability to print with multiple materials. If you consider the labor time and costs of traditional prototyping, 3D printing prototypes are far cheaper than the traditionally manufactured ones.

## RAPID MODIFICATIONS AND ITERATIONS



Prototyping is inherently a trial and error test. Engineers have to follow a loop (design-prototype-evaluate-iterate-design modification) to finalize a design. With 3D printing, prototypes are easily available, and designers and engineers can check form, fit, and function much earlier and more frequently – resulting in a major reduction in risks and cost-overruns further down the production lifecycle.

## THREE THINGS TO CONSIDER BEFORE 3D PRINTING A PROTOTYPE

### 1. FINAL PRODUCT

One of the most important aspects to consider before 3D printing a prototype is the application of the final product. In some cases, the prototype should replicate the final product dimensionally, functionally, or aesthetically. In other cases, the prototype may just be a single component that needs to be checked for its fit into an assembly. Simpler still, a concept model may need to relay the shape and feel of a product in a user's hands before choosing the basic industrial design.

### 2. 3D PRINTING TECHNOLOGY

Depending on the type of prototype and its application, an engineer should decide the 3D printing technology to be used. For functional prototypes, Fused Deposition Modeling (FDM) is commonly used. FDM is also used for parts that require features above 100 microns. For aesthetically appealing prototypes, technologies like Stereolithography (SLA) or Polyjet are used. And in certain cases, it may

make sense to use a combination of additive and subtractive manufacturing technologies for the best prototype result.

### 3. DESIGN GUIDELINES

When 3D printing prototypes, you need to consider design guidelines such as wall thickness, watertight design, multiple shells, or maintain the minimal feature size as per the 3D printing technology. This is similar to considerations you would want to make when using other manufacturing technologies; however, with 3D printing you can access an entirely new range of geometric freedoms than you would be able to with subtractive technologies.

*Continue reading this article* to learn about the types of 3D printing prototypes as well as popular materials for these prototypes.

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