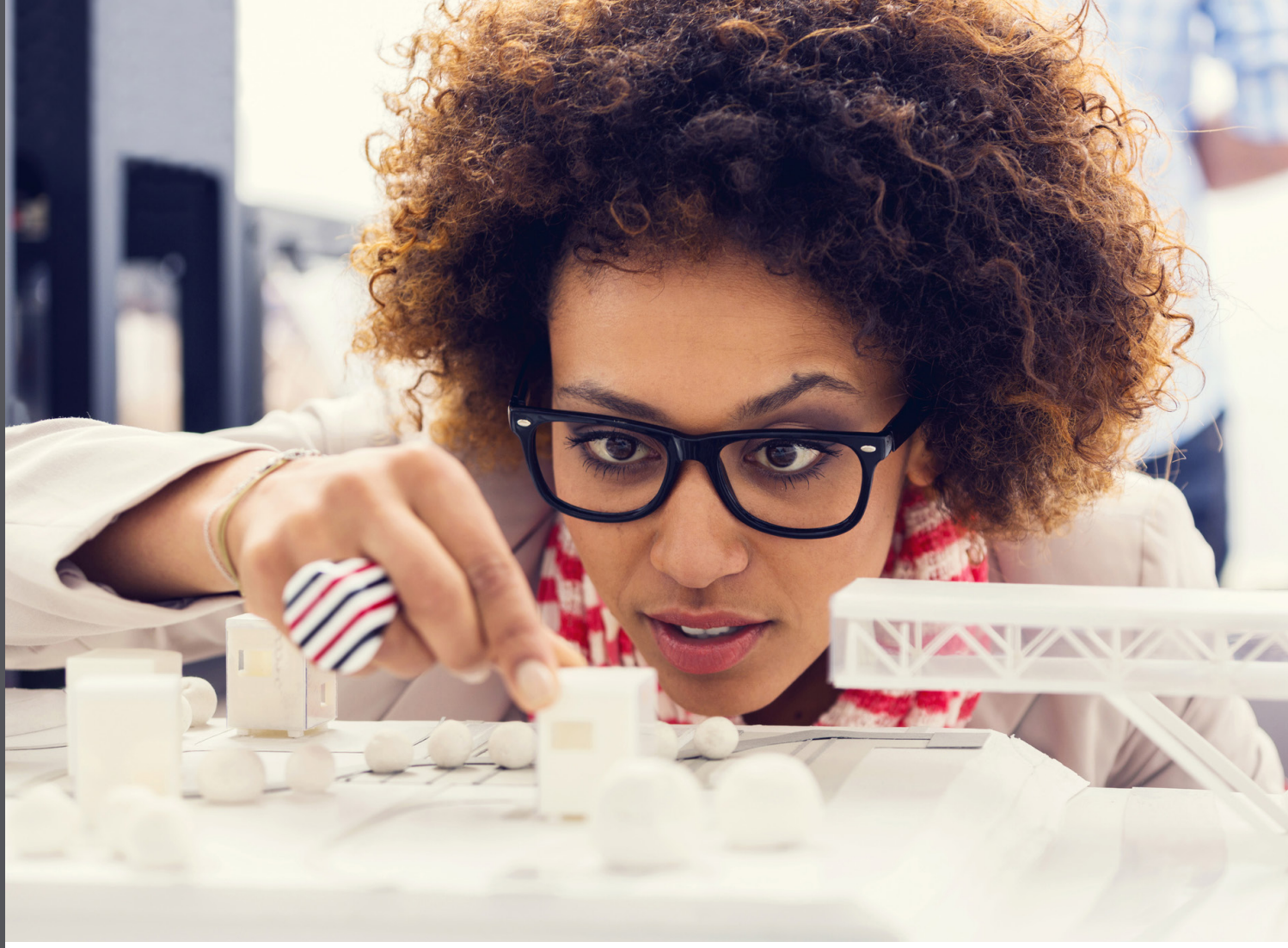

3D Printing Q&A

What is 3D Printing?

3D printing, also known as additive manufacturing, is the exact opposite of the traditional way of making objects. Instead of machining or “subtracting” material to form an object - much like how a sculptor cuts away clay - 3D printing adds layer upon layer of material to build an object, but only where it’s needed. Product designers and engineers upload a digital (CAD) file to a 3D printer, which then prints a solid 3D object.

Thermoplastics are the most frequently used materials, but the technology also includes photopolymers, epoxy resins, metals, and more. Cutting-edge bioinks, which use a mixture of human cells and gelatin, have also been leveraged to 3D print complex tissue models. Even edible materials such as chocolate are being used in 3D printers.

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3D Printing Q&A

Why should I invest in 3D printing – what are the benefits?

3D printing provides a number of business benefits that provide compelling reasons for its adoption. These benefits are characterized by six key drivers:

- Design freedom – Parts can optimized for the design purpose rather than limited by the restrictions of traditional manufacturing constraints.
- Embedded functionality – 3D printing allows for the inclusion of added capabilities within a part or assembly, eliminating manufacturing steps, lowering cycle time and reducing cost.
- Streamlined supply chains – On-demand capabilities and point-of-use production short-circuit traditional supply chains, speeding delivery and reducing inventory costs.
- Personalization – With the encumbrance of economy-of-scale out of the picture, personalization can go mass-market, allowing greater market differentiation.
- Cost-efficient manufacturing – The absence of tooling requirements eliminates one of the largest manufacturing costs, making lower-volume production cost effective.
- Life-cycle sustainability – Design freedom and point-of-use production allow for lighter, optimized parts that save fuel use and reduce environmental impact.

In other words, 3D printing opens new doors. You can shave days off production cycles, remove complexity from final assembly, produce lightweight, high-strength structures, create hyper-realistic prototypes and be more competitive.

Is 3D printing just for rapid prototyping?

3D printing is an essential tool for accelerating the prototyping process. However, its applications stretch well beyond prototyping to other facets of the product lifecycle.

- Manufacturing – Design freedom and economically viable low-to-mid-volume production enable new possibilities for product design and operational improvement. Applied in combination, these two capabilities have the potential to transform decades-old supply chains and business models.
- Tooling – 3D printed tooling advantages include on-demand production, customization, digitization of designs and unrestrained design flexibility. This cuts out costly suppliers, compresses lead times, enables digital warehousing and accelerates manufacturing floor productivity.
- Sales and Retail – 3D printing gives retailers the ability to innovate, delivering highly customized, on-demand products and new experiences such as “co-designed” items developed in conjunction with the customers.
- Aftermarket Supply – Businesses that embrace 3D printing for spare and replacement parts can replace warehouses of spare parts with 3D printers or a contract 3D printing service bureau to produce parts on a just-in-time basis.

3D Printing Q&A

How costly is it to implement 3D printing?

This depends on the depth of implementation and the specific type of 3D printing technology used. 3D printers span the cost spectrum from relatively low-cost machines that are suitable for an office environment to large, expensive, industrial-grade printers. Within any given technology category, the difference between low-end and high-end systems often includes part size, variety and quality of materials, and the accuracy, reliability and consistency of the systems. Compared to traditional modeling for prototypes or traditional manufacturing methods like CNC machining or injection molding, 3D printing is typically much faster and at lower volumes, much less expensive. As the benefits and applications grow, the technology can be scaled appropriately.

How does 3D printing impact product development and speed to market?

3D printing accelerates the process by reducing the time and cost associated with prototyping and refining the design. Many more 3D printed prototypes can be produced in the time needed to mold or machine them and for much less cost. Highly realistic prototypes printed on full-color multimaterial printers look like the final product, cultivating faster and better decisions.

What can designers do with 3D printing?

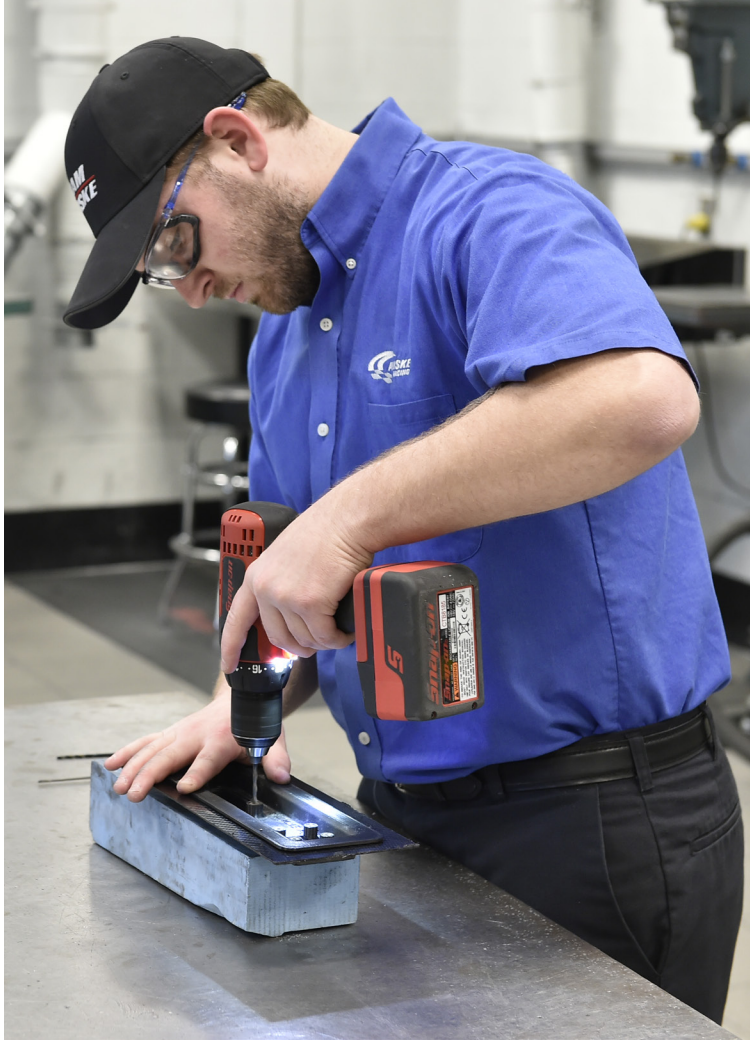
3D printing gives designers the capability to drastically shorten the design process compared to traditional methods of hand-modeling or outsourcing to model shops.

Keep the design process entirely in-house. With 3D printing, designers gain full control over the design process. Creating models in-house saves the time associated with outsourcing. More timeline flexibility empowers designers to try new ideas and iterate often, resulting in better products that stand out.

Prototype faster and smarter. Outsourcing is often too expensive and time-consuming to allow iteration of more detailed prototypes, especially models that incorporate CMF (color-material-finish). The speed and streamlined workflow of 3D printing gives designers the freedom to create dozens of detailed prototypes while reducing the time to arrive at the optimal design.

Create beautiful, highly detailed models. With full-color, multimaterial printing, designers can create prototypes that look, feel, and even function like the real thing in just a few hours. The ability to assess the color, texture, and ergonomics of a product means better feedback and faster approval from clients.

3D Printing Q&A



What advantages does 3D printing have for manufacturing?

3D printing negates the need to fabricate and install costly tooling to make things. Its additive nature makes it a fast, low or mid-volume production solution that doesn't rely on economies of scale, much like an investment in injection mold tooling does. This opens up new opportunities where lower-volume and/or on-demand production was previously uneconomical. It also supports distributed manufacturing, where parts can easily be printed from anywhere. For instance, an airline could 3D print its own spare parts at a maintenance facility instead of having to have them shipped by the manufacturer.

From a tooling perspective, 3D printing offers the same agility, being able to produce jigs, fixtures, end-of-arm tools and other manufacturing aids in much less time and for less cost than traditional tooling. These tools can easily be ergonomically customized and optimized for the operator, rather than designed for how they're manufactured. Strong thermoplastics in place of metal allows them to be lighter and easier to use, increasing task efficiency and lowering cycle time.

Is 3D printing a replacement for conventional manufacturing technology?

3D printing is not a wholesale replacement for existing manufacturing methods like molding and machining. Its benefit lies in supplementing these other technologies at points where they can't compete. For example, 3D printing's additive nature is able to make structures that aren't possible with machining or molding. It also makes low- to mid-volume production economically viable because there's no need for the tooling investment. Similarly, it's much faster to get started, which is why GM turned to 3D printing to retool its production line to produce ventilators in the pandemic. In short, 3D printing is another tool in the toolbox, but one that offers key benefits over traditional manufacturing practices when used strategically.

When does it make sense to use additive manufacturing for end-use production parts?

There are five characteristics that tend to favor 3D printing of end-use parts:

- Complexity - parts that would be difficult or impossible to machine or mold
- Large Up-front Investment - high initial cost of creating injection molds
- Redesign - new product design that may be susceptible to changes
- Customization - one-off products for custom applications
- Low to Mid-Volume Production – economically produce a few hundred to several thousand parts

3D Printing Q&A

I'm interested in adopting 3D printing. What are my next steps?

Becoming familiar with the technology, understanding the impact it has across the product lifecycle and identifying areas where it may provide benefit in your business is the logical first step. This kind of analysis is supplemented by identifying your business objectives and noting the intersection points where 3D printing offers benefit. Do you want faster prototyping? Are you looking to reduce product development cycle time? Do you need to reduce manufacturing costs?

This whitepaper offers key insight into how 3D printing helps transform businesses to achieve these kinds of goals. Another initial step involves outsourcing 3D printing to a service bureau. This offers the benefits of the technology without the initial up-front printer investment. As your use and application of 3D printing grows, you can evaluate the business case for bringing this capability in-house.

How do I effectively implement 3D printing in my company?

Like any new technology or change in business orthodoxy, it pays to be deliberate and planful when implementing 3D printing. You may not get the results you want without a well thought-out plan for deploying the technology or a clear strategy for long-term, high-value return. You may figure it out, but the odds are against you. Starting small, with one or two printers, will allow an organization to become familiar with the technology, its applications and benefits. From there, the technology can be scaled for wider implementation and corresponding benefit.

How much training is required to implement 3D printing?

The level of familiarization and training depends on the type of 3D printing technology you choose. However, there are many types of 3D printers that do not require significant investments in training time to become operational. The software associated with these printers provides a simple workflow that allows operators to quickly go from CAD model to printed part. Generally speaking, the more sophisticated the printer and its capabilities, the more training will be required for effective implementation.

What are the pros and cons of using a service bureau?

Contracting with a service bureau to make your 3D printed parts is a good way to get introduced to the benefits of the technology. You gain the expertise and insight of a 3D printing specialist who can possibly guide you in optimizing the use of the technology for your specific purposes. Your out-of-pocket expenses are usually lower initially since you avoid the up-front expense associated with a printer purchase. Conversely, customers who already own 3D printers use service bureaus to offload work when in-house capacity is exceeded. Service bureaus also cater to many types of 3D printing technology, more than most companies own. This is beneficial when you want 3D printing services that are different than your in-house 3D printing capability.

3D Printing Q&A

Why not just use a service bureau exclusively instead of buying 3D printers?

The answer to this question depends on your specific business case. If you need 3D printing services only occasionally or your needs for the type of 3D printing technology vary often, using a service bureau exclusively in lieu of buying 3D printers may make sense. However, if you find benefit in the technology and it becomes a part of your business model, then the purchase of 3D printers typically makes more economic sense in the long run.

How can Stratasys help me?

We've been in the business of helping customers solve problems for over 30 years with our 3D printing solutions. We can help you determine what technology is right for your application, whether a printer or a service bureau is more appropriate, as well as answer any questions you might have. Contact us today and let us help you take the next step with this transformative technology.

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