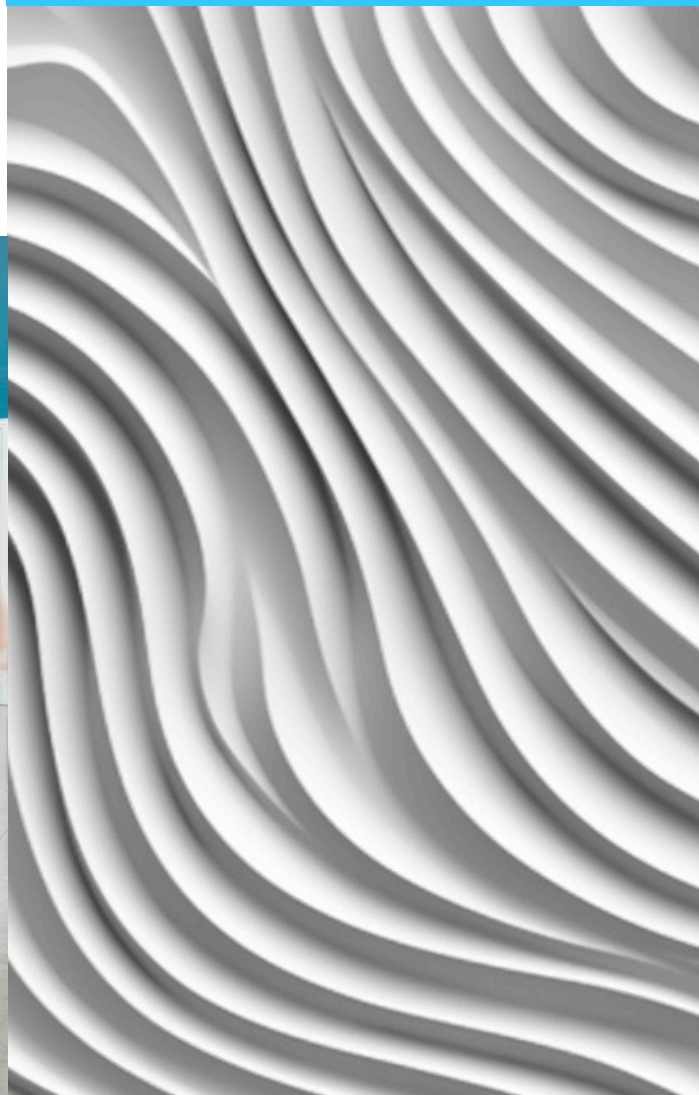
stratasys direct

EBOOK
BENEFITS OF 3D PRINTING

Understanding the Benefits of 3D Printing

Learn the benefits of 3D printing according to regular AM users and see how you can leverage it for your business.



Why Additive Manufacturing?

3D printing, also known as additive manufacturing (AM), offers a new way to create parts, allowing engineers to design and prototype parts and products faster.

What started as a rapid prototyping tool has evolved into a powerful manufacturing technology, enabling the production of complex parts and products across a wide range of industries.

Companies large and small, from multiple industires, have been inspired by the new design complexities possible with 3D printing. Without the constraints of conventional manufacturing methods, AM opens new opportunities for organic shapes and creative product design. With the ability to print parts on-demand directly from digital data, engineers are taking advantage of AM in key areas of their workflow.

To better understand how 3D printing can benefit your company, Stratasys Direct surveyed AM users to understand the benefits companies most valued when using this manufacturing method. Approximately 700 3D printing users from a variety of industries reported what they consider to be the top benefits for their business. We've compiled their response to highlight some of the key benefits of AM. In addition, we expand on their responses with our own experiences and expertise from 30+ years working with additive manufacturing technology.

Survey Answers

Listed in order, here are the top benefits of AM cited by the surveyed companies:

Design freedom

3D printing doesn't abide by traditional rules

1. Opens up opportunities for:
   - Lightweight structures
   - Part count reduction
   - Non-linear holes, channels & features

Speed

1. On-demand parts within hours or days
2. Eliminate tooling lead times

Ease of customization

1. AM doesn't suffer from economies of scale
2. Personalization of products
3. Tailored to precise ergonomics

Risk mitigation

1. Eliminates the risk of obsolescence
2. Reduced lifecycle of impact of parts
3. Minimized production waste

Manufacturing efficiency

1. Produce parts directly from digital data
2. Little capital costs difference between a batch of one hundred or one thousand parts

Supply chain optimization

1. AM is digitally-driven manufacturing and can produce parts on-demand
2. Consumer driven supply chains
3. Reduced transportation time and costs

Design Freedom

3D Printing Breaks Traditional Rules

One of the key advantages of AM is its ability to create complex designs. 3D printing puts designers in control of the entire process, eliminating delays associated with model delivery and costly mistakes. This increased flexibility allows for rapid iteration and experimentation, leading to innovative and superior products.

3D printing accelerates the design process by making rapid iteration accessible. Designers can create and refine numerous detailed prototypes quickly and affordably. High-fidelity prototypes, complete with accurate colors and finishes, are now achievable in less than a day—a huge improvement over traditional methods' week-long lead times.

Non-linear holes, channels & features

Undercuts, negative draft, non-linear holes and interior features are not a problem for 3D printed parts. One of the significant benefits of the AM process is that interior features, such as stiffeners, baffles, ribs and struts can be designed and constructed as one integral part.

Part count reduction

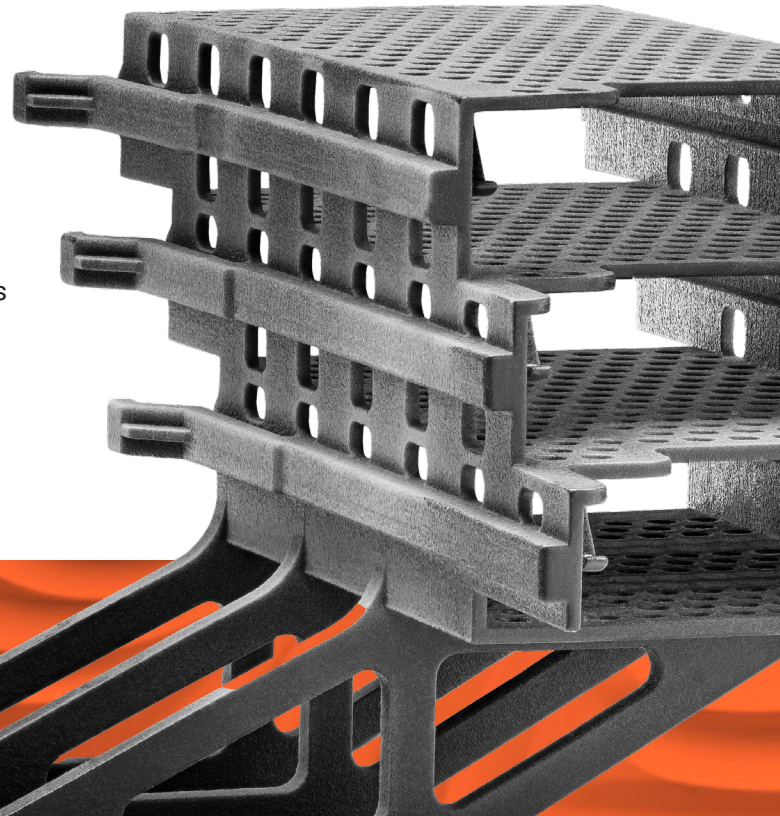
Using 3D printing instead of conventional processes, like CNC machining, removes traditional manufacturing constraints and opens up nearly endless opportunities for tool configuration. Common conventional design considerations, like irregular profiles, contours or number of machine set ups, are no longer relevant when designing parts for AM. 3D printing handles complex shapes easily, eliminating the need for multiple setups and processes required by traditional manufacturing.

Because of the technology's ability to handle design complexity, additively manufacturing jigs and fixtures eliminates or significantly reduces assembly time. Tools previously envisioned with multiple components, and those requiring assembly via traditional manufacturing processes, can be redesigned as one contiguous component, saving time and post-build labor.

Lightweight Structures

Another advantage found in using 3D printing is ability to design structures that allow for weight reduction. Strong plastics are an excellent alternative to conventional metal parts produced by CNC or molding.

3D printing is often utilized to deliver lighter replacement parts in applications such as tools for production workers involved in assembly and fixture work or automotive parts.



Speed

Produce Parts On-Demand

3D printing has been widely acknowledged as a fast alternative to traditional manufacturing processes for a range of applications.

The technology can build multiple parts in a matter of hours, enabling product development teams to receive imperative feedback, revise, and reiterate within days.

Eliminate Tooling Lead Times

Hard-tooling molds are usually made from tool steel with a CNC milling machine or via electrical discharge machining (EDM). When used in mass production, they can last for millions of cycles but cost hundreds of thousands of dollars. What's more, lead times to produce these molds are often measured in months rather than weeks or days.

For smaller volume projects, complex designs, or functional prototypes, tooling lead times can cripple a project. 3D printing is much quicker; a part can be built within a few hours, compared to the days or weeks it takes to create tooling and without the wait for first shots to be shipped.

Your project's application is usually the driving consideration behind technology choice, but requirements like finishing needs, assembly, materials, cost-effectiveness, and delivery date play into the decision as well. When turnaround time is crucial, some technologies and build methods are more ideal. For example, PolyJet is a fast technology, building many parts in a matter of hours.

If you don't own a machine, or if your in-house capabilities aren't sufficient for your project, you can utilize a service bureau like Stratasys Direct.

The material-jetting technology is ideal for highly detailed, cosmetic prototypes. PolyJet can print multiple colors and textures saving you time in post-processing where you may have required painting or decals. Time lends itself to an ideal process for rapid prototyping.

Bigger parts may be better suited for Stereolithography (SLA), and can be made using a sparse method in which Stratasys Direct builds strong parts with a near hollow interior. This process takes half the time to build since less material is used. These parts are also significantly lighter than their solid counterparts while still maintaining a good level of strength.

For projects that need multiple small parts quickly, SAF® may be more suitable. This technology builds in a powder material chamber which lends to nesting of parts. This batch manufacturing process can create multiple smaller parts nearly 5 times faster than other similar methods.

Freedom of Customization

Economies of Scale

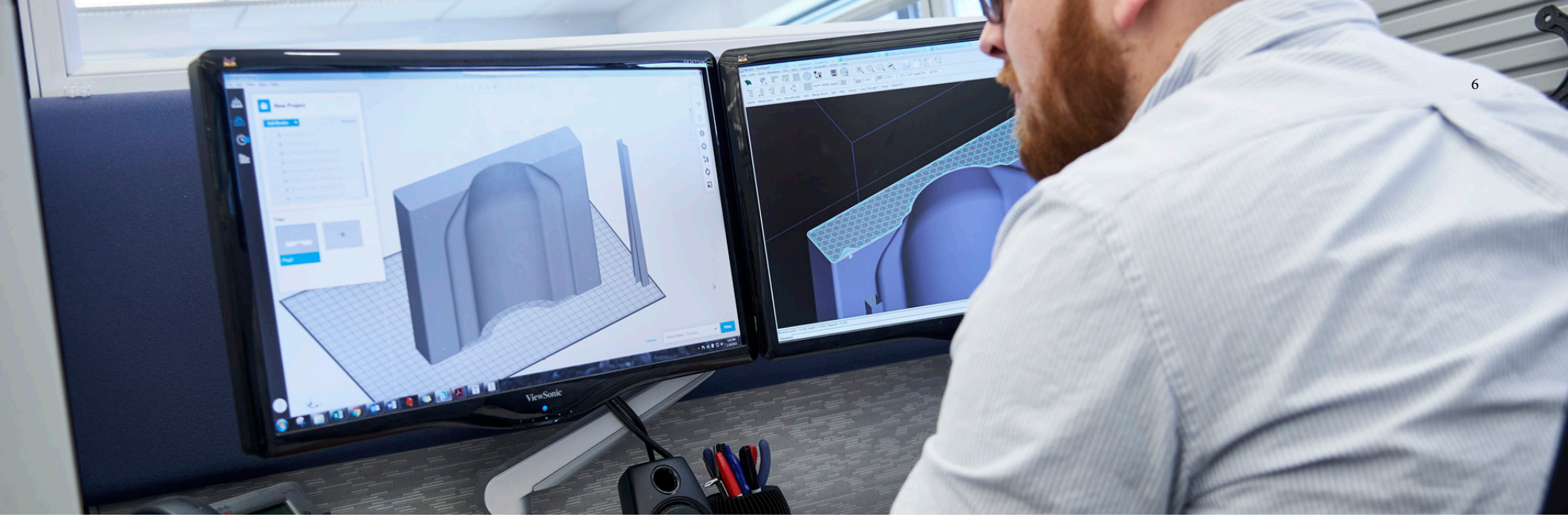
Economies of scale can be a key concern for many companies with a diverse product offering. When it comes to customization and one-off parts, 3D printing is hard to beat. More recently, service bureaus like Stratasys Direct have developed volume packing and build schedules that allow optimized production of parts.

Personalization of Products

Depending on the end-part, the ability to create multiple iterations with custom ergonomics, graphics, colors, or small design tweaks can make or break a product line. 3D printing not only allows you to iterate faster, but companies can reduce time to market by enabling designers to integrate unique graphics or specifics in a made-to-order setting.

Tailored to the Ergonomic Profile of Customers

Long tooling production timelines and a lack of surrogate parts are areas where AM can improve efficiencies and decrease costs. With AM's design freedoms, custom ergonomics can also be integrated easily into a 3D model and printed on-demand. Additive manufactured parts can produce contours and organic shapes that help increase customer comfort with no extra costs.



Manufacturing Efficiency

Produce parts directly from digital data

The ability to try a design idea, test it and redesign it accordingly in a matter of hours, rather than weeks, can prevent work delays and reduce damage throughout the production processes. Unlike 3D printing, outsourcing parts to a conventional manufacturing facility can result in lead-times of weeks from the initial drawing to release of a finished part.

A cost-versus-benefit analysis can confirm that 3D printing with a service bureau or in-house significantly reduces planned lead times. 3D printing can be a more preferable method of manufacturing due to the speed of production and low part costs.

Little costs difference between a batch of one, one hundred, or one thousands parts

Compared to injection molding, 3D printing has a consistent cost-per-part unit pricing, making it ideal for lower volume projects. Additionally, it doesn't deal with the cost and time of tooling molds, which can be compounded by factors like design mistakes that require molds to be remade correctly or the need to create multiple iterations before the final part design and quality are achieved.These are some of the reasons that manufacturers have turned to 3D printing for specific use cases where tooling may inhibit manufacturing efficiency.

In cases where design changes are required, a new iteration of a part can be created at minimal cost. This, combined with the speed of 3D printing, allows designers and engineers greater design freedom and lends itself to a faster iteration process.

Larger volumes of parts can be achieved with some technologies, such as powder bed fusion, by nesting parts together in a single batch. Even lower unit pricing is achieved with batch manufacturing, and material costs can be reduced significantly by recycling unused material. Additionally, the batch manufacturing process can create multiple smaller parts faster.

Supply Chain Optimization

Consumer Driven Supply Chains

Adopting additive manufacturing (AM) streamlines the supply chain by reducing the need for multiple suppliers, many of which can provide local production with lower labor costs. This eliminates the reliance on overseas production for cheaper labor rates and significantly reduces or eliminates tooling costs. 3D printing service bureaus also offer fast turnaround times, enabling companies to address issues quickly and efficiently. Additionally, with on-demand production, there's no need for warehousing, and parts are delivered faster.

3D Printing is a Digitally Driven Manufacturing Process & Can Produce Parts on Demand

Digital design files allow for a "virtual" inventory of parts available for print on demand. Digital inventories can lead to significant costs savings with less storage requirements and the ability to quickly edit designs and produce new iterations. The added agility of AM enables unparalleled responsiveness to market needs. Currently, manufacturers may source tens to hundreds to thousands of parts from a variety of suppliers. Looking forward, the model for procurement may look very different. Manufacturers will be able to acquire a range of parts from a much smaller group of suppliers armed with a fleet of 3D printers.

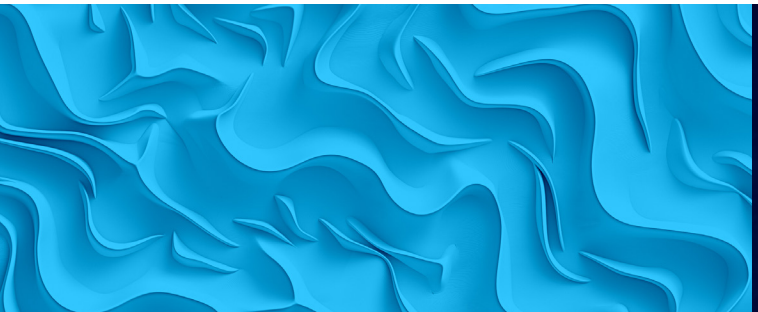
A byproduct of this capability is the added advantage of supplier redundancy. Experienced service bureaus like Stratasys Direct offer reliable service with the knowledge of which technology works best for your applications and the quality requirements to meet expectations.

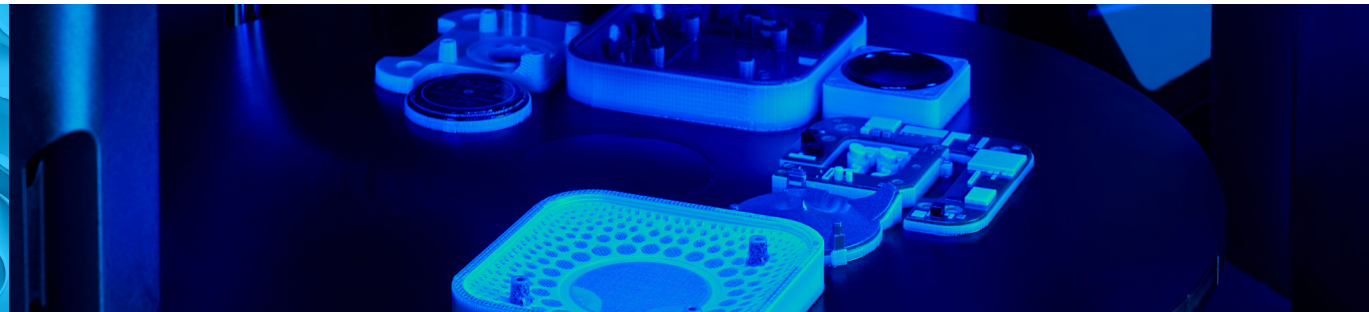
Specific facilities can locally 3D print designs on-demand from files sent securely across the globe, or they can print from a nearby supplier that provides needed services.

Reduced transportation time and costs

The ease of a local supplier to manufacture parts opens the potential for significant transportation cost reductions, giving businesses the control to print parts when they're needed, where they're needed. A halt in the production line can result in compounded production problems down the line. Long lead times will be a thing of the past when businesses embrace 3D printing for expeditious tool-less manufacturing. In some cases, parts can be made within hours or days instead of weeks, significantly reducing manufacturing downtime.

Replacement parts is a valuable use case for 3D printing by allowing your company to reduce costly inventory management of spare or obsolete parts.





Taking 3D Printing Further: 5 Key Areas to Evaluate for Maximum Impact

Many businesses are beginning to explore additive manufacturing, intrigued by its potential advantages. However, using 3D printing for select projects only scratches the surface of what it can achieve. To truly maximize its impact, companies should assess these critical areas to deepen integration and drive strategic implementation.

1. Range of Applications

The advances of 3D printing have made applications possible from prototyping and marketing tools to manufacturing aids and fully functional production parts. Businesses who aren't utilizing AM throughout the full product development cycle are likely missing out on cost-savings, lead time reductions, and improved product performance.

2. Design for Manufacturability

Businesses that adopt AM open up new possibilities with an incredible amount of design freedom. Parts can be designed for function rather than manufacturability. With benefits like part consolidation, organic cellular structures, and the ability to easily build tough features like undercuts, conformal structures and living hinges, 3D printing offers a new opportunity to design and produce geometries and assemblies previously thought impossible. Let 3D printing enable the next wave of innovation in your company.

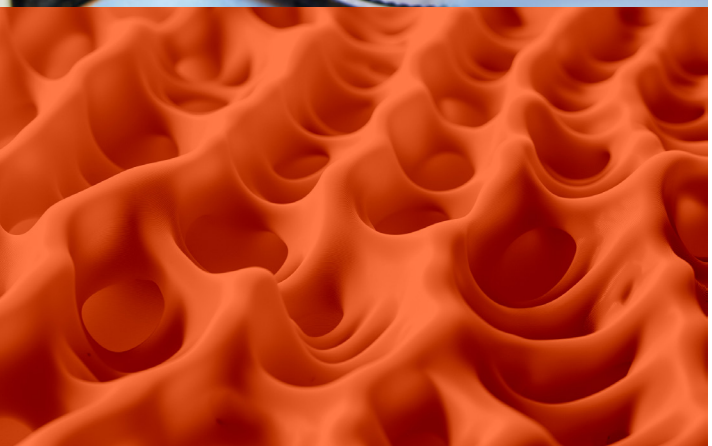
3. Material & Technology Variety

There is no one-size-fits-all process when it comes to manufacturing, even with additive manufacturing. By trying different 3D printing technologies and subsequent materials, new possibilities and applications are born. Each process has its own benefits and limitations, but by experimenting beyond what's comfortable and known, a company could reap huge rewards.

Furthermore, it's important to acknowledge additive technology as a complementary method to conventional manufacturing. Sometimes 3D printing's biggest impact may not be in the final product; rather, it may be used to produce manufacturing tools that streamline the production floor.

Specifically, 3D printed jigs and fixtures provide a light-weight, cost effective and customized solution for traditional production floor processes. 3D printed jigs and fixtures on the manufacturing floor, bridge-to-production applications for mass produced products, and assembly components are all applications that work in conjunction with traditional manufacturing.

The future of manufacturing lies in the integration and synergy between additive and conventional technologies. Additive manufacturing is not only advancing traditional methods but also redefining what's possible, paving the way for more innovative and efficient production solutions.



4. Infrastructure

Infrastructure challenges, such as a shortage of trained personnel, limited space for industrial printers, or extended wait times for machine use, can hinder the effectiveness of 3D printing in your organization. To maximize project potential, some companies consider solutions like acquiring additional printers or hiring skilled employees. However, a more cost-effective and efficient option might be outsourcing to an experienced 3D printing provider. A make vs. buy analysis can reveal whether external expertise could better serve your needs.

Collaborating with experienced service providers like Stratasys Direct brings several benefits. They possess in-depth knowledge of 3D printing technologies, materials, and best practices. In addition, they offer valuable insights into your design process, helping you enhance and secure the success of your project.

When your internal 3D printing capacity falls short, these partners become indispensable suppliers, ensuring seamless production without delays. By leveraging their expertise, you can focus on innovation and quality, ultimately positioning your business to thrive in the competitive landscape of additive manufacturing.

5. Internal Support

A vital element of taking full advantage of additive manufacturing for businesses is having a 3D printing champion or group in the organization. This person or team will take on the responsibilities of learning the key elements of the technology's impact on the organization, and they will in turn learn to communicate its financial, business, and engineering value. Staying abreast of emerging AM technologies, materials, and exciting new applications can ensure you have an expert ready to propose new ideas that will lead to effiency and cost-savings.

The 3D printing champion can take the time to educate the organization on 3D printing's potential and identify key areas that it can improve upon. By facilitating training they can help cultivate an organization whose employees are knowledgeable about the technologies and are able to bring about additional new use cases.

Key Takeaway

According to our survey, many companies, no matter size or industry, are experiencing the long-term business benefits of additive manufacturing and are embracing the technology more year by year. Stratasys Direct is committed to continuous process improvements and greater accessibility to the latest advancements for our customers.

Whether it's technological solutions that allow for better parts, standardization solutions that help qualify components for high-requirement applications, or resources that help engineers and designers educate and champion additive manufacturing in their company, we are focused on how we can help you excel into the future of manufacturing.

Expert help is always available

Whatever your project, our 3D printing and manufacturing experts are here to help you achieve your project requirements.

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