



WHITEPAPER

2022 Trends in 3D Printing at Scale

A Survey of 3D Printing for Production Manufacturing

December 2022

 ESSENTIUM™

Introduction

Additive manufacturing (AM) continues to transform how parts and tools are manufactured at scale. When 3D printing was first introduced, it was not a feasible option for production manufacturing at scale due to a lack of materials, slow print times, high costs, and quality requirements. However, with the latest advancements in high-performance printing machines, design software, and certified materials, manufacturers can now generate production floor-ready parts at scale quickly and more cost-effectively without compromise — even in the most demanding industrial environments.

As 3D printing continues to mature, it's time to move past the hype of expectations promised of this technology to the reality of its current state of use across manufacturing floors. This study investigates the current experiences, challenges, and trends driving its growth among manufacturing companies. The primary objective is to capture relevant data and note any changes in 3D printing for production manufacturing from prior years. Participants were asked about a wide range of topics related to the present and future use of industrial 3D printing and their opinions on outcomes.

The following report, sponsored by Essentium, is based on an online survey of 170 managers and executives working at manufacturing companies. All were responsible for decisions regarding 3D printing for production parts. This is the fifth year we have conducted this survey, and certain questions were repeated from prior studies to enable trend analysis.

Key Findings

Past the hype, now the reality of 3D printing

- 89% have increased 3D printing of production parts in 2022, although extreme growth rates are slowing slightly
- 96% agree that 3D printing is dramatically more reliable than 5 years ago
- 100% have gained financial benefits from 3D printing, including cost savings, increased revenue, or both
- 57% say 3D printing has enabled a competitive advantage
- 80% of executives report that their C-suite are 3D printing advocates
- Faster time to market and improved part performance ranked as the top business drivers for growth in 3D printing at scale

3D printing for today's production manufacturing

- 88% are using hybrid production, combining 3D printing and traditional approaches
- 71% used 3D printing to address supply chain issues; all of those reported that it was an effective approach
- 86% report that 3D printing has helped forward their sustainability initiatives

The future of 3D printing at scale

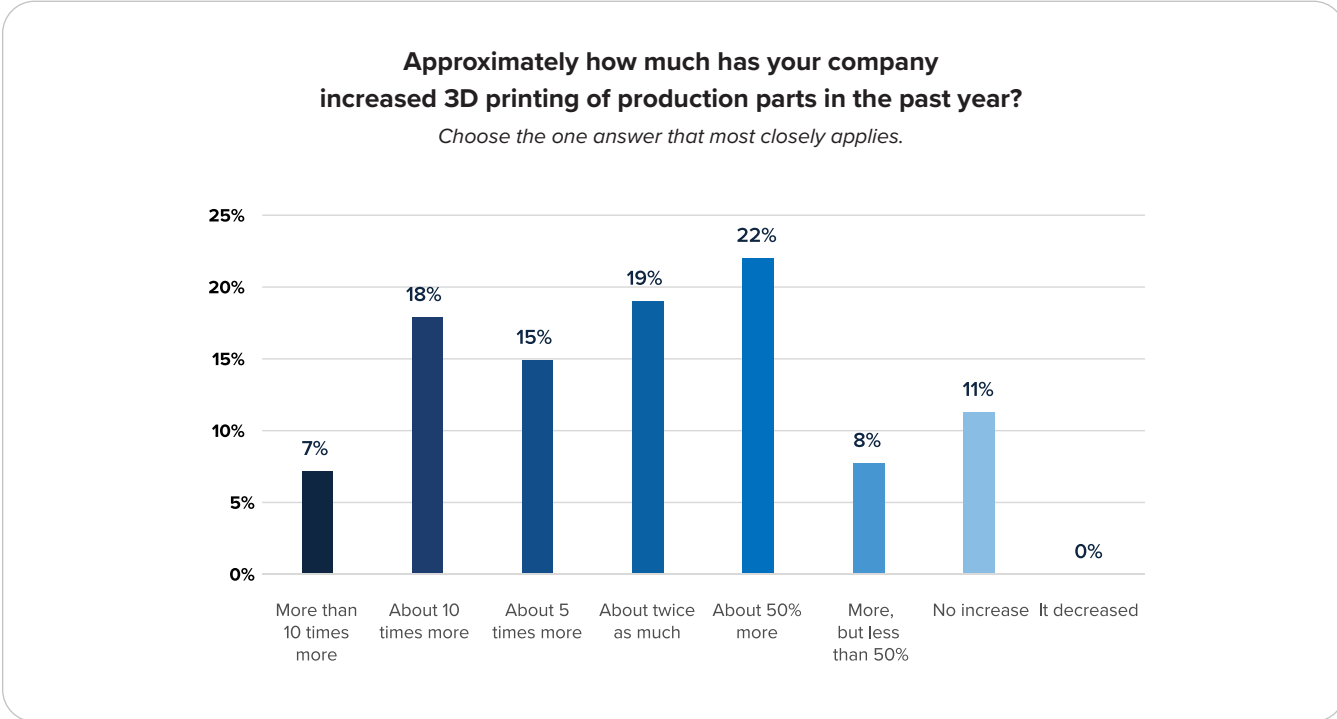
- 95% expect their company's use of 3D printing will increase
- 99% say certified materials are important
- 54% expect aggressive growth of 3D printing for large-scale manufacturing will continue, although a third expect the pace of growth to slow somewhat

Detailed Findings: Past the hype, now the reality of 3D printing

3D printing continues a growth trajectory, although acceleration is slowing slightly

Since the 1980s, 3D printing has generated tremendous hype as it promised to cut time to market, immediately respond to new customer demands, and enhance product development and personalization. Yet as 3D printing approaches maturity and is widely adopted by manufacturers, is the technology adoption leveling out, or is it entering a period of more sustained growth?

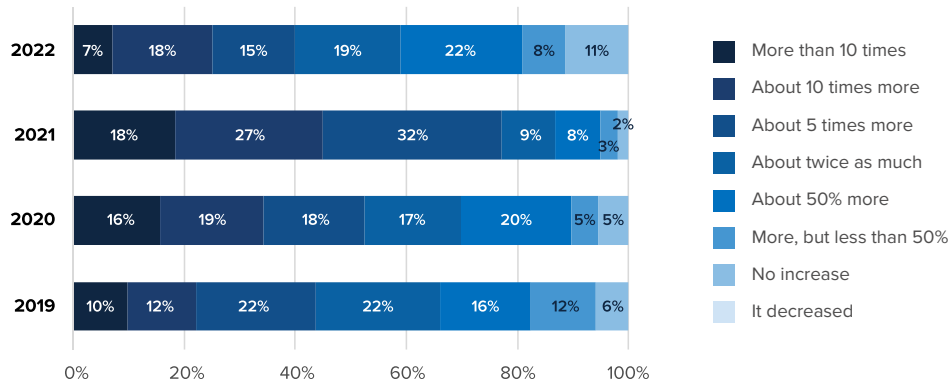
When we asked manufacturing executives and team managers to assess their increase in production parts during the past year, the majority (89%) stated they increased the printing of production parts. Remarkably, this includes a quarter (25%) increase by 10 or more times in just one year. It is also interesting to note that no manufacturing companies (0%) decreased their use of 3D printing for production parts in that same period. This data substantiates a strong growth pattern during the past year, which is particularly notable considering the recent supply chain issues and fears of recession.



While this growth is encouraging, it is important to consider how the rate of this growth has evolved over the past few years. We have asked this same question for four years in a row, which allows us to compare these numbers year over year. The data shows that while growth continues, the rate of that growth appears to have slowed in the past year.

Approximately how much has your company increased 3D printing of production parts in the past year?

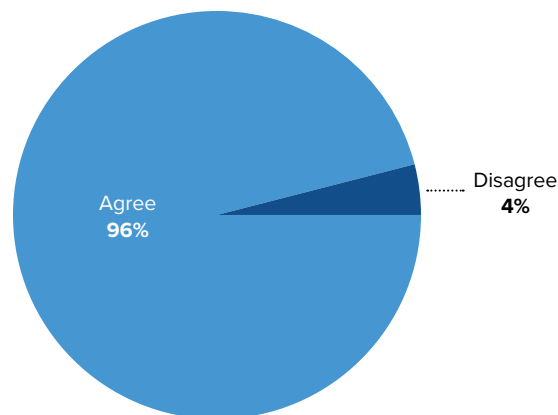
Choose the one answer that most closely applies.



Many changes have contributed to 3D printing growth, with expertise topping the list

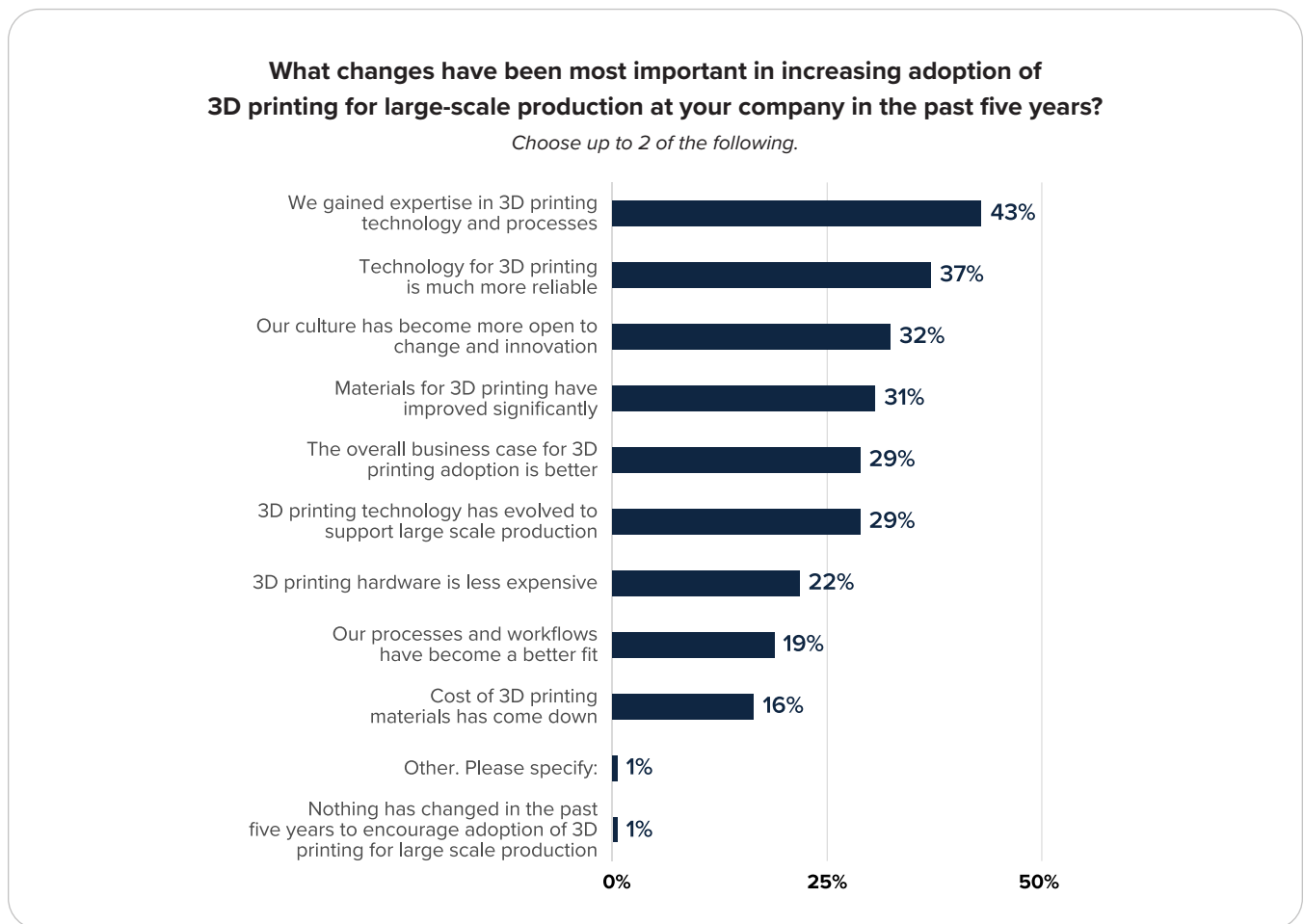
To understand the “why” behind the constant growth trajectory of 3D printing at scale during the past few years, it’s vital to examine the company and industry changes. One of the key evolutions shown in the data is the increasing maturity of the technology. The optimism expressed about improvements in the quality of 3D printing in 2022 is very robust, with almost all (96%) manufacturing leadership in agreement about its improved reliability today compared to just five years ago.

“3D printing is dramatically more reliable than it was five years ago.”



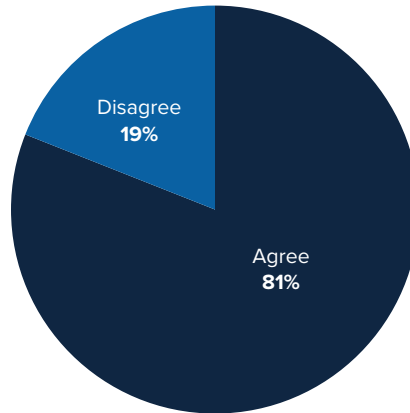
However, reliability wasn't the only change needed to enable growth. Manufacturers report that gaining additional expertise (43%) is the number one change that fueled their increased adoption of 3D printing for large-scale production. This is followed by more reliable technology (37%), company cultural shifts to change and innovation (32%), improved materials (31%), a better business case for 3D printing adoption (29%), evolved technology to support large-scale production (29%), and more. One participant took the time to let us know that their company is using 3D printing to offset a loss of skilled labor in other areas of their operations.

It is particularly interesting that when we break down their responses by job level, 37% of executives are more likely to identify the overall business case for 3D printing as a significant change, far more than the 24% of team managers that said the same.



Despite the positive changes driving the steady adoption of 3D printing, a vast majority (81%) of manufacturing stakeholders admit they were initially uneasy about the technology until they gained more confidence using it.

“My company was nervous about using 3D printing at scale, but experience has given us much greater confidence.”

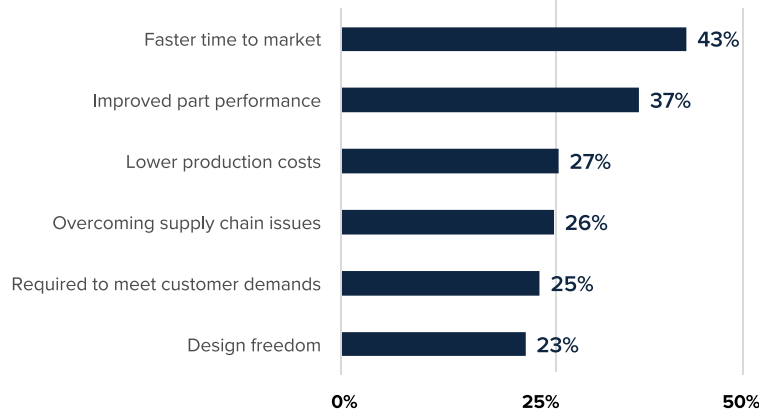


Faster time to market and improved part performance are the leading business drivers for growth

A key goal of this study is to identify the business motivations for companies to increase their adoption of 3D printing for production manufacturing. According to manufacturers, the primary business drivers are faster time to market (43%) and better part performance (37%). Other factors include a need for lower production costs (27%), overcoming supply chain issues (26%), meeting customer demands (25%), and enabling design freedom (23%).

Since your company began using 3D printing for large scale production, what have been the most critical business drivers contributing to increased adoption?

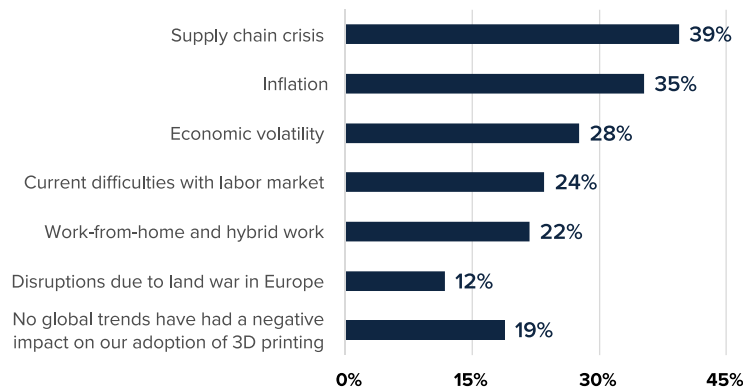
Choose the one answer that most closely applies.



Nevertheless, most manufacturers (81%) confess that many global trends created friction for their 3D printing strategies. These include supply chain issues (39%), inflation (35%), economic volatility (28%), difficulties with the labor market (24%), and more. Executives who have broader responsibilities reported different levels of impact on these trends than their team managers with more narrow responsibilities. Specifically, executives cite a higher level of concern about economic volatility (46% vs. 32% of team managers) whereas team managers are most worried about supply chain issues (44% vs. 32% of executives).

Have any global trends in the past few years limited, prevented, or delayed your company's adoption of 3D printing?

Choose all that apply.

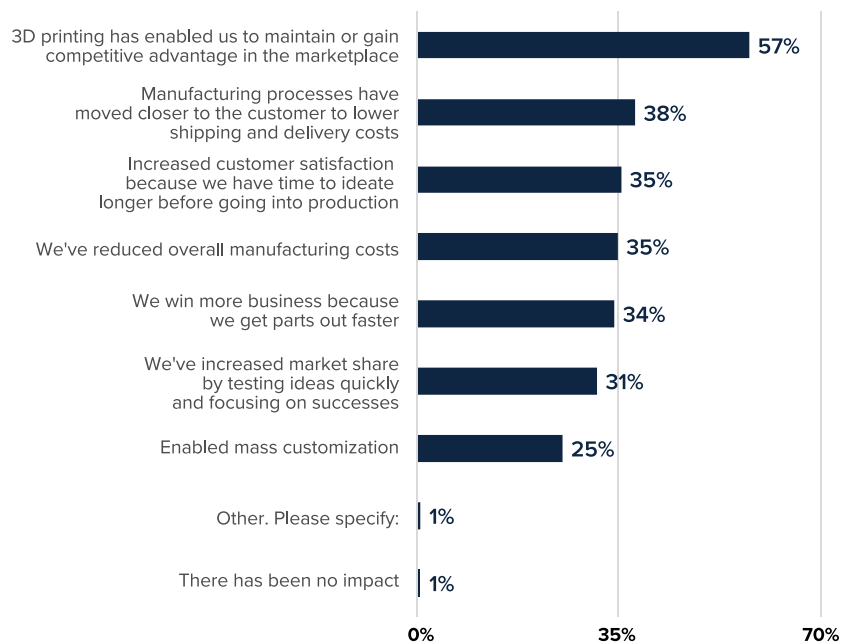


3D printing has enabled a competitive advantage

One of the bright lights in this study is the wide range of positive impacts that have been gained from 3D printing adoption. Almost all (99%) companies relate that they have benefitted from adopting 3D printing into their manufacturing processes. The top benefit, cited by well over half of companies (57%) is a competitive advantage in the marketplace. Also noted were lower shipping and delivery costs since they are closer in proximity to customers (38%), increased customer satisfaction (35%), reduced manufacturing costs (35%), and winning more business opportunities by faster part delivery (34%). One participant took the time to explain that their company relies on 3D printing to make their product and that 3D printing is necessary for the company to exist at all!

What positive impacts has the adoption of 3D printing had on your company?

Choose all that apply.

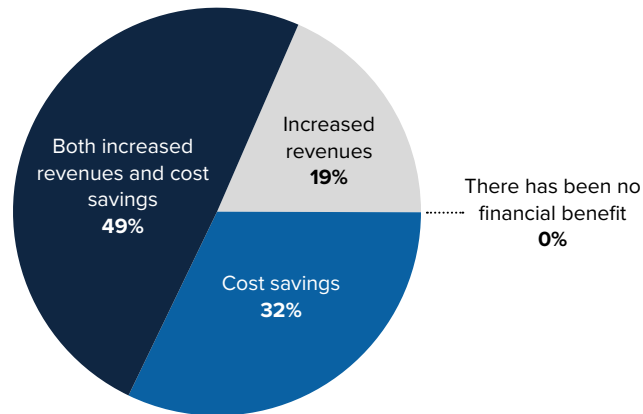


All manufacturers have gained financial benefits from using 3D printing

While some trends come and go, financial benefits are always top of mind for profit-generating companies, and deeply influence how they run and operate their business. The opportunity to increase revenue or decrease costs is paramount. For manufacturing companies, all (100%) reported financial benefits from adopting 3D printing at scale. Remarkably half (49%) reveal both increased revenues and cost savings.

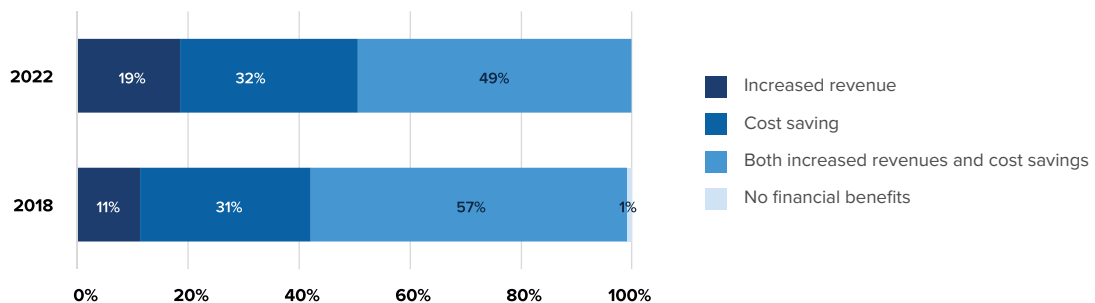
Overall, what has been the financial benefit of 3D printing to your company?

Choose the one answer that most closely applies.



There is no doubt the financial benefits have paid off, but how does it compare to the expectations? Despite the hype around 3D printing, we found that for the most part, expectations have been met. Five years ago, we asked a similar question about the expected financial benefits from the adoption of 3D printing technology, although the earlier question was framed in terms of expectations once 3D printing had matured, with no timeline given. We see that expectations for cost savings were slightly higher than was realized (88% in 2018 vs. 81% in 2022), and expectations around revenue increases were on target (68% in both years).

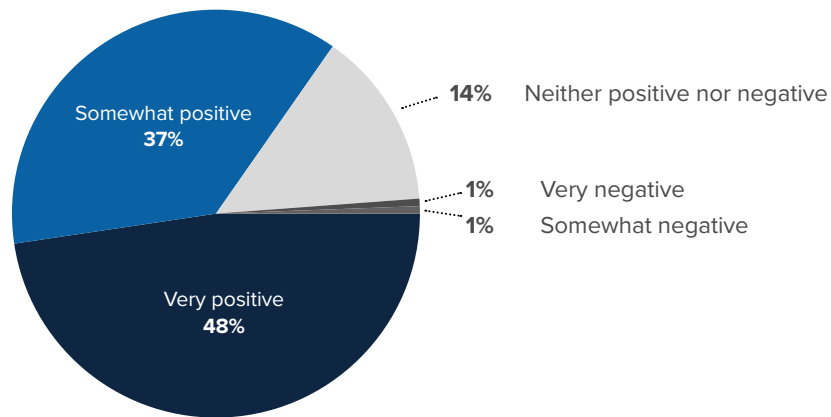
Overall, what has been the financial benefit of 3D printing to your company? (2022) vs. Continuing to consider this scenario where the future of 3D printing technology and costs have matured, what would be the financial benefit to your company? (2018)



Executive leadership is positive about 3D printing at scale

One of the qualities that define a standout executive is the ability to be a visionary and positively lead the organization toward growth. And growth is often synonymous with a company's ability to keep up with technology and digital transformation. Likewise, the open mindset of a leader's dedication to technology advancements, such as 3D printing for production manufacturing, will influence the mindset of the rest of the organization. According to manufacturers, 85% report their executive leadership is positive about 3D printing, with nearly half (48%) reporting they are "very positive."

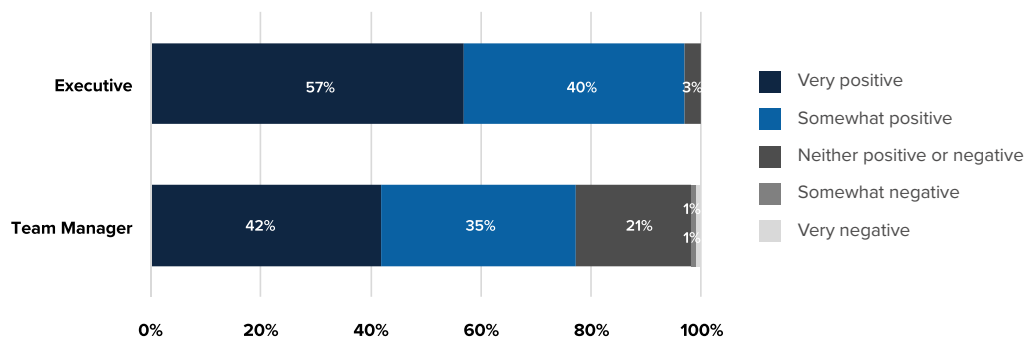
Which of the following best describes the typical attitude of your company's executive leadership towards 3D printing at scale?



When we drill down on these responses by participants' job levels, we see executives, who are arguably more in touch with the opinions of their peers, have a higher level of positivity (97% vs. 77% of team managers.) It may be that executives need to communicate more openly about their excitement toward 3D printing.

Which of the following best describes the typical attitude of your company's executive leadership towards 3D printing at scale?

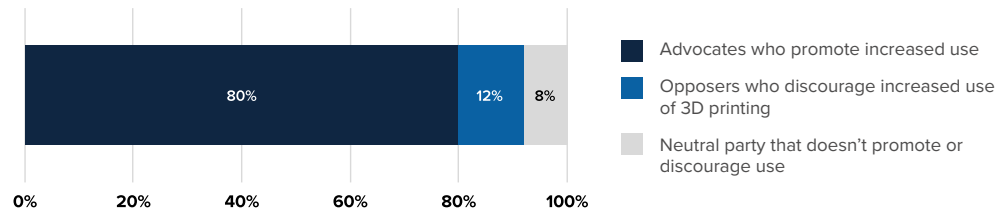
By Job Level.



To further understand the impact of leadership on 3D printing adoption, we asked what role a company's C-suite plays in adopting 3D printing at scale. A whopping 80% of executives say their C-suite are 3D printing advocates.

What role does your company's C-suite play in promoting the adoption of 3D printing at scale?

Executives

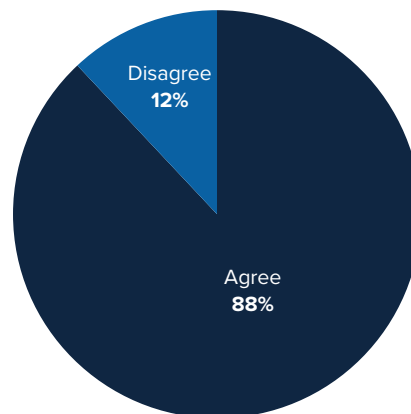


Detailed Findings: 3D printing for today's production manufacturing

Hybrid production is ubiquitous

Sometimes the most critical aspect of newer technology is the ability to combine it with traditional methods for even better outcomes. For example, integrating 3D printing with traditional injection molding methods is a powerful combination that enables manufacturers to bring their production capabilities to new levels. Manufacturing stakeholders couldn't agree more, with 88% reporting that their company is using hybrid production, which blends both 3D printed parts and manufactured parts in the same products.

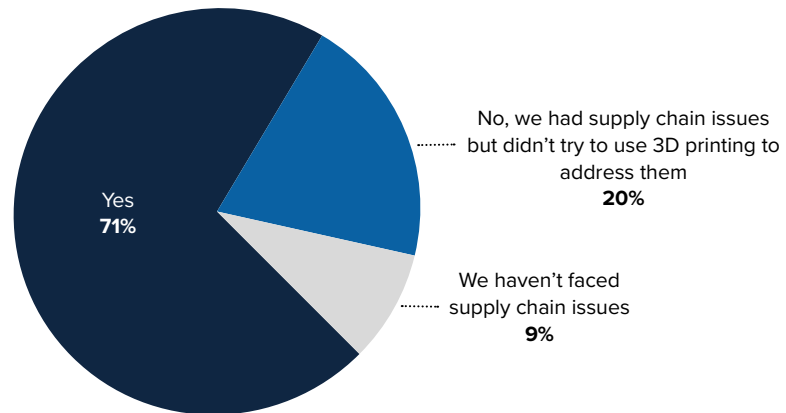
"Our company is increasingly using hybrid production, integrating both 3D printed parts and traditionally manufactured parts in the same products."



Supply chain issues are rampant; 3D printing helped

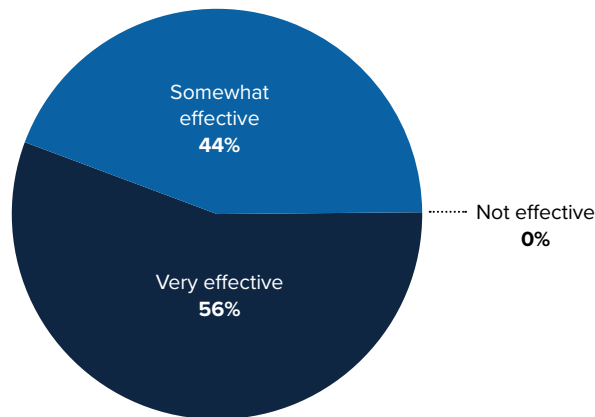
Manufacturing is the engine that drives local, national, and worldwide economies. During the past several years, the manufacturing industry has experienced significant disruptions, including supply chain issues that have forced many companies to override traditional manufacturing processes and implement new technology to keep the lights on. When we asked manufacturing stakeholders how they addressed recent supply chain issues, 71% reported they looked to 3D printing for product manufacturing.

Did your company attempt to make use of 3D printing to address recent supply chain issues?



Of those manufacturers who experimented with 3D printing to deal with supply chain issues, all of them (100%) said it was effective, with over half (56%) characterizing 3D printing as a “very effective” solution for supply chain challenges.

How effective was your company's use of 3D printing to address supply chain issues?

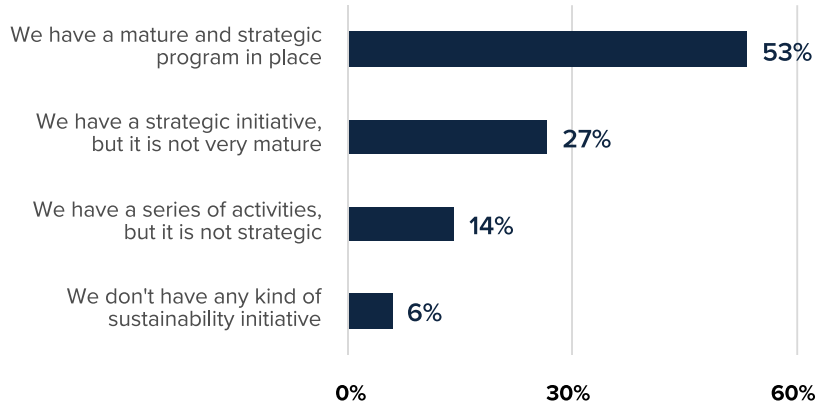


3D printing is positively impacting sustainability initiatives

In addition to rethinking their operational processes to deal with supply chain issues, companies are also taking a more sustainable approach to manufacturing by using more recyclable and environmental-friendly materials, lowering energy consumption, and more. This research indicates that 94% of manufacturers are making efforts on sustainability, with 53% reporting they have a mature and strategic program in place.

How would you describe your company's approach to sustainability?

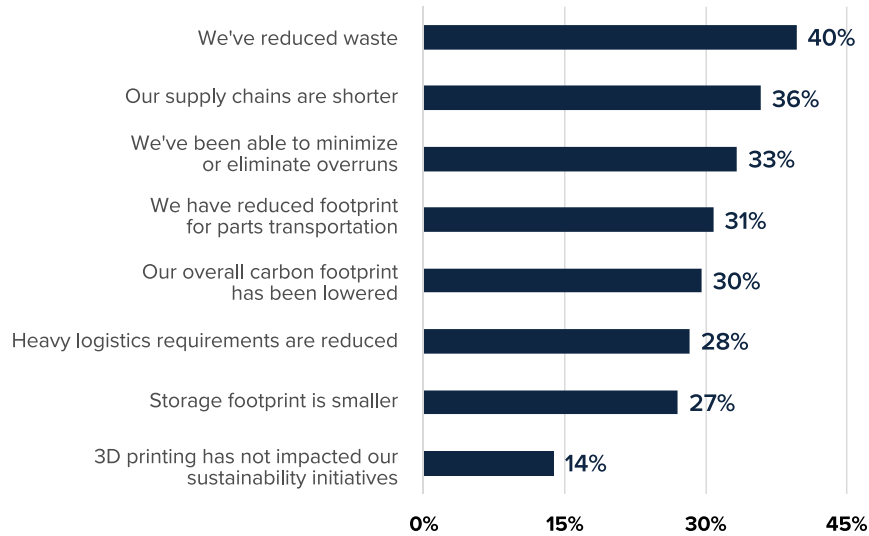
Choose the one answer that most closely applies.



When we dig deeper to discover how 3D printing has impacted sustainability initiatives, the majority (86%) of manufacturers that have a sustainability initiative, report it has had a positive impact. Manufacturing leaders share specific benefits gained, including less waste (40%), shorter supply chains (36%), fewer or no overruns (33%), reduced footprints for parts transportation (31%), lowered carbon footprint (30%), less heavy logistic requirements (28%), and smaller storage footprints (27%).

What impact has 3D printing had on your company's sustainability initiatives?

Choose all that apply.

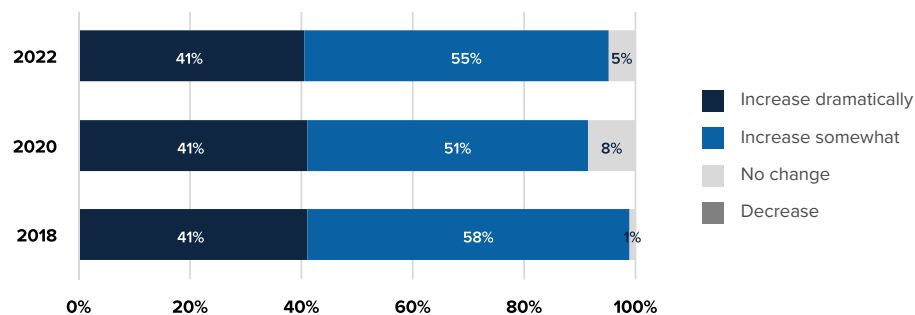


Detailed Findings: The future of 3D printing

3D printing is expected to continue growth

While 3D printing is unmistakably maturing in its applications across manufacturing, will the continual pattern of usage spikes and dramatic growth year over year plateau or slow down? When we asked manufacturing leaders to quantify how their usage of 3D printing will change in the next three to five years, 95% expect it will increase, including 41% that characterize that increase as “dramatic.” It is interesting to note that this latter number has been stable over the years that we have been conducting this research.

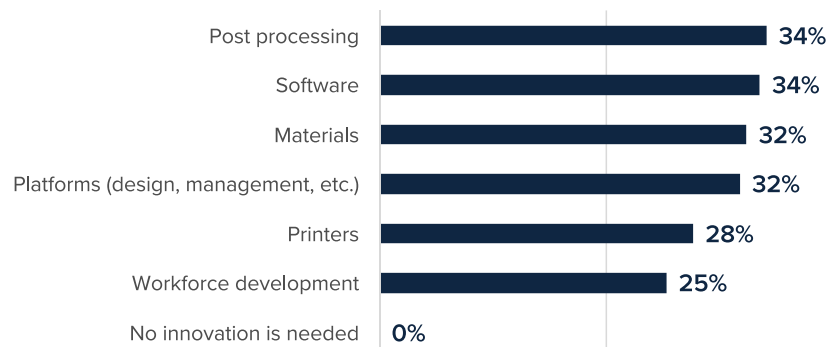
How do you expect your company’s use of 3D printing will change over the next 3-5 years?



These figures signal that there is still room for additional 3D printing growth as the technology continues to expand in scope. However, all 3D printing stakeholders (100%) say that to get to the next level of maturity, further innovation must be developed. According to manufacturers, there is no single area that needs innovation. The areas of 3D printing requiring the most advancements are post-processing (34%), software (34%), materials (32%), platforms (32%), printers (28%), and workforce development (25%).

What areas of 3D printing require the most innovation in order to see the next major breakthrough in adoption?

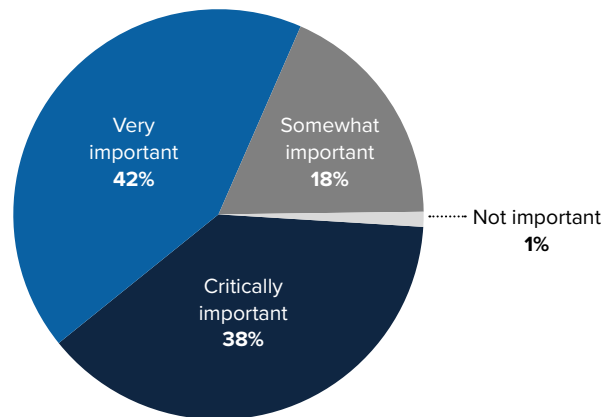
Choose up to 2 of the following.



Certified materials are important to manufacturers

Even though there are plenty of 3D printing materials available to manufacturers, ensuring that these materials meet or exceed existing standards is fundamental to adopting 3D printing at scale for specific industries like aerospace, medical, nuclear, military, and automotive. For these industries, manufacturers must prove their adherence to the same standards (e.g., ISO, CE, FDA) as traditionally manufactured items — from the materials to the finished products. Unsurprisingly, there was strong agreement among nearly all (99%) manufacturing leaders about the importance of using certified materials for large-scale manufacturing, with 80% saying it was “very important” or “critically important.”

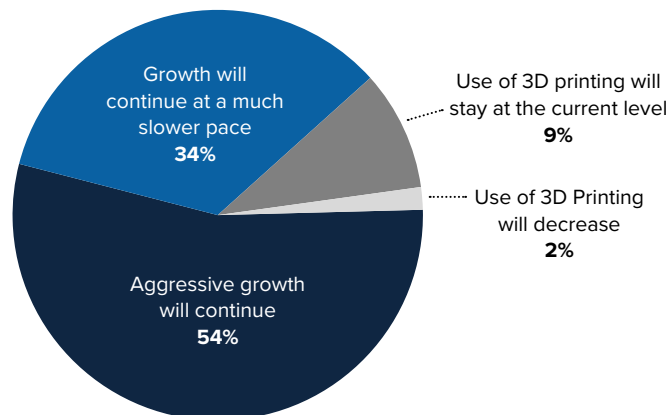
When using 3D printing for large-scale manufacturing, how important is it that materials are certified?



Growth in 3D printing is expected to continue

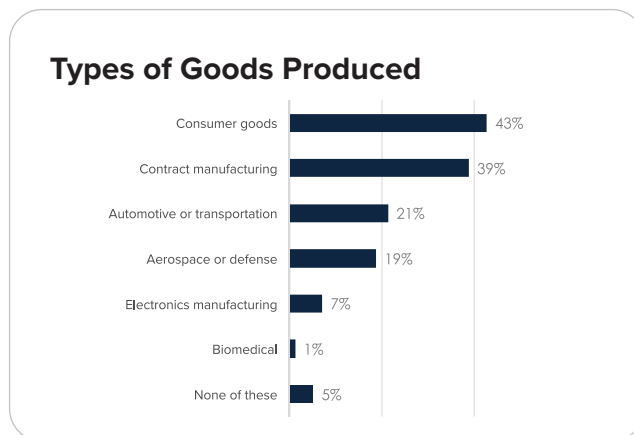
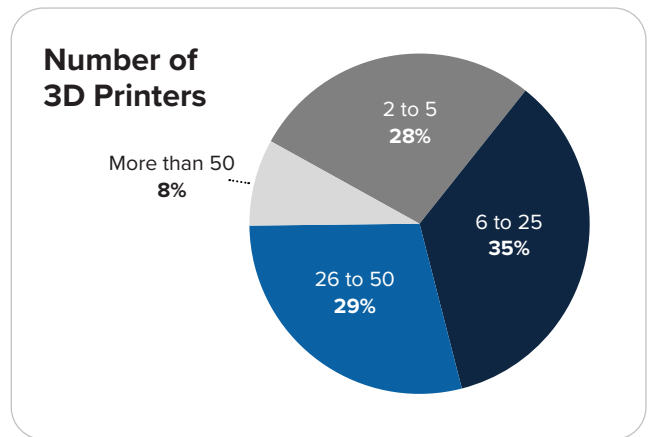
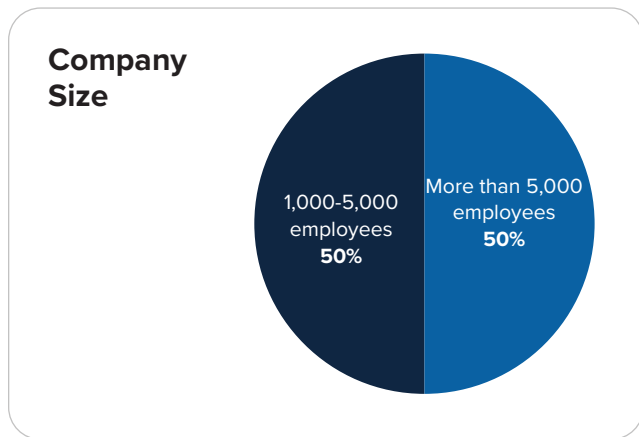
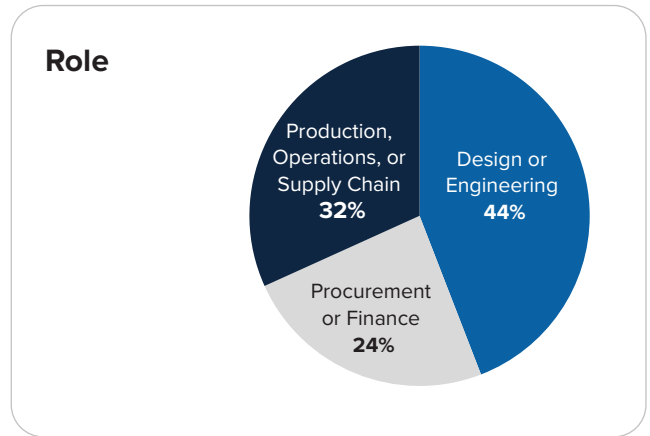
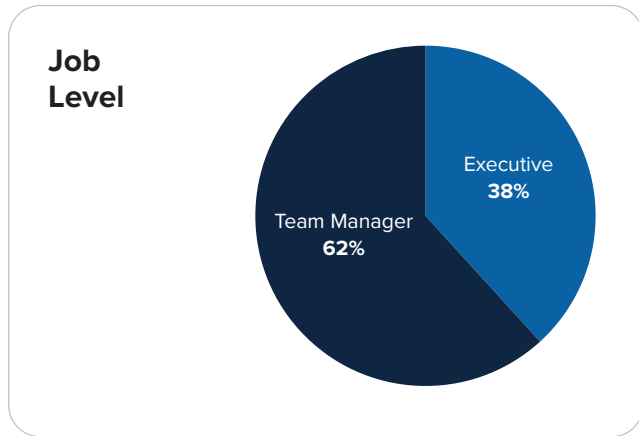
As manufacturing leaders glimpse forward to predict the progression of 3D printing for production manufacturing over the next five years, they are confident about its future growth track. More than half (54%) expect the current aggressive growth trend will continue, with a further third (34%) believing growth will accelerate but at a slightly slower rate.

Which of the following statements best represents your feelings about how 3D printing for large scale manufacturing will grow across the manufacturing industry as a whole over the next five years?



Survey Methodology and Participant Demographics

In the fall of 2022, an online survey was sent to an independent database of managers and executives working at manufacturing companies. A total of 170 qualified executives completed the survey. All participants were responsible for decisions regarding 3D printing for production parts. Participants included a mix of roles and company sizes. Questions were asked on various topics related to the current and future use of 3D printing, as well as opinions on outcomes. Certain questions were repeated from similar 2018, 2019, 2020, and 2021 studies to enable trend analysis. Due to rounding, certain graph options may not add up to exactly 100%.



About Dimensional Research

Dimensional Research® provides practical market research for technology companies. We partner with our clients to deliver actionable information that reduces risks, increases customer satisfaction, and grows the business. Our researchers are experts in the applications, devices, and infrastructure used by modern businesses and their customers. For more information, visit dimensionalresearch.com.

About Essentium

Essentium, Inc. provides industrial 3D printing solutions that are disrupting traditional manufacturing processes by bringing product strength and production speed together, at scale, with a no-compromise engineering material set. Essentium manufactures and delivers innovative industrial 3D printers and materials, enabling the world's top manufacturers to bridge the gap between 3D printing and machining and embrace the future of additive manufacturing. Essentium, Inc. is AS9100 certified and ITAR registered.