

TRENDS IN 3D PRINTING AT SCALE

A SURVEY OF 3D PRINTING STAKEHOLDERS IN
PRODUCTION MANUFACTURING

Dimensional Research | January 2020



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Introduction

3D printing is an additive manufacturing (AM) technique for fabricating a wide range of physical products from a digital design using 3D printing technology. By depositing material, layer upon layer, instead of removing material through traditional milling, machining, carving, shaping, or other subtractive means, manufacturers can use this process to create an array of finished products – anything from a pair of sports shoes to automotive parts to medical devices. While 3D printing offers an enormous potential to increase design flexibility, shorten manufacturing time, and deliver better value, some stakeholders perceive it as a prototype, one-off solution used in the engineering lab, instead of a large-scale production solution used on the factory floor.

This research investigates the current realities of using 3D printing for producing production parts at large manufacturing companies across the globe. It captures current opinions among decision makers about their use of 3D printing, its technological and organizational obstacles to adoption, and the potential impact to revolutionize the manufacturing industry.

The following report, sponsored by Essentium, is based on an online survey of 162 executives and managers who are directly responsible for decisions related to 3D printing for production parts. Questions were asked on a range of topics about the current and future use of 3D printing as well as opinions on outcomes. Certain questions were repeated from a similar study conducted one year ago to enable trend analysis.



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Key Findings

- **3D printing of production parts is growing dramatically**

- All areas of 3D printing grew in the last year
- 3D printing for full-scale production parts doubled from 21% a year ago to 40% today
- Companies doing runs of thousands of 3D printed production parts jumped from 18% last year to 47% this year
- 44% increased their use of 3D printing of production parts by a factor of five or more in the past year
- This growth is driven primarily by increased experience (48%), improved materials (47%), and cost reduction (39%)

- **3D printing will continue to grow at an accelerated pace**

- 62% of executives report that their use of 3D printing will increase “dramatically” in the next three to five years
- 68% report 3D printing will have cost benefits up significantly from 46% last year

- **Many technological and organizational obstacles to adoption remain**

- 91% report challenges with the adoption of 3D printing for large-scale production
- Design and engineering teams are having the most success adopting 3D printing at scale, while procurement and finance are having the least success
- 99% report that working with vendors in an open ecosystem is important to 3D printing at scale

- **3D printing at scale will be worth the investment**

- 84% say when 3D printing at scale matures it will reduce their costs, and 85% say it will increase their revenues
- 52% strongly agree that the overall industry could save billions of dollars, up from 38% last year

NOTE: This study focuses exclusively on companies using 3D printing for use cases beyond simple prototyping. The data in this report is not representative of all manufacturing companies.

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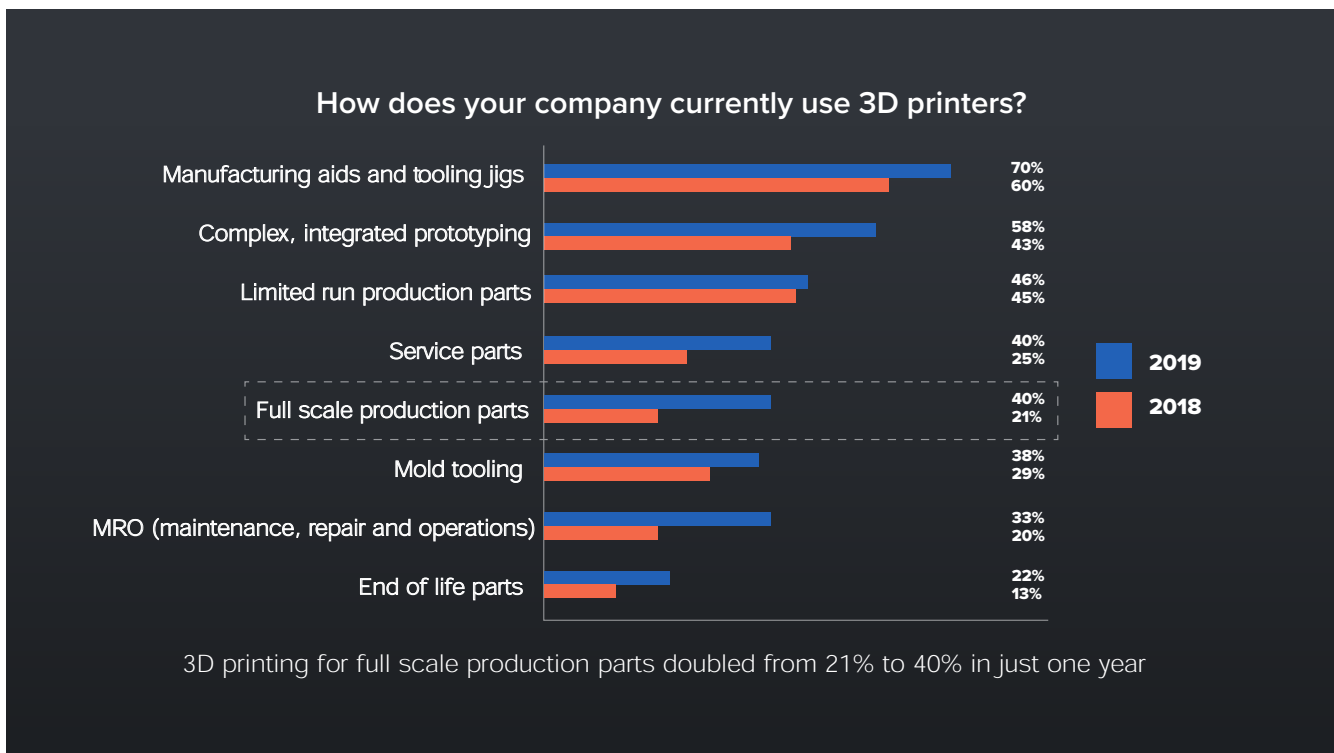
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Detailed Findings: 3D printing for production is growing dramatically

All areas of 3D printing beyond simple prototyping grew in the past year

For nearly three decades, 3D printing has been broadly used for prototyping or highly customized one-off parts. However, today more companies are pushing the boundaries beyond simple prototyping use and implementing 3D printing across their entire manufacturing process – from creating manufacturing aids and tooling jigs to limited run production parts to full-scale production parts and more.

The research conducted this year indicates an increase in all areas of 3D printing beyond simple prototyping, with a particularly significant spike in use for full-scale production parts, nearly doubling from 21% last year to 40% this year.



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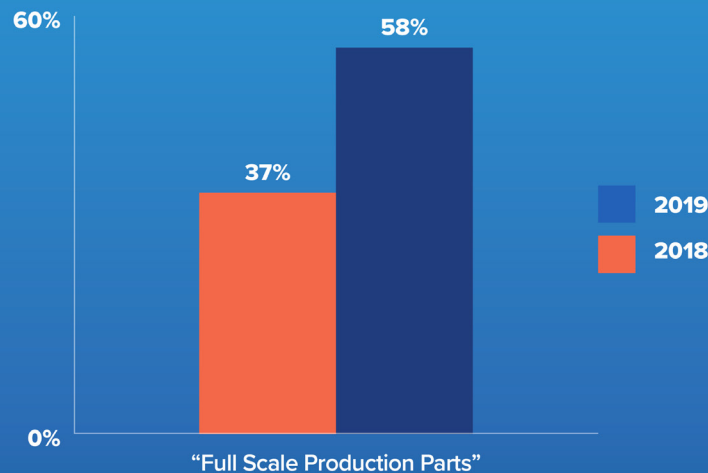


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Companies expect to do many more things with 3D printers in the future

While 3D printing has delivered on many fronts, some businesses have been disappointed that it hasn't completely disrupted large-volume manufacturing at the rate some early adopters predicted. But through steady advancements and more low-priced units, this industry outlook is steadily changing. In fact, when we asked 3D printing stakeholders to think about how their companies use 3D printers today with how they expect to use them in the future, they report plans for much higher use of 3D printing going forward than they actually use today, especially for use cases including production parts. Specifically, 3D printing stakeholders are forecasting a much higher increase in future use of 3D printing for full-scale production parts, up from 40% today to 58% in the future, as well as an increase in the use of limited run production parts, up from 46% today to 63% in the future.

How do you expect your company will use 3D printing in the future?



Expectation for future of 3D printing at scale changed dramatically in only one year

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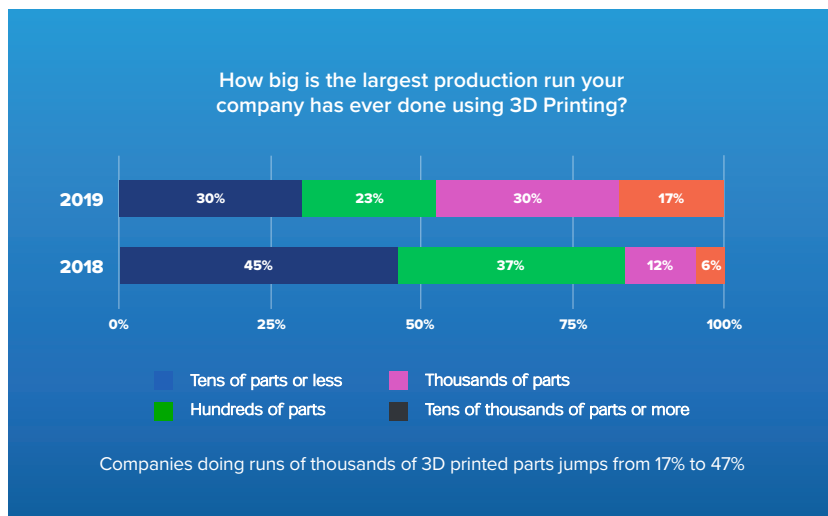
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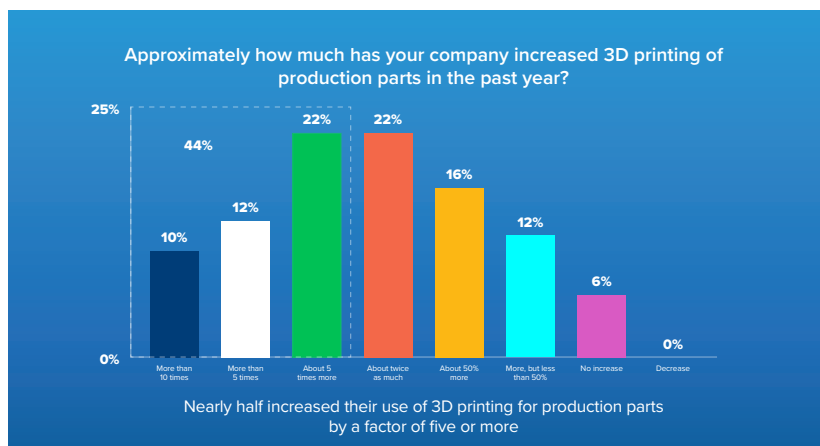
Runs with thousands of 3D printed parts show notable jump

One of the most encouraging trends in the research is the spike in the number of companies completing runs of thousands of 3D printed production parts. 3D printing stakeholders report a very significant jump from 18% last year to 47% this year. Furthermore, this number (47%) rises to more than half (54%) among large companies with 5,000 or more employees.



Nearly half increased their use of 3D printing for production parts by a factor of five or more

When we drill down to quantify the increased use of 3D printing for production parts in the past year, we see that two-thirds (66%) of companies more than doubled their use and not a single company (0%) decreased use. Importantly, a remarkable 44% increased their use by a factor of five or more in just the past year. This upbeat trend suggests that 3D printing of production parts is evolving into a respected part of the overall manufacturing process.



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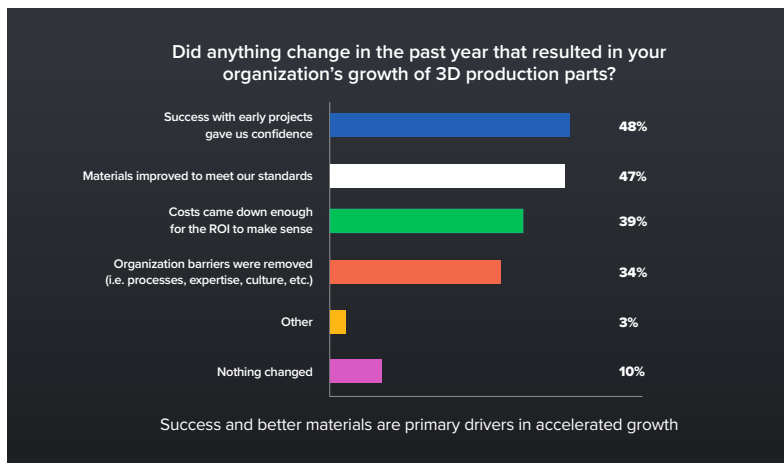
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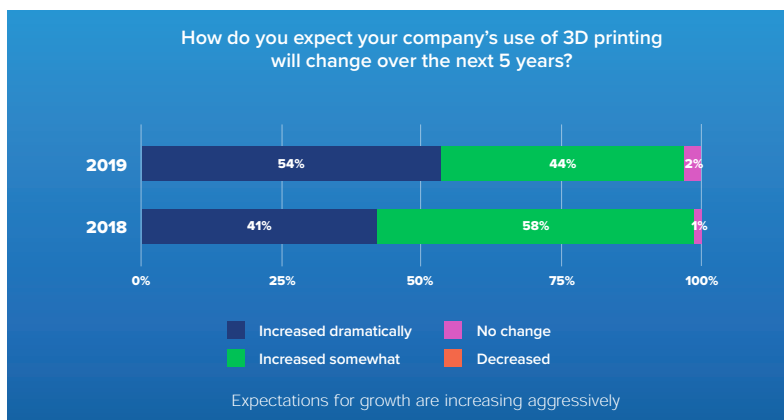
Success and better materials are primary drivers of accelerated growth

Is there a sole condition, situation, or decision influencing this growth of 3D printed of production parts among companies within the past year, or are there multiple factors contributing to this acceleration? This research demonstrates that there is no single element effecting this change of use in the past year. It is a range of factors including successful experiences (48%), better materials (47%), and cost reduction (39%) that are key contributing growth drivers within the past year. Several participants also took the time to write in “other” responses, including bad experiences where they learned (e.g., failures as well as successes) and the investment in new printer technology.



Expectations for growth are increasing aggressively

To further explore opinions on the outlook and impact of 3D printing among this group of experienced managers and executives, we posed a series of questions about their future expectations of this technology. What we found is rising positivity for the near future of 3D printing. More than half (54%) of participants predict a dramatic increase of use of 3D printing in the next three to five years, up from 41% in just one year.



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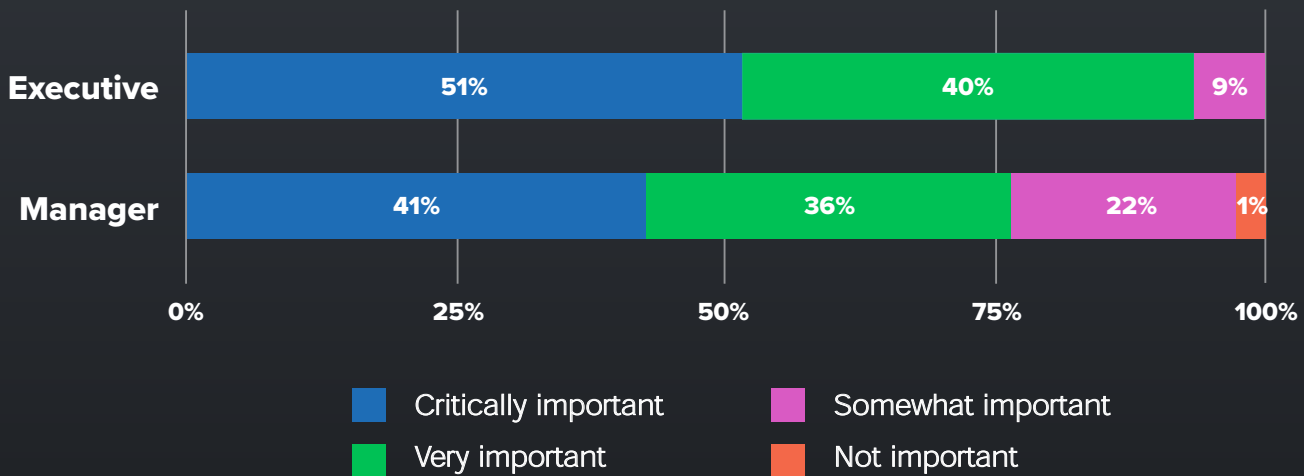


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This shifting attitude about the future use of 3D printing is most notable among executives, with 62% speculating a dramatic increase of use within the next three to five years compared to just 46% of managers.

How important will the ability to effectively produce 3D printed goods be to your company's strategy over the next five years?

BY JOB LEVEL - 2019



Executives see greater strategic importance in 3D printing



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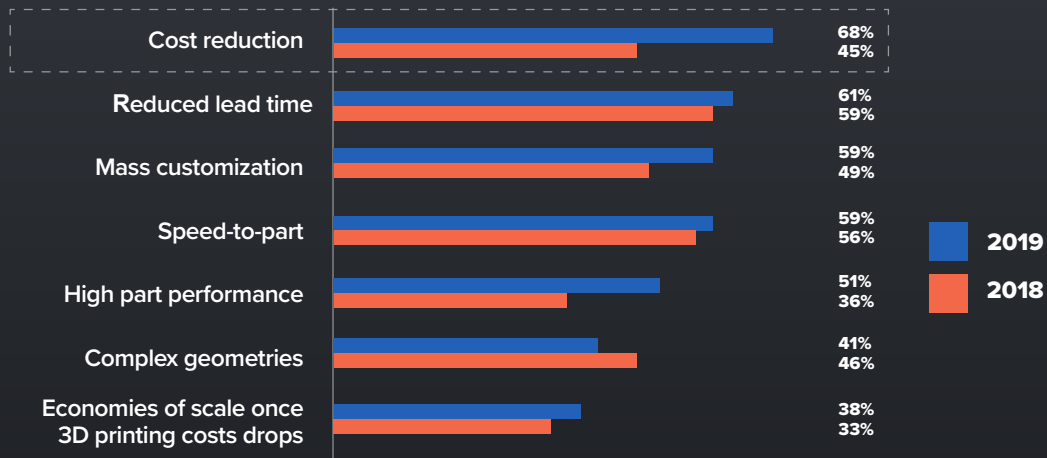


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Potential cost reduction benefits have crystalized over past year

When the future of 3D printing is realized companies will reap a host of potential benefits. We asked 3D printing stakeholders to envision where their companies will gain the most positive business impacts. The top business benefit cited is cost reduction (68%), up notably from last year (46%). In comparison, last year's primary benefits were mostly related to speed, including reduced lead time and speed-to-part. While those expected benefits have also grown, it's clear that the cost benefits of 3D printing for large-scale production have become more obvious in the past year with the potential to reduce overall manufacturing costs.

What are the potential benefits for your company in using 3D printing for large-scale production manufacturing?



Potential cost reduction benefits have crystalized over past year

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A SURVEY OF 3D PRINTING STAKEHOLDERS IN PRODUCTION MANUFACTURING



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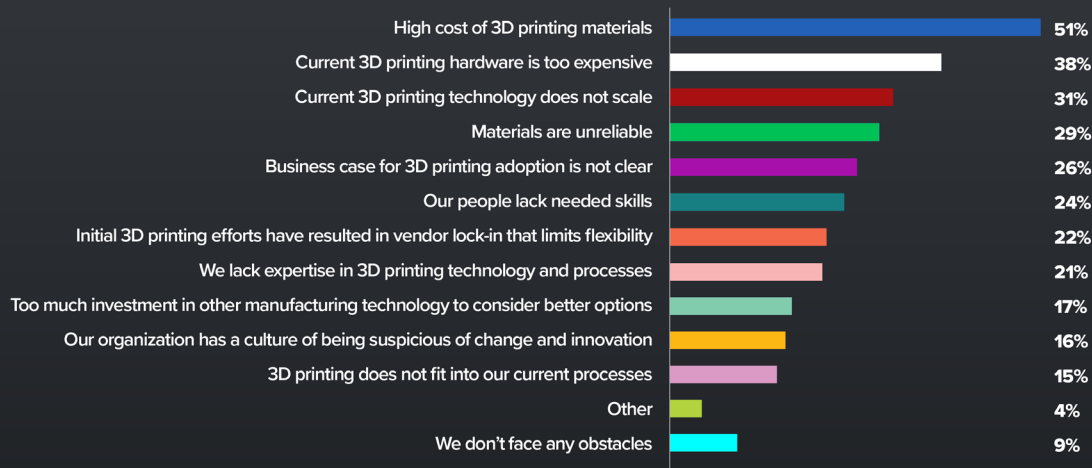
Detailed Findings: Many obstacles to adoption remain

Companies face a range of challenges with 3D printing for production

Nearly all stakeholders (91%) say that their company faces obstacles in scaling their use of 3D printing. Ironically, the top challenges reported are cost related even though the potential for cost benefits are widely expected as shown previously. Cost-related concerns include the high cost of 3D printing materials (51%) and expensive 3D printing hardware (38%). Undoubtedly, these expenses will need to decrease in order to enable the full benefit of large-scale use of 3D printing.

Other challenges reported are technology that does not scale (31%), unreliable materials (29%), and the business case for 3D printing adoption being not clear (26%). A few individuals also wrote in “other” challenges, such as lack of trust and 3D printing is not a fit for all goods produced.

What obstacles does your company face in adopting large-scale 3D printing?



Companies face wide range of challenges with 3D printing for large scale production

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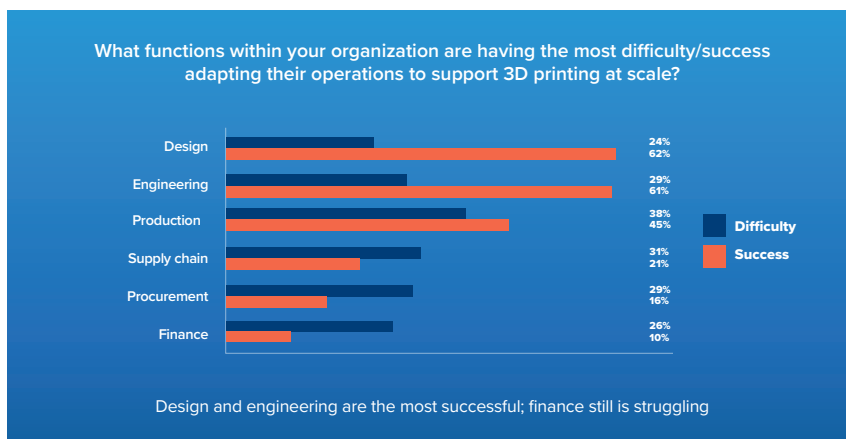
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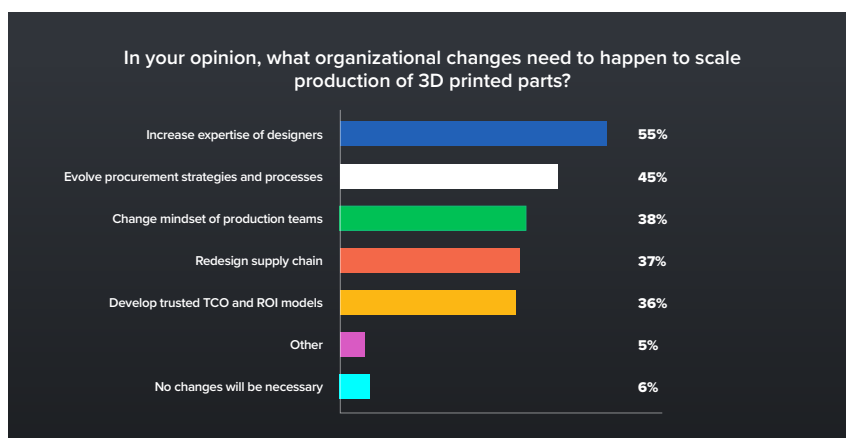
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Design and engineering are the most successful; finance still is struggling

When it comes to adapting company operations to support large-scale 3D printing, there is a sizable gap between business functions that are thriving and those facing stumbling blocks with this organizational change. According to 3D printing stakeholders, design (62%) and engineering (61%) groups are experiencing the most success in adopting 3D printing at scale. On the other end, procurement (29%), and finance (26%) are the least likely to find success.



Yet even the most experienced teams need to evolve. While design is the most critical area of 3D printing and typically more adaptable in its efforts to support large-scale 3D printing, they are also the functional area requiring the most change. More than half (55%) of companies report they need to increase designer expertise in order to scale production of 3D printed parts. Other key organizational changes include evolving procurement strategies and processes (45%), changing mindsets of production teams (38%), redesigning supply chains (37%), and developing trusted TCO and ROI models (36%). A handful of participants also wrote in some “other” challenges like difficulty with time, familiarity, and the customer mindset.



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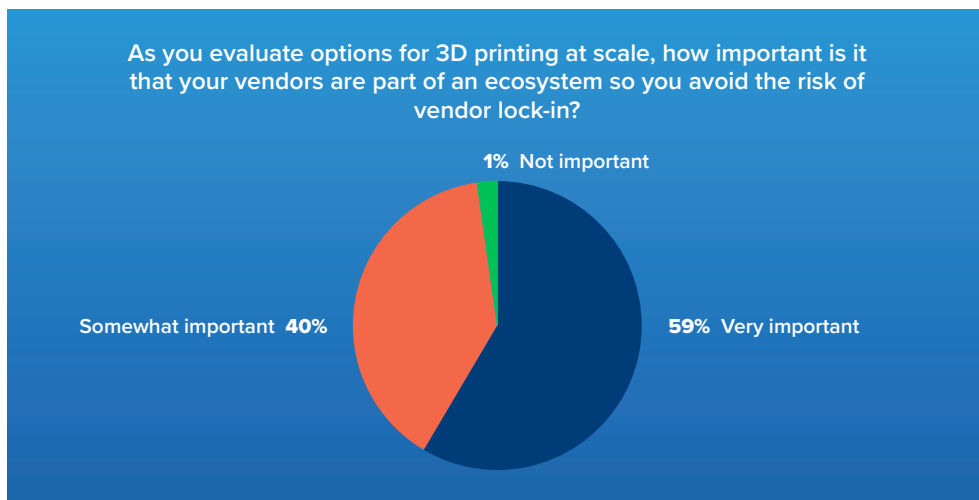


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Avoiding vendor lock-in matters to 3D printing

One of the most noteworthy aspects of this research is the high demand for an open ecosystem to the additive manufacturing market. Why is this requirement so important to 3D printing at scale?

Previously, the market was dominated by closed systems where customers were locked into vendors' hardware, processes, and materials. Today, manufactures are demanding more open ecosystems that give them greater control of their innovation, more choices in materials, and industrial-scale production at lower costs. Almost all 3D printing stakeholders (99%) report that it is important to avoid vendor lock-in related to 3D printing including a majority (59%) who characterize this factor as "very" important.



Detailed Findings: 3D printing at scale will be worth the investment

3D production printing at scale will reduce costs and increase revenue

The strong growth rate of 3D printing combined with the expansion of successful use cases are strong motivators for investing in this technology. To better evaluate opinions on the potential for future industry impact of 3D printing at scale, we presented survey participants with a very positive scenario for 3D printing and then asked them a series of questions related to potential cost savings and increased revenue earnings from this scenario.

Future 3D Printing Scenario

Imagine the scenario in the future where your company has solved all hardware, materials, and organizational challenges of 3D printing at scale.



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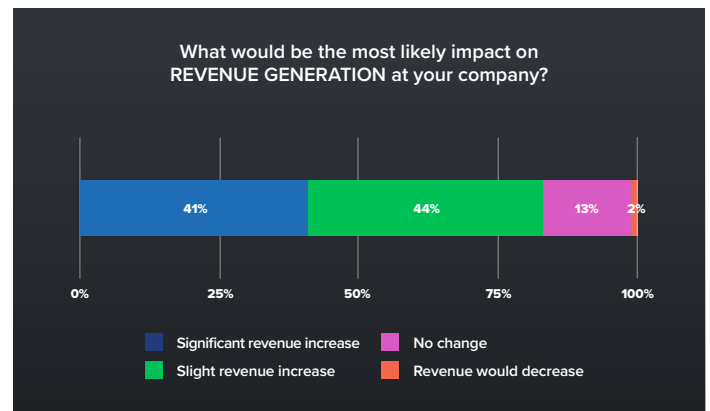
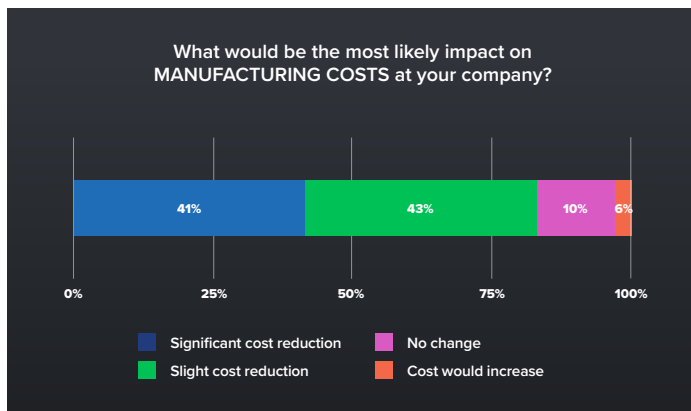
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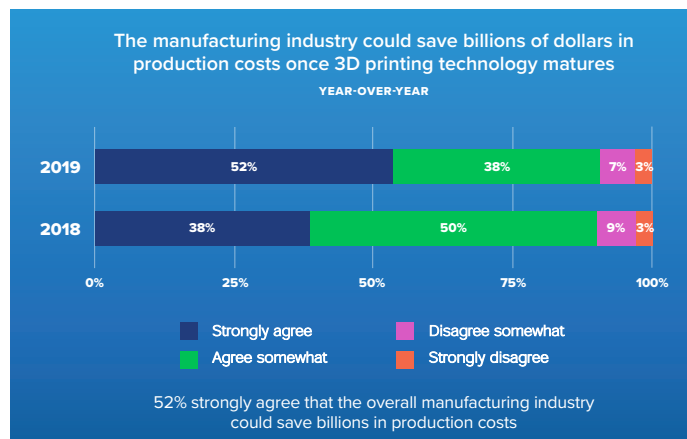
Our goal was to learn if experienced 3D printing stakeholders believe the positive outcome is a realistic future or a pipedream. What we found are strong levels of optimism when 3D printing at scale matures with direct financial impact at most companies represented. According to participants, 84% expect to reduce their costs when 3D printing at scale matures. Furthermore, 41% anticipate that cost reduction to be “significant.” These cost savings could be realized in a number of ways. For example, 3D printing doesn’t require tooling. By eliminating tooling costs for a new product, manufactures could save hundreds of thousands of dollars.

Likewise, 85% say they will increase revenue, with 41% predicting a “significant” revenue increase, a compelling business outcome when combined with the expected cost savings.



Expectations for savings impact of 3D printing have grown sharply

When we compare the predicted savings impact year over year, the growing confidence in 3D printing maturity continues to swell. More than half (52%) of all 3D printing stakeholders agree that the manufacturing industry as a whole will save billions of dollars, up notably from 38% last year.



TRENDS IN 3D PRINTING AT SCALE

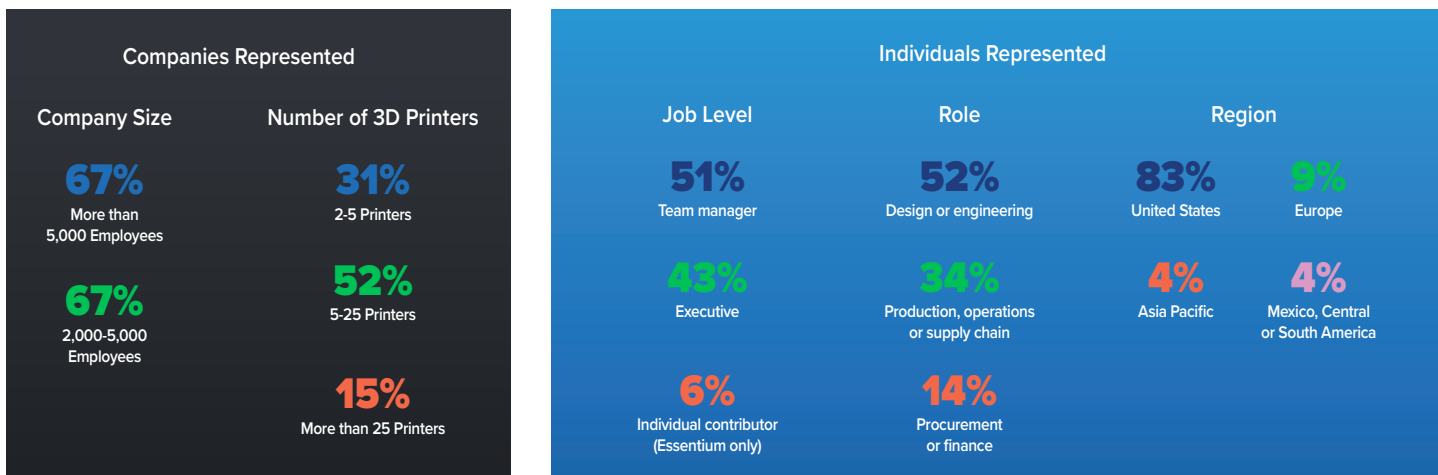
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Survey Methodology and Participant Demographics

An online global survey was sent to an independent database of managers and executives working at large manufacturing companies. A total of 162 individuals completed the survey. All worked at manufacturing companies and were responsible for decisions regarding 3D printing for product parts. Participants included a mix of job levels in decision making, company sizes, verticals, and regions. Certain questions were repeated from a similar study conducted one year ago to establish trend analysis.



About Dimensional Research

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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.