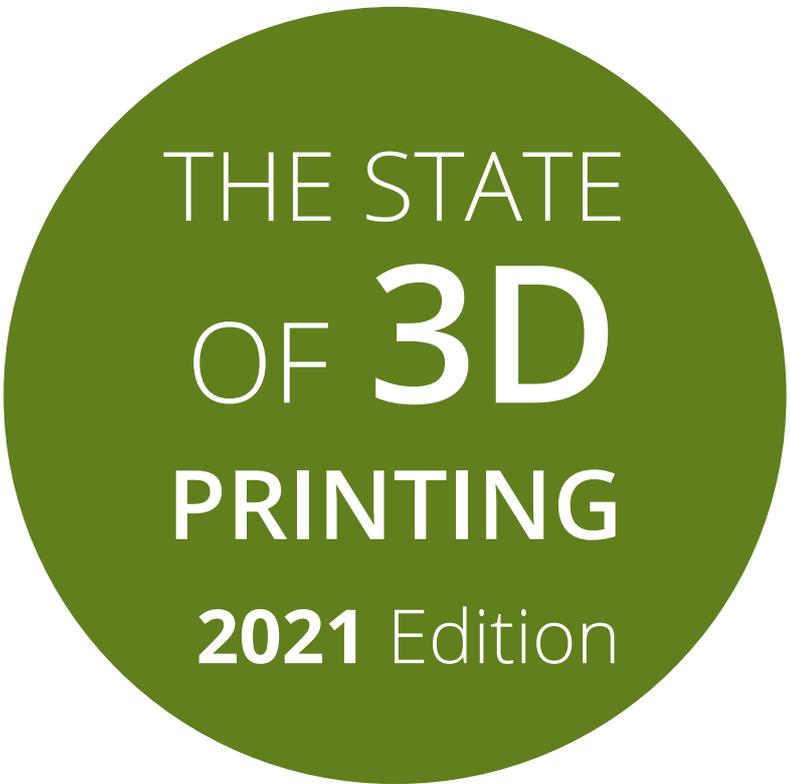


The data you need to understand the 3D printing world
and build your 3D printing strategy

THE STATE OF 3D PRINTING 2021 Edition



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THE STATE
OF **3D**
PRINTING
2021 Edition

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Welcome to the seventh edition of The State of 3D Printing, the largest study of 3D printing users! **This year's report captures the views of more than 1900 respondents** using 3D printing in a wide variety of applications and industries. This seventh edition is also the most international State of 3D Printing, we've ever published, **with users from 86 different countries** represented.

In 2020, the 3D printing industry was thrust into the spotlight as urgent manufacturing needs were met with innovative 3D printing solutions. We **saw 3D printing gain widespread recognition as a serious manufacturing technology**, capable of meeting shortfalls in traditional manufacturing.

As we continue to follow the adoption of 3D printing by nearly every industry, we see that **52% of respondents are using 3D printing for end-use mechanical parts and 27% for end-use consumer goods**. The growth of 3D printing for end-use parts shows just how far technologies, materials, and post-processing solutions have come. We've reached the point where 3D printed parts are indistinguishable from injection molding!

Another encouraging sign of the health of the industry can be seen in its resiliency in facing the COVID-19 pandemic. **30% of businesses noted an increase in 3D printing operations in response to the pandemic** and we also note that investment in 3D printing remains strong with 23% saying they invested more than 100k in 3D printing last year.

Finally, I'd like to thank some special contributors to this edition of The State of 3D Printing. This year we've included **special commentary by industry leaders Ramon Pastor (VP & GM 3D Printing, HP), Francois Minec (Managing Director, BASF Forward AM), and Nora Toure (Founder, Women in 3D Printing)**. I'm sure you'll find their views as insightful as I have!

I wish you a very pleasant reading of the seventh edition of The State of 3D Printing and look forward to building the future of this exciting industry with you all.

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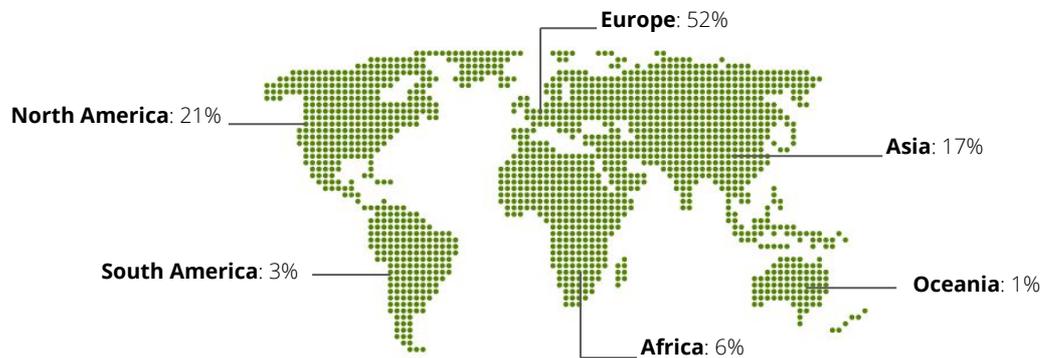
Clément Moreau

-CEO & Co-founder Sculpteo

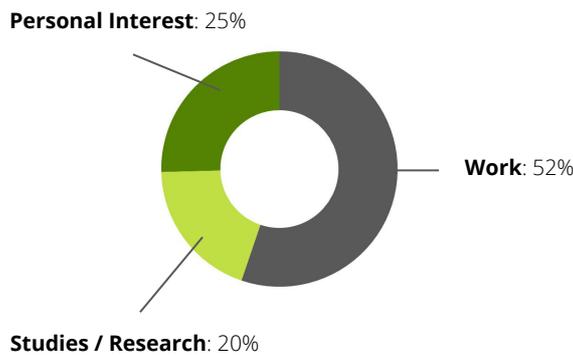
For this 2021 edition of The State of 3D Printing we had more than 1900 respondents, allowing us to build a strong analysis of the 3D printing industry. With 3D printing users from all over the world, we're able to present a global view of the use of 3D printing and the potentials of this technology in the future.

The respondents are mainly CEOs, researchers, or part of an R&D team with 60% of 3D printing users having an engineering background. While 3D printing is used in a wide variety of industries, 20% of respondents are working in industrial goods. We also notice a maturing of the industry with 66% of users having more than 3 years of experience with additive manufacturing. This maturing is also noticeable in the ages of the respondents, with more than 60% of users over 35 years of age.

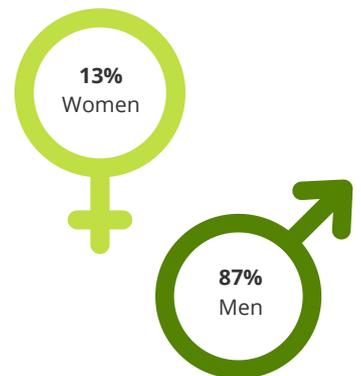
Geography



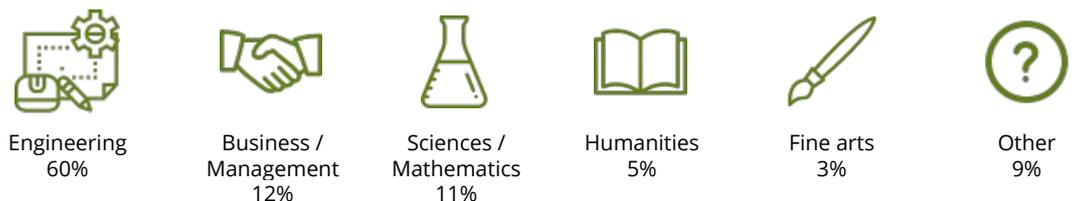
Primary context for using 3D printing



Gender

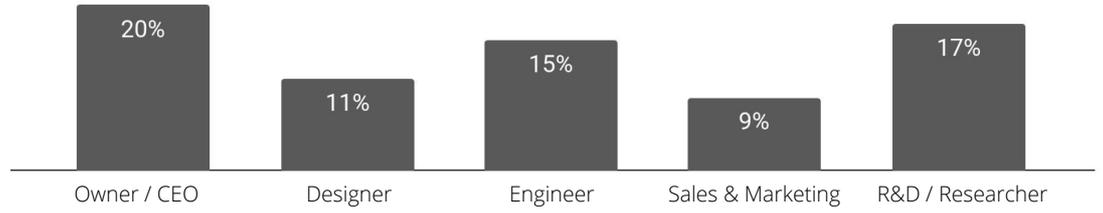


Educational Background

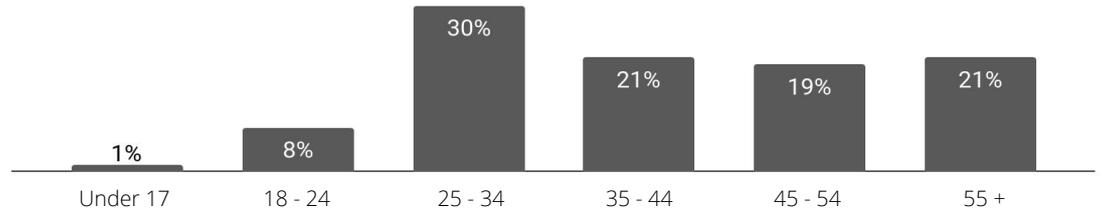


WHO ARE 3D PRINTING USERS?

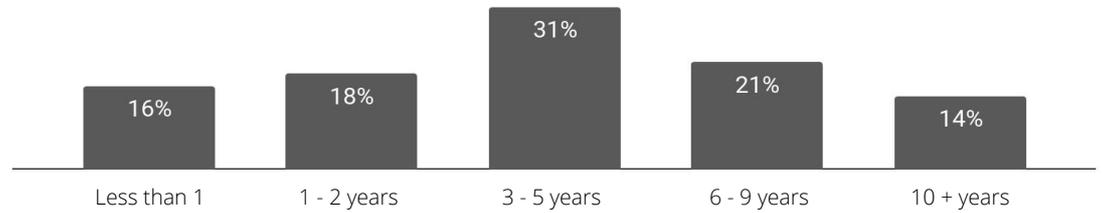
Role



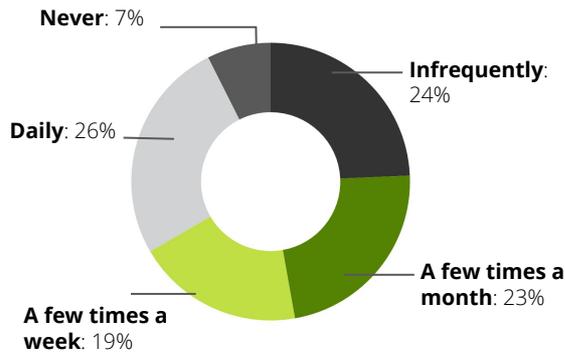
Age



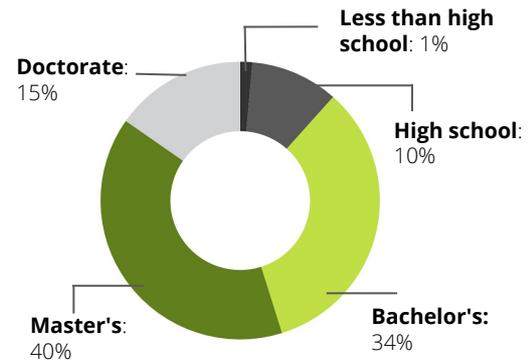
Experience in 3D Printing



Frequency of Use



Educational Attainment



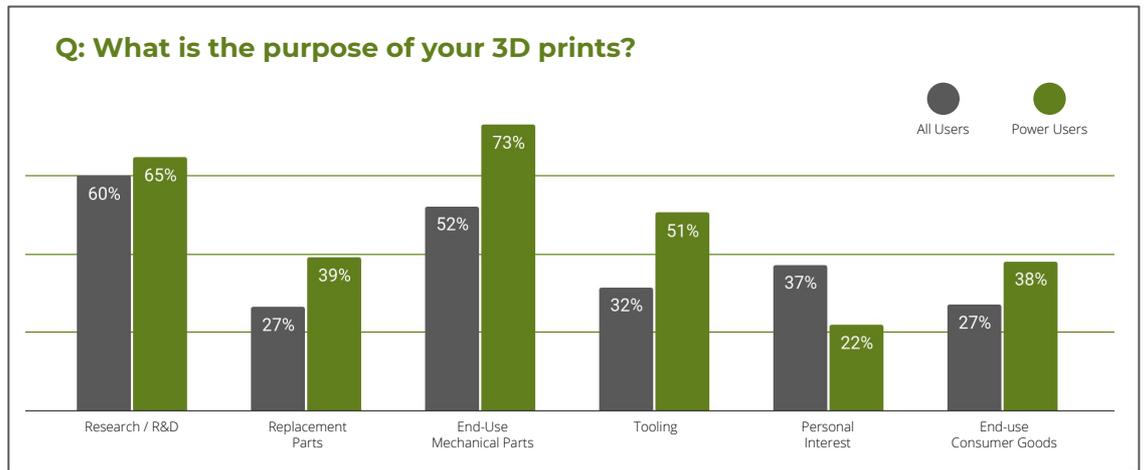
Industry



3D printing produces real parts for end-use applications

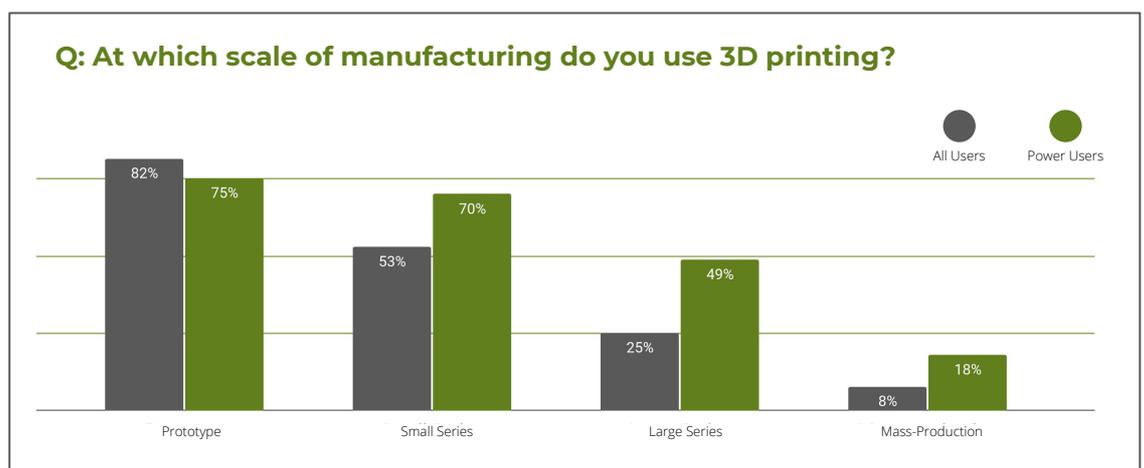
Additive manufacturing is once again proving to be a real manufacturing solution. While primarily considered for R&D and prototyping purposes, this technology is now considered as a real production tool. For **Power Users (Users of 3D printing in a work context with significant investment and experience using the technology)** the scalability of 3D printing is more evident, **49% say they use it for large series production.**

3D printed parts are increasingly used for end-use mechanical parts and end-use consumer goods. Tooling is also becoming a significant use of 3D printing, showing more and more how additive manufacturing is considered as a reliable, manufacturing technology.



3D printing has revolutionized manufacturing, enabling companies of any size or industry to develop, iterate and distribute goods more efficiently. We are seeing the global manufacturing paradigm shift due to the growing adoption of 3D printing for production of final parts and R&D, particularly given the ability to use 3D printing to meet the increasing demand for personalization and customization.

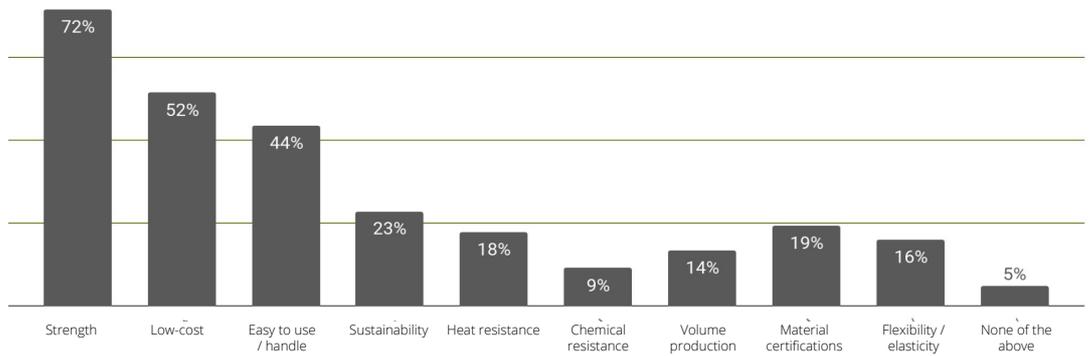
- Ramon Pastor (VP & GM 3D Printing, HP)



The industry has to meet the needs of end-use applications with new materials

There are some priorities when it comes to material choice. As 3D printing is increasingly used for demanding industrial applications, respondents highlighted strength as their main consideration while choosing a manufacturing material. Indeed, **for 72% of them, strength is the most important material property**. The need for low-cost materials is a requirement for 52% of 3D printing users, which is in line with the increase of scaled production with 3D printing.

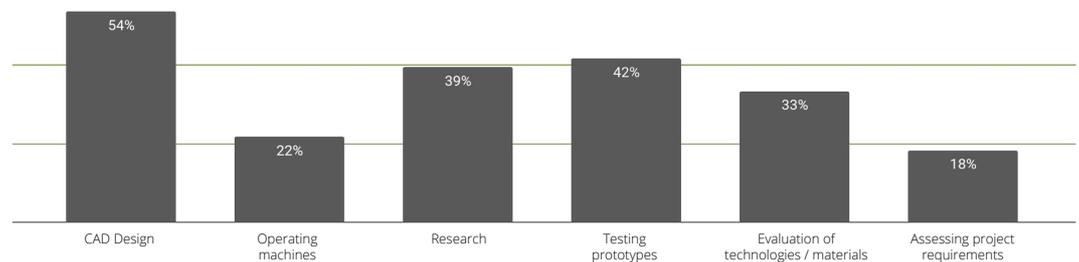
Q: What are your top requirements for material selection?



Suitable 3D printing materials are key for companies shaping the additive manufacturing industrial revolution. While material properties and affordable cost are among the most important decision-making factors for the choice of materials, sustainability continues to gain importance.

- Francois Minec (Managing Director, BASF Forward AM)

Q: What are the top areas in which you spend your time?



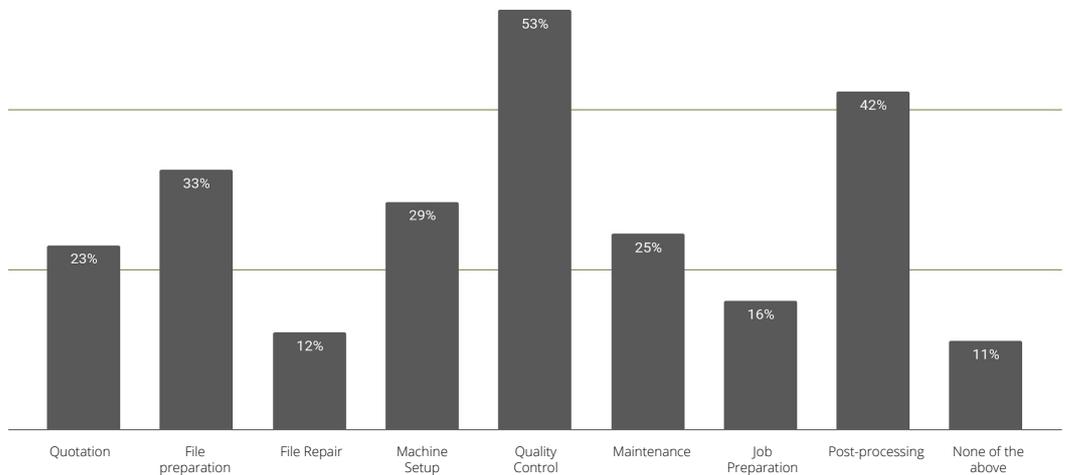
We note a continued emphasis on CAD design and testing for 3D printing users. The potential of Design for Additive Manufacturing is becoming a real advantage to unlock opportunities and new benefits for businesses.

Part quality and post-processing remain the primary challenges for 3D printing users

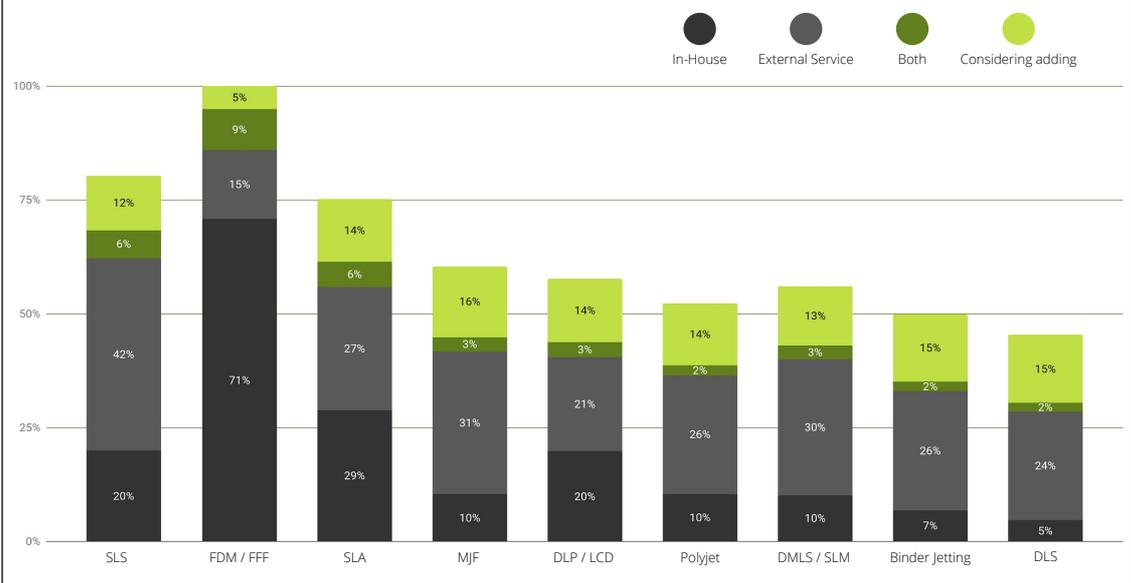
With an increase of production with additive manufacturing, quality control and post-processing continue to be important challenges for the industry. Businesses that use additive manufacturing for more demanding projects, expect more consistency and repeatability in the quality of parts. Even as industrial technologies become more refined the need for scalable post-processing is still a real challenge.

This year we notice an increase in desktop 3D printing technologies as in-house solutions. Not surprisingly, more industrial technologies such as SLS and MJF continue to be primarily used through external service bureaus.

Q: What are the top challenges for using your 3D printer(s)?



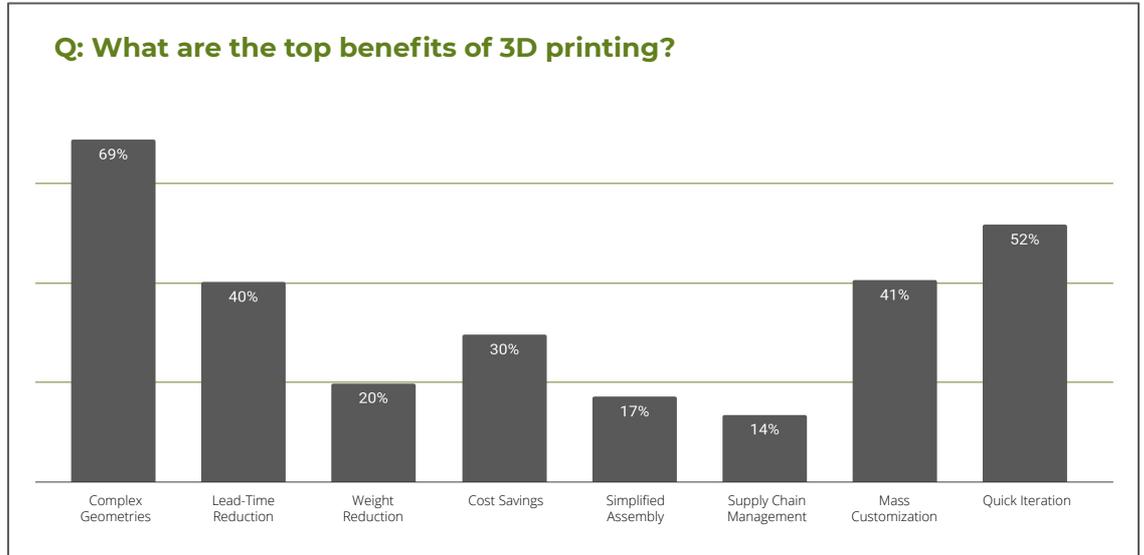
Q: Which 3D printing technologies do you use?



Innovation & adaptability take the lead

This year, we see a clear evolution showing how additive manufacturing plays an important role in innovation and adaptability for businesses. **69% of 3D printing users are pointing to complex geometries as a main advantage.** 52% identify quick iteration as a top benefit, an increase of 7% over last year, pushing the limits of manufacturing as a differentiation strategy in competitive industries.

Additive manufacturing also offers a level of adaptability impossible to attain with traditional manufacturing techniques. Mass customization is highly sought after by industries such as footwear, sporting goods, and medical applications. **Indeed 41% of users cite mass customization as an advantage, up 9% over last year.** Increasing flexibility in processes and into the parts themselves has become a priority for businesses.

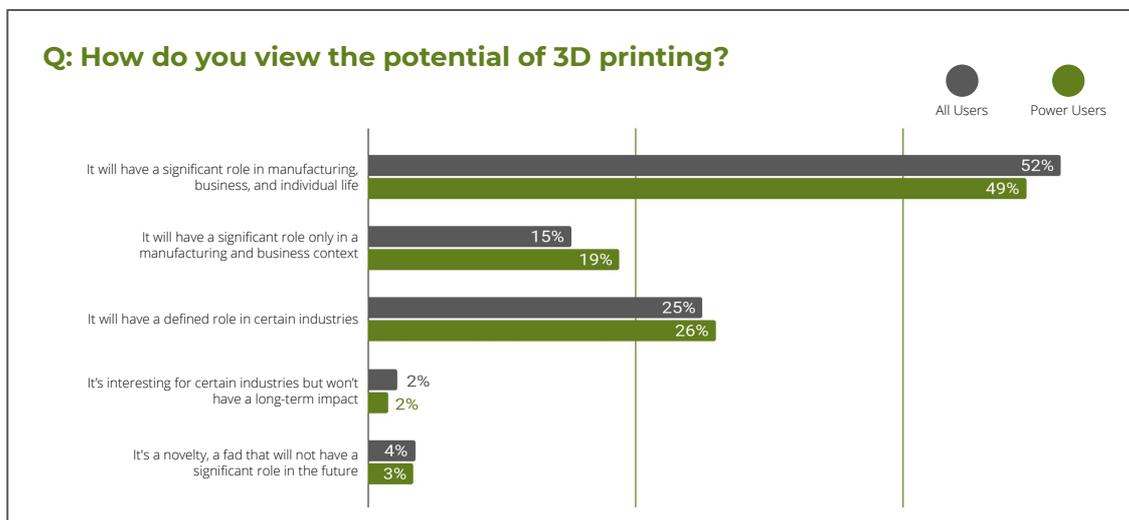


It is interesting to notice that Additive Manufacturing is confirming its advantage over manufacturing processes for complex geometries and quick iterations needs. Mass customization needs have jumped from 32% to 41% since last year, probably thanks to the PPE user-cases we've seen emerging during the COVID crisis.

- Nora Toure (Founder, Women in 3D Printing)

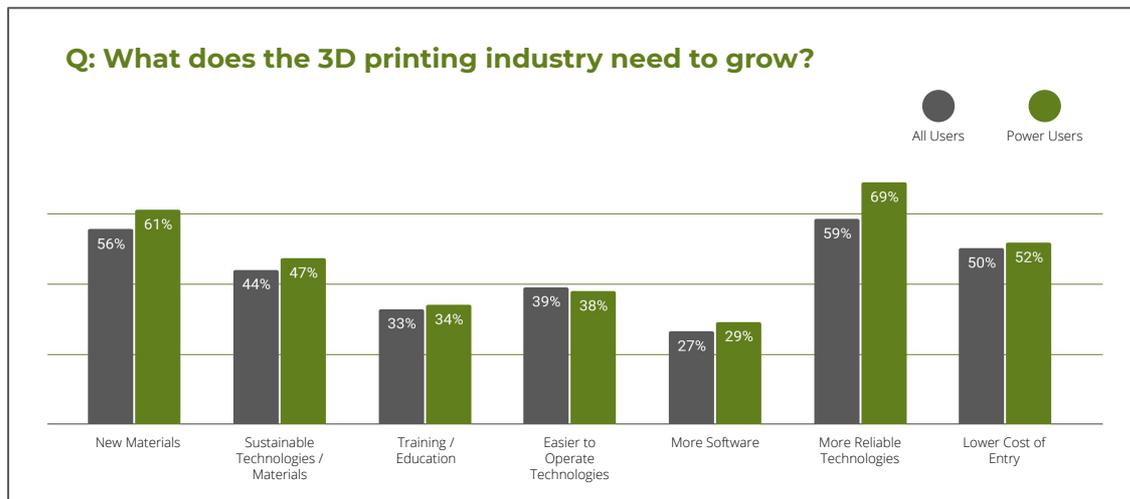
Reliability and materials unlock the potential of 3D printing in manufacturing

Once again we see optimism from 3D printing users regarding the future of this technology. In 2020 we saw real life-saving applications of 3D printing put to the test. But what does the industry need to grow beyond these emergency situations to become a standard of production? Our respondents highlighted three main elements limiting the adoption of this technology. According to them, **a lower cost of entry, more reliable technologies and new materials are the keys to grow this industry.** With more affordable solutions and materials adapted to new applications, additive manufacturing is sure to take its place as a manufacturing heavyweight.



Batch-to-batch consistency and reliability of the technology, total cost of ownership, and materials enabling new applications are the keys to further driving the industrialization of Additive Manufacturing. But the whole industry also needs to raise awareness of the potentials of Design for Additive Manufacturing (DfAM).

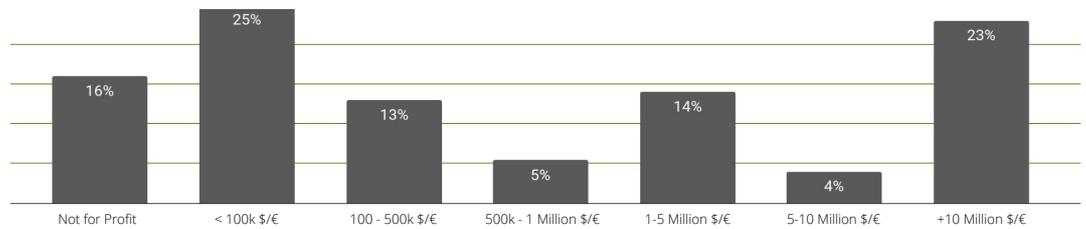
- **Francois Minec** (Managing Director, BASF Forward AM)



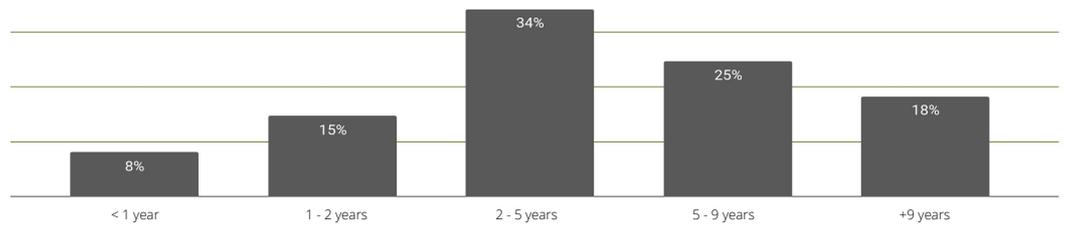
Businesses are becoming more mature in their use of the technology. **What was once a few printers for R&D purposes, has evolved into entire departments and years of experience.** 38% say 3D printing is their main activity, and 18% of companies have a department dedicated to 3D printing. Multinational companies are increasingly considering this technology as a reliable solution, able to fulfill their requirements for even the most demanding projects.

Now let's take a closer look at how companies are concretely implementing additive manufacturing into their business strategy. Initiating a 3D printing strategy involves many diverse profiles and businesses of all sizes are on the lookout for top talent in CAD design, R&D, and engineering.

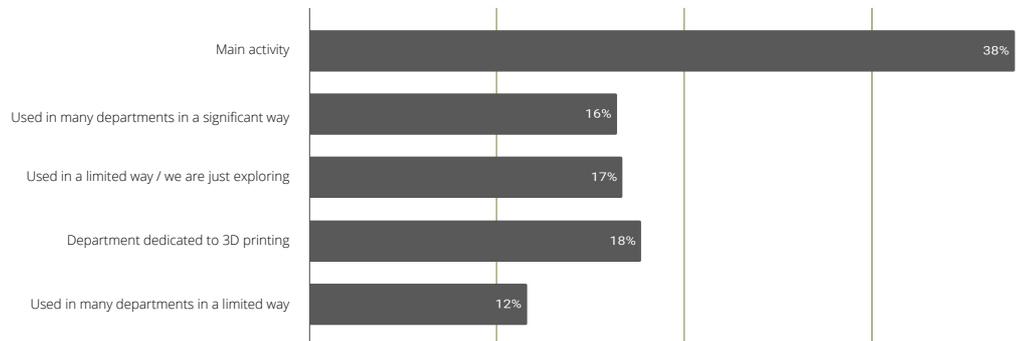
Q: What is the annual revenue of your company?



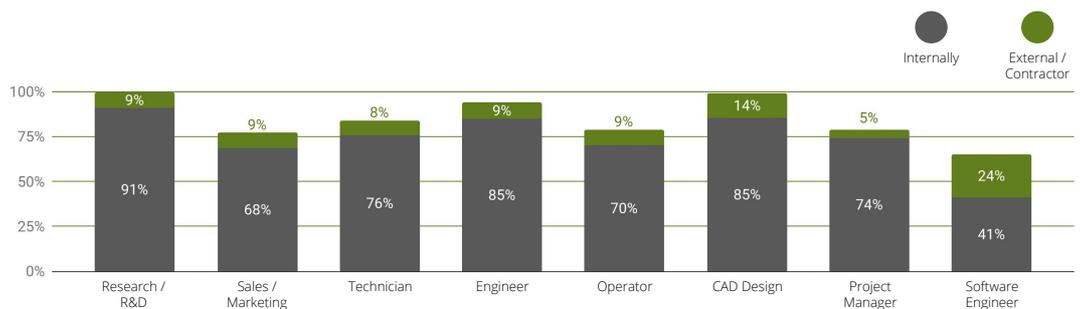
Q: How long have you used 3D printing at your company?



Q: What is the extent of the use of 3D printing in your company?

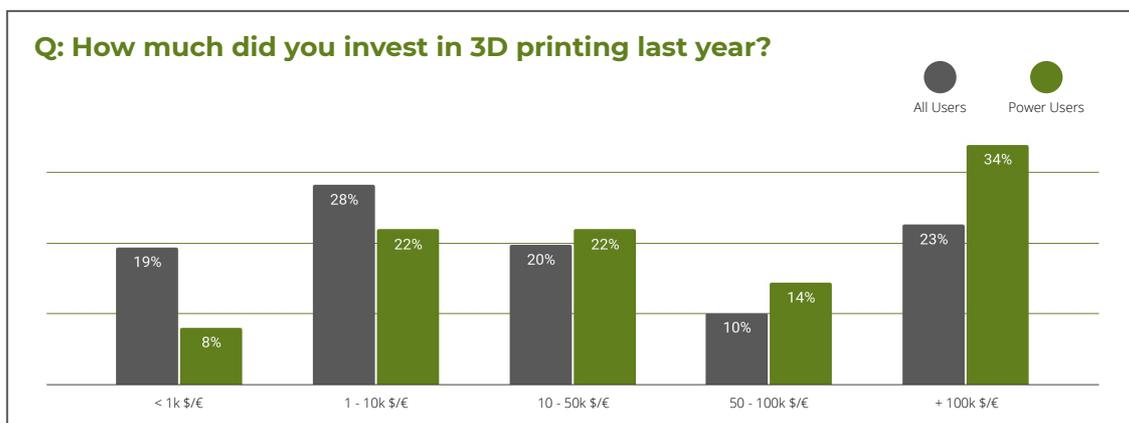


Q: Which roles/profiles are involved in your 3D printing activity?



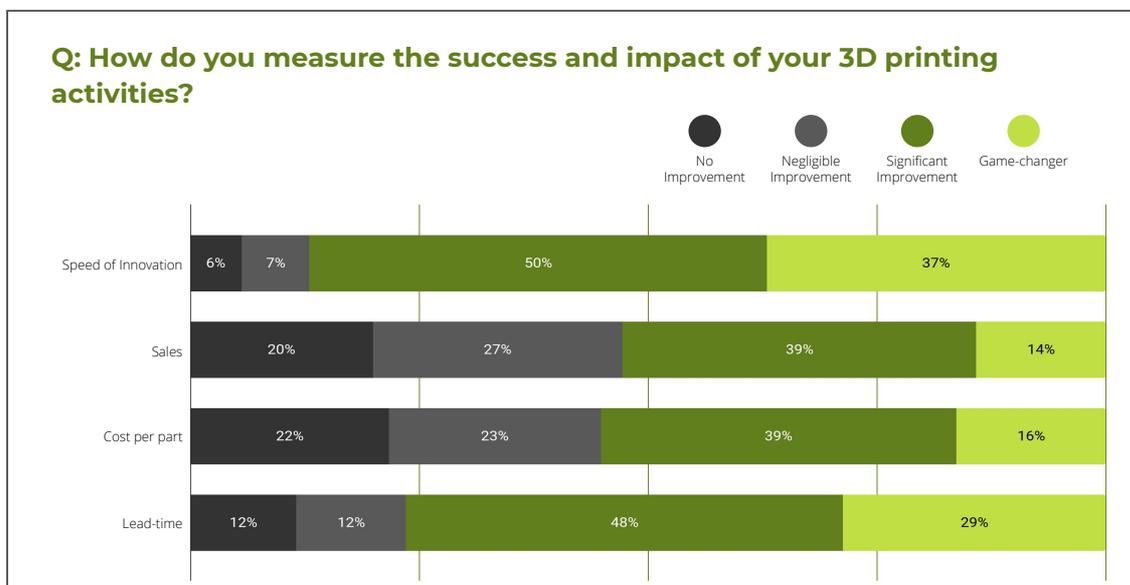
Speed of innovation is the main measure of ROI

While significant 3D printing investments have taken a slight dip since last year (-4%), considering the unique economic situation of 2020, investments are still high. **34% of Power Users have invested more than 100k** in developing their 3D printing activity, confirming that the business world is confident about its use of additive manufacturing. Indeed, **87% of business users believe this technology has made a great improvement for the speed of innovation, this is an increase of 7% over last year.**



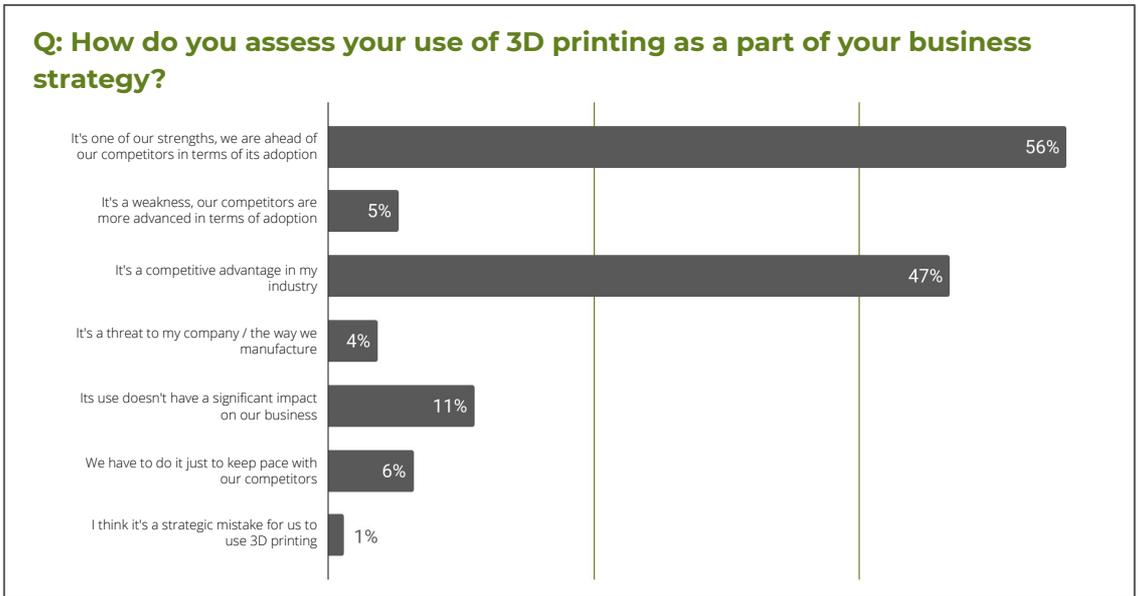
Measuring the ROI of 3D printing has always been a challenge since many of the benefits of the technology are difficult to quantify, such as innovation or competitiveness. While speed of innovation and lead-time are the most straightforward to measure, we know from experience with companies of all sizes that 3D printing has opened new doors in terms of design and new applications.

- **Clement Moreau** (CEO Sculpteo)



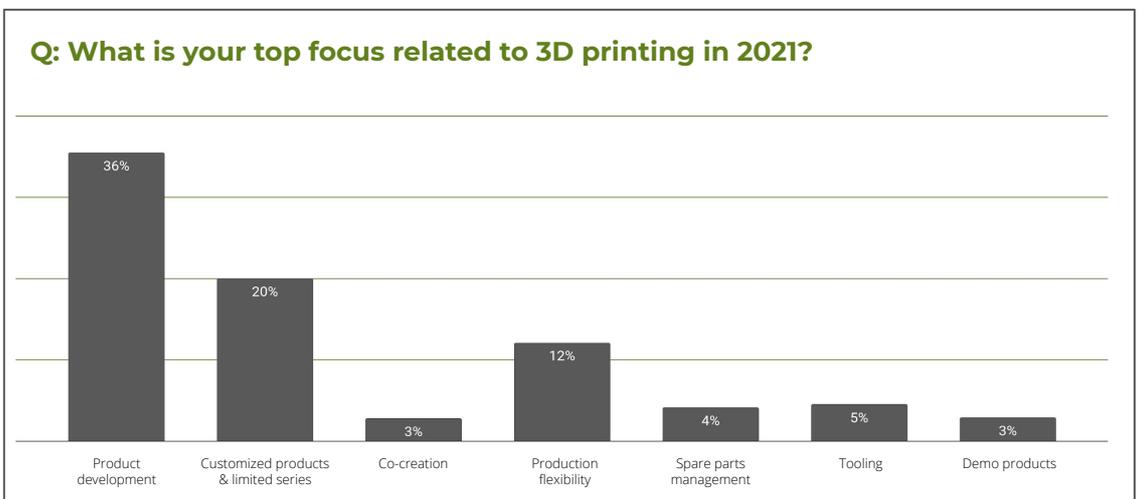
3D printing users find differentiation through product development and customization

With 47% of users saying 3D printing is a competitive advantage in their industry, and 36% saying their top focus is on product development it's clear that a well thought out 3D printing program can bring added value to any business. We see that Power Users have a clear sense of the role and purpose of a 3D printing program, and align their budgets and priorities accordingly. **72% of Power Users say that 3D printing is one of their strengths and that they are ahead of their competitors in its adoption.**



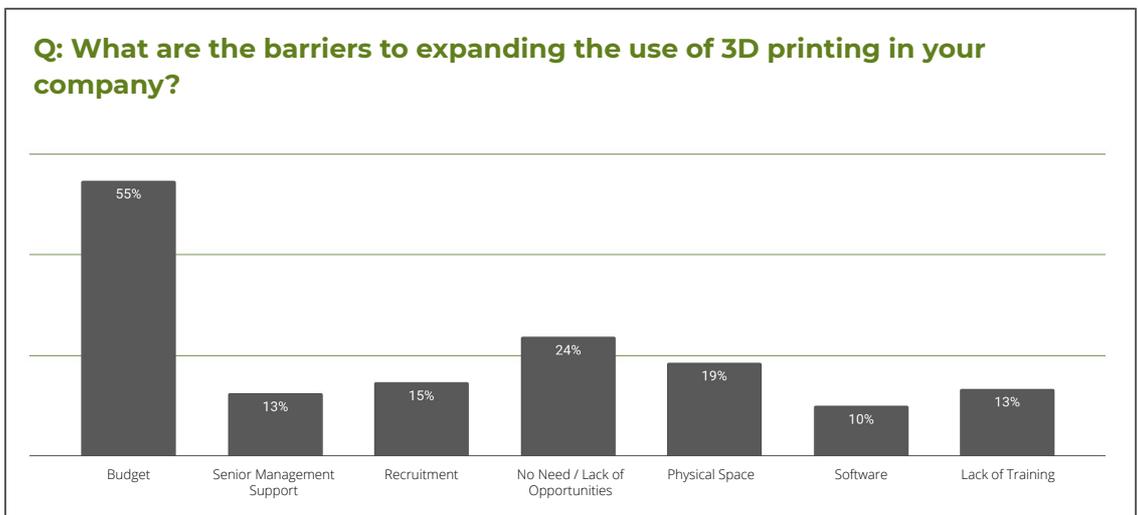
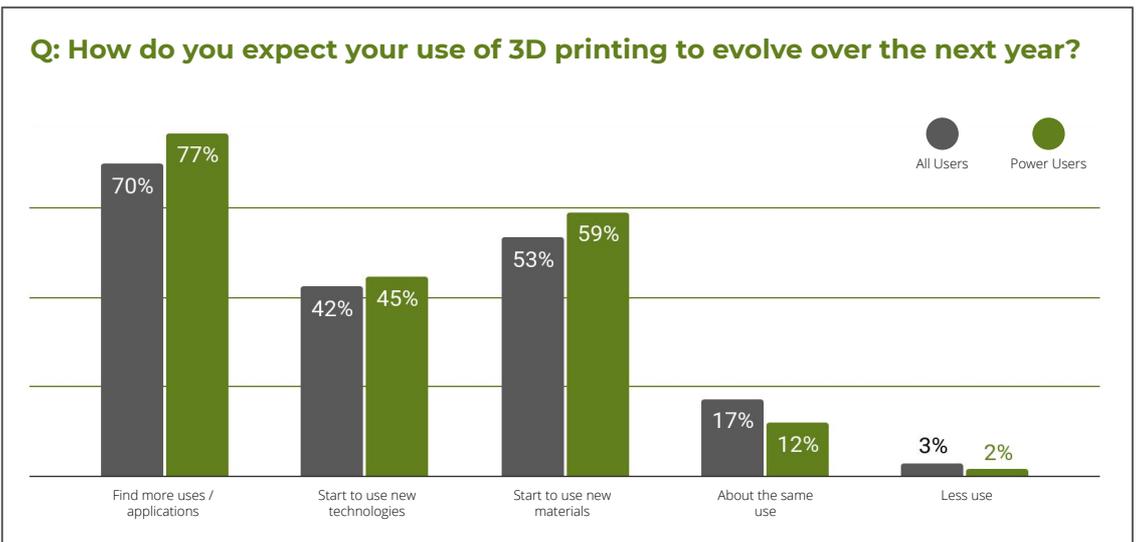
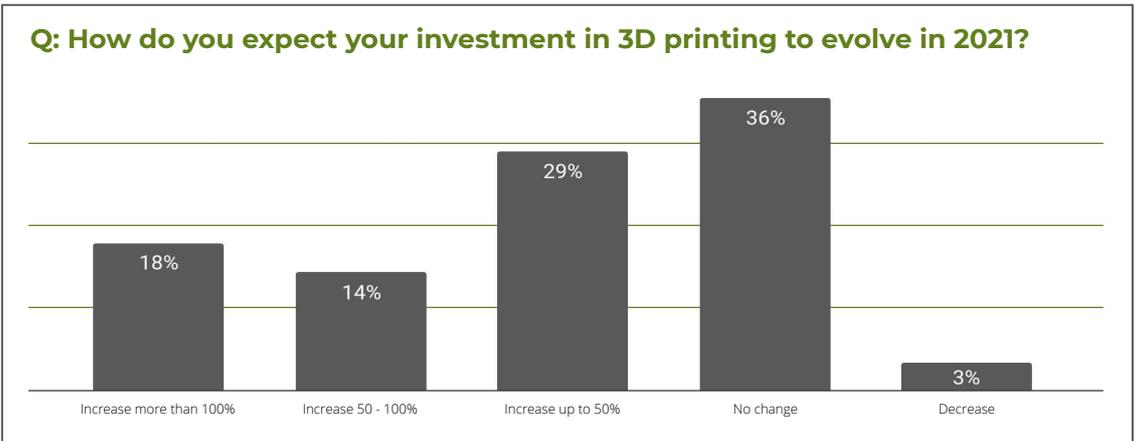
Prototyping, pre-series manufacturing and mass-customization remain the main applications for Additive Manufacturing. However, for the manufacturing of spare parts as well as for flexible production, Additive Manufacturing is gaining momentum.

- **Francois Minec** (Managing Director, BASF Forward AM)



New applications and investment drive the evolution of 3D printing

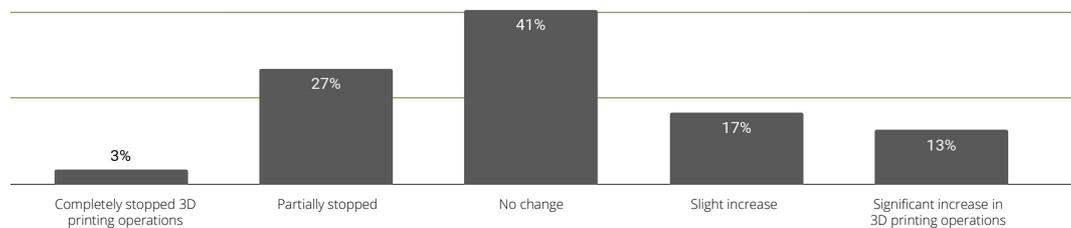
61% of users say they will increase their 3D printing investment in 2021; this clearly shows the confidence of businesses in this technology. **70% of businesses are looking to find new applications and integrate new materials as the 3D printing market is evolving quickly and constantly unveiling new solutions.** But, even with this increase in investment, budget remains the main barrier for businesses to expanding 3D printing use.



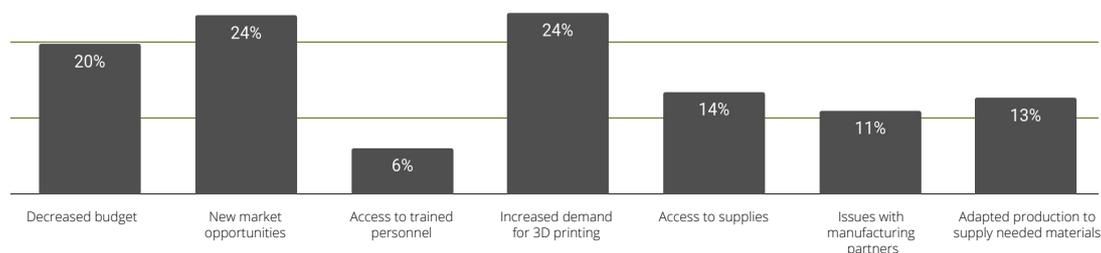
3D printing emerges as a critical support for front-line workers

The impact of the COVID-19 pandemic was felt by every industry. Despite this unprecedented shock, 3D printing became a serious player for convenient on-demand manufacturing. Facing the lack of flexibility of traditional manufacturing, 3D printing appeared as an interesting alternative. In this context, **37% of our respondents faced new market opportunities and an increased demand** for additive manufacturing.

Q: What has been the impact of the COVID-19 pandemic on your 3D printing business strategy?



Q: Which factors have influenced this impact?



COVID-19 and geopolitical and economic uncertainty have accelerated interest in adopting 3D printing to build resilient supply chains and enable local, on-demand manufacturing. As COVID-19 disrupted global supply chains and limited the ability to efficiently deliver critical materials, 3D printing emerged as a key technology to fulfill some of the most in-demand supplies. Although many companies understand the importance of digital transformation, the pandemic has led to business disruption including capital expenditure limitations, resulting in slower 3D printing growth over the past year.

- Ramon Pastor (VP & GM 3D Printing, HP)

Q: How has the COVID-19 pandemic affected your supply chain?





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