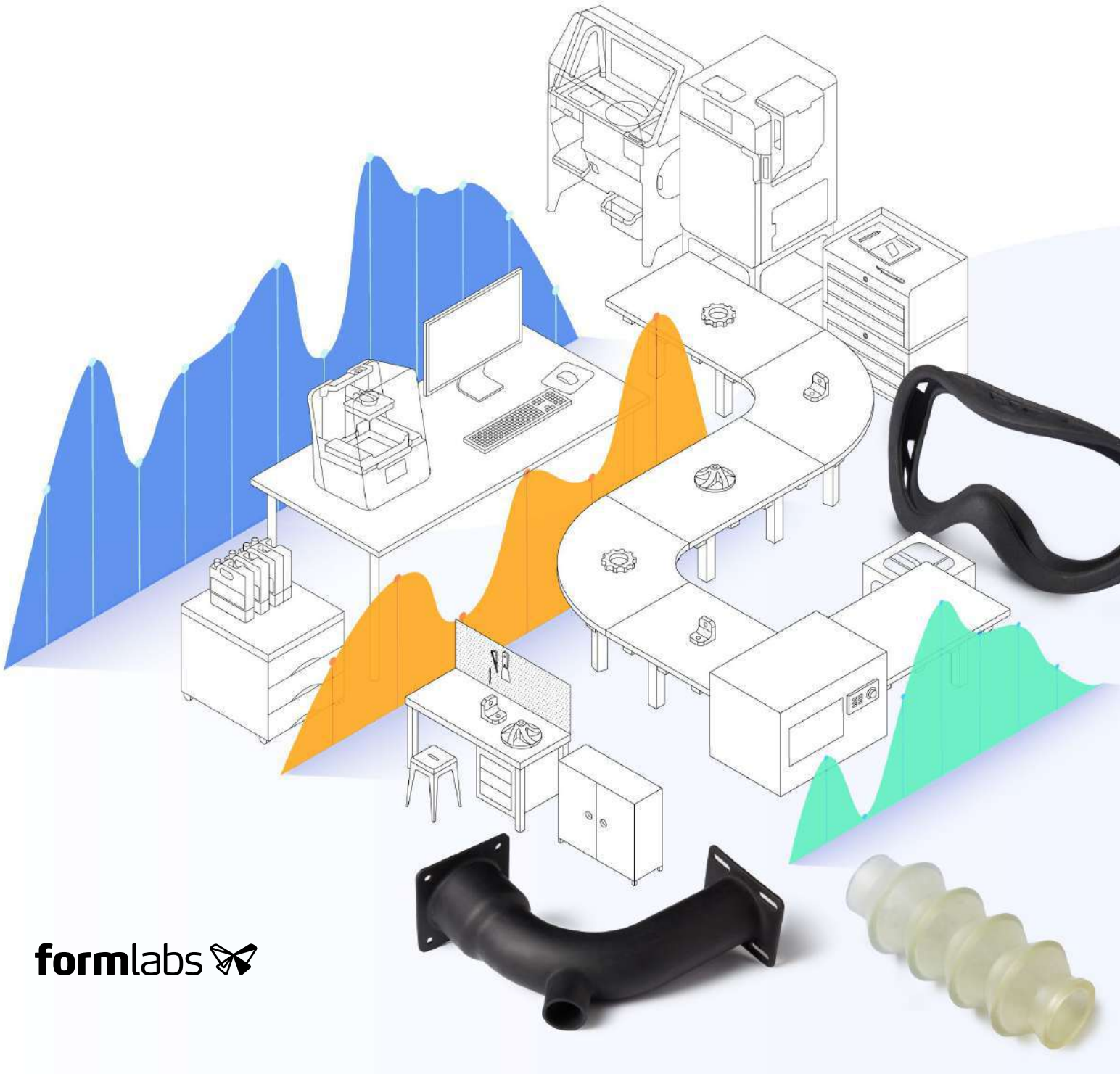
The 2022 3D Printing Applications Report



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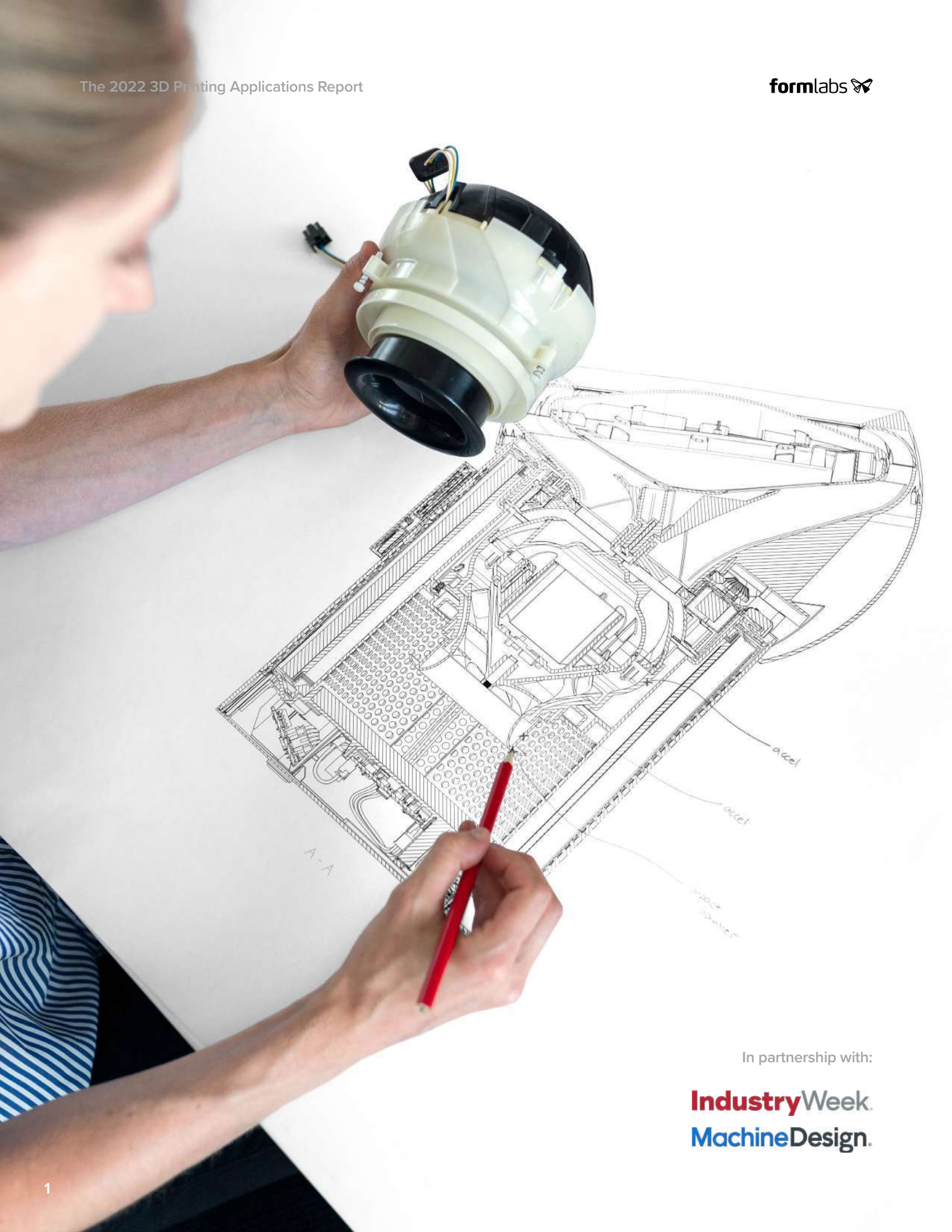

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Preface

In the past ten years, the adoption of additive manufacturing has touched every industry. No longer primarily the domain of hobbyists, powerful, reliable 3D printers have developed into essential tools for businesses. 3D printing can increase manufacturing speed, reduce costs, enable rapid prototyping, and facilitate innovative products and designs. But how is the 3D printing landscape changing? What new applications are gaining traction? That's what this report is all about.

The popularity of 3D printing has grown as it has established itself as an accessible complement to traditional manufacturing. This report represents a snapshot of the current market for additive manufacturing, and an in-depth exploration of traditional and newer applications for additive manufacturing. It examines how consumers are using additive manufacturing, which types of technologies they are investing in, and what they expect to see happen in the coming years.

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3D printing has moved beyond the early adopter phase, but still shows signs of robust growth and expansion into new industries and applications.

To better understand how the use of 3D printing is evolving, this report looks at two main cohorts of users, **the early adopters**, who began using additive manufacturing over two years ago, and **the recent adopters**, who invested in the technology within the past two years.

The report finds that there has been a significant uptick in new 3D printing applications within the recent adopters cohort. While rapid prototyping and model making continue to be popular use-cases, a large number of businesses have started to deploy 3D printing for small-batch custom production and the creation of end-use parts. Among recent adopters, 48% of businesses are using 3D printing for small-batch custom piece production. Additionally, the frequent use of 3D printing to create end-use parts is heavily skewed towards recent adopters, with 63% of recent adopters frequently or always using 3D printing for end-use parts, compared to only 33% of early adopters. The use of end-use parts is heavily skewed towards new recent adopters, with 63% of recent adopters frequently or always using 3DP for end-use parts, compared to only 33% of early adopters.

This shift among the recent adopters represents the expanding use of 3D printing to better address customer needs and to adapt products and workflows to changing markets. It shows that additive manufacturing will continue to empower and impact businesses as they seek to streamline and modernize their workflows.

The findings in this report are based on more than 400 unique responses, from both current users and nonusers of 3D printing. 72% of respondents currently use 3D printing, while 28% of respondents do not.

Fig 1.

Our Research Panel by Occupation

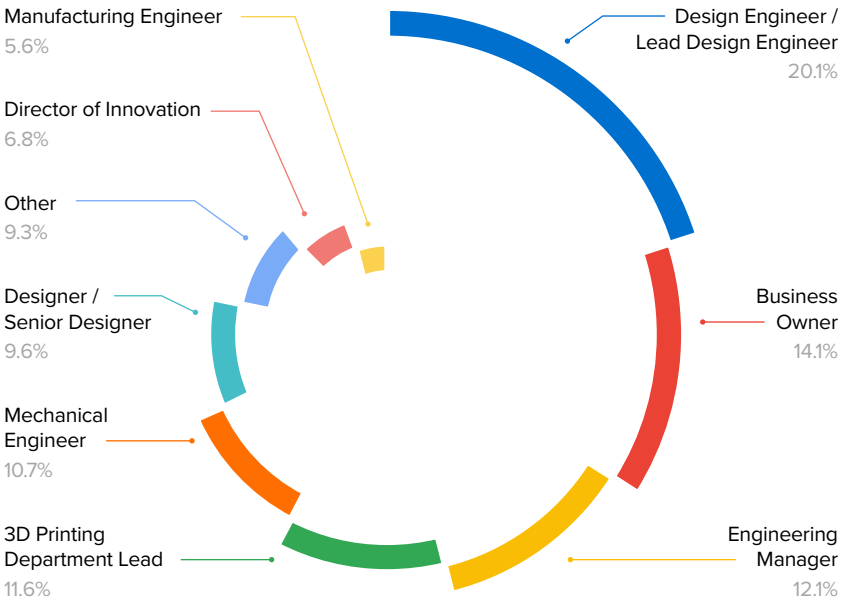
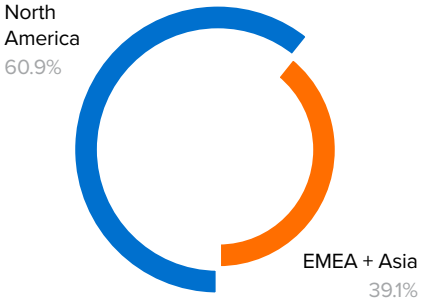


Fig 2.

Our Research Panel by Location



The Additive Manufacturing Industry in 2022

Due to the declining equipment costs, in-house 3D printing has become more prevalent. Over seven in 10 (72%) study participants indicated their company currently uses 3D printers, with the majority printing in-house (55%) compared to outsourced 3D printing (17%). This trend aligns with the recent proliferation of professional desktop printers that now offer similar quality to industrial machines of the past for a fraction of the price.

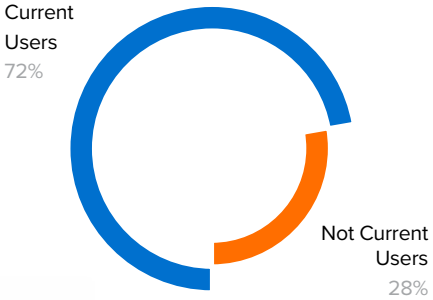
"3D printing is like the real life undo button, allowing me to be more courageous with my design process."

Kat Ermant

Lead Prototype Technician, Peloton

Fig 3.

28% of Our Panel Is Not Currently Using 3D Printing



"In the museum profession, 3D printing has expanded our thinking and has enabled us to set the bar higher."

C. Mei-An Tsu

Objects Conservator, Museum of Fine Arts

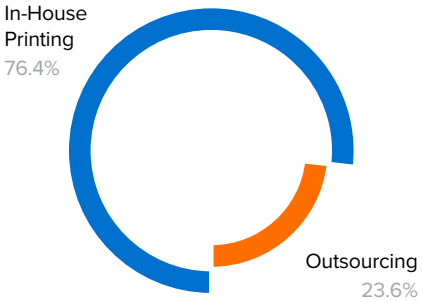
There are two primary ways in which a business can take advantage of additive manufacturing. They can:

1. **Invest in in-house 3D printing**. Empowering internal teams with their own 3D printers does come with an upfront investment cost, but it lowers cost per print significantly compared to outsourcing. It also eliminates shipping, meaning prints can be used immediately after completion. In-house 3D protects business from supply chain shocks, meaning production is not interrupted by shipping delays.
2. **Use 3D print services**. Companies may send their digital files to a service bureau, who will then 3D print the parts and mail them back. This method has no upfront investment costs, but recurring printing costs are expensive in the long run. Outsourcing also creates long lead times, with firms having to wait anywhere from one week to one month to receive their prints.

These numbers are skewed upward by businesses in Europe, the Middle East and Africa (EMEA). EMEA businesses are ahead of their North American counterparts, with 88% of respondents saying they are investing in either in-house or outsourced 3D printing, compared to 64% in North America.

Fig 4.

Percent of 3D Printing That is Outsourced vs Done In-House



Which 3D Printing Processes Are the Most Popular?

Fused deposition modeling (FDM), also known as fused filament fabrication (FFF), is the most widely used form of 3D printing at the consumer level, fueled by the emergence of hobbyist 3D printers. Due in part to its low price point, FDM is the most used 3D printing technology by our respondents. But as users have started to adopt additive manufacturing for end-use part production, the importance of selective laser sintering (SLS) has become apparent. Looking forward to future investment, SLS has a high share of respondents saying it was the most important in terms of perceived impact on their business (46%), outstripping the perceived impact of SLA (36%). This is despite only 34% of users currently using SLS, a bullish sign for future investment in SLS technology.

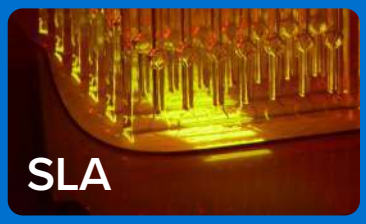
The growing investment in technologies other than FDM becomes apparent when comparing early adopters to new adopters. Within the new adopters cohort, FDM continues to be the most common technology used, but there has been notable shifts towards investment in other technologies. One reason for this is the declining cost of access to some of these new technologies, such as SLA and SLS 3D printing.

"All of these factors have lowered the barrier to entry for manufacturing for small start-ups like PSYONIC, allowing us to manufacture in house instead of outsourcing, which is particularly useful for our iterative prototyping methods that would previously have been prohibitively expensive."

James Austin

Lead Mechanical Engineer, PSYONIC

A breakdown of 3D printing technologies currently being used, comparing recent adopters to early adopters.



Stereolithography

56%

of adopters compared to 46% of early adopters.

Selective Laser Sintering

44%

of adopters compared to 27% of early adopters.

Fused Deposition Modeling

74%

of adopters compared to 78% of early adopters.

Given the rate at which in-house 3D printing has been adopted, and that most businesses expect continued expansion of 3D printing applications, **it is no surprise that over half of the respondents have a dedicated headcount for additive manufacturing roles**. It is possible that this will become far more common in the coming years. Many users of Formlabs 3D printers are general engineers on the shop floor, or individual designers printing parts for their own products. As the number of 3D printing technologies expand, along with their applications, users with specific additive manufacturing skill sets will be in high demand.

"Beyond prototyping, 3D printing enables on-demand custom tooling, adding flexibility to manufacturing processes in order to bring more innovative products to market. It's great to see how manufacturers and product designers have been leveraging 3D printing to rethink the way manufacturing tools are made."

Juliette Combe

Applications Engineer, Formlabs

"Improved engineering materials allow engineers and designers to use 3D printing not just for look-alike prototypes but also functional prototypes, and even early production units."

Sharon Soong

Materials Lead, Formlabs

3D Printing Applications: An Expanding Landscape

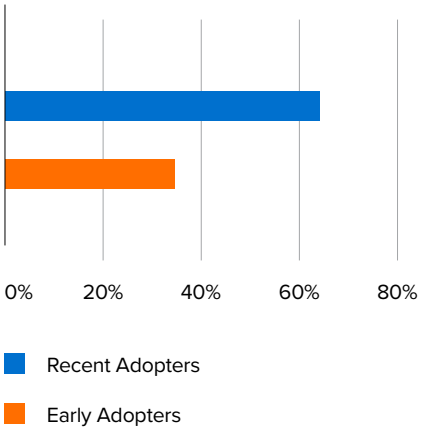
The main impetus behind the early adoption of additive manufacturing by most businesses has long been the creation of prototypes and models. Bringing 3D designs to life to generate feedback and iterating on them is a vital use case for a wide range of industries. Our survey data backs this up, with rapid prototyping (58%) and the creation of models and props (53%) being the most widely used applications.

These use cases will certainly remain popular, especially as new materials are introduced which push the boundaries of prototyping. More durability, increased flexibility, biocompatibility, and other properties of polymers can make them suitable for industry and application specific prototyping.

One of the major trends happening in the industry is driven by recent adopters: small-batch production and the deployment of end-use parts have increased in popularity. Users are leveraging 3D printing to not only control product design, but product creation as well. **Recent adopters are about twice as likely to frequently print end-use parts compared to early adopters.**

Fig 5.

% of Users Creating End-Use Parts



"Over the past few years, we have seen a rapid expansion of digital fabrication applications into manufacturing processes. Accelerated by COVID supply chain disruptions, we've seen 3D printing add flexibility, mitigate risk, streamline workflows, and support traditional manufacturing methods in new and exciting ways."

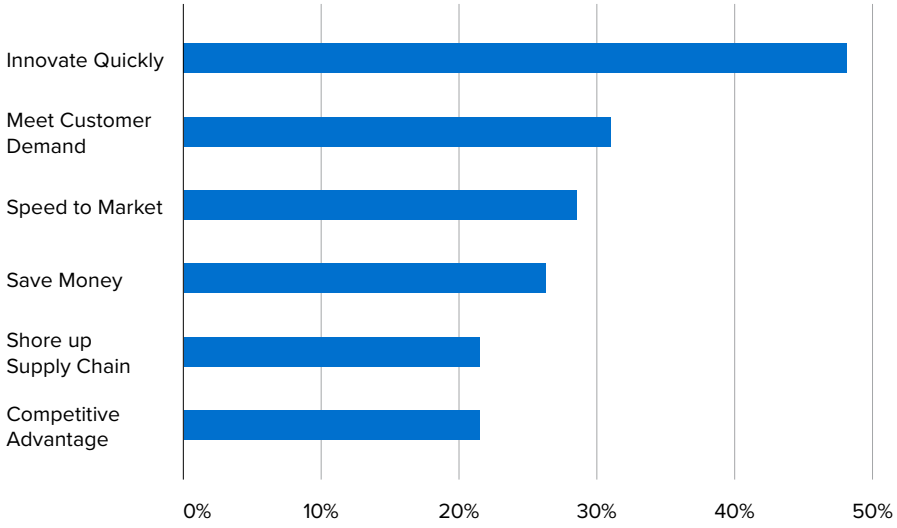
Max Lobovsky

Co-Founder, Formlabs

When it came to assessing benefits of specific 3D printing applications, the ability to innovate quickly was most cited by respondents. Other more frequently reported benefits across applications were **speed to market**, **competitive advantage**, **meet customer demand**, and **save money**. The expansion of 3D printing use cases has been accompanied by users broadening their needs and views of what the technology offers their business. We can surmise that there is likely more room for continuous expansion of additive manufacturing in the coming years, and that current investment has not plateaued.

Fig 6.

Perceived Benefit of 3D Printing, by % of Total Users



Respondents perceived benefit of using 3D printing to create end-use parts

In-house rapid prototyping addresses many of these needs, such as speed to market. But users are learning that they can also gain a competitive advantage by bringing end-use part creation in-house, or can increase speed to market by bringing production in-house. Among recent adopters, 60% have started using 3D printing for rapid tooling (vacuum forming, thermoforming, injection molding, etc), compared to only 30% of early adopters. Using 3D printing for rapid tooling allows businesses to bridge the gap between traditional tools and pure 3D printing, and is a cost-effective and quick way to produce parts in limited quantities.

Saving money - or cost savings - is seen as a significant benefit mostly among recent adopters. 78% of recent adopters cite cost savings as a significant or very significant benefit of 3D printing, compared to 47% early adopters. This can likely be attributed to the decreasing cost of a wide variety of printing technology.

"3D printing has allowed us to iterate through designs more quickly and at a reduced cost compared to traditional prototyping methods."

Will Hilgenberg

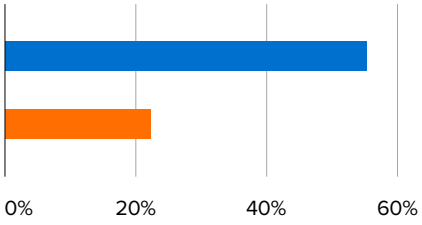
Founder, Albatross Bikes

Due to cultural changes and the COVID-19 pandemic which began in 2020, new benefits of in-house 3D printing have surfaced. In 2021, 65% of recent adopters ranked remote start and monitoring features as important or very important, versus only 32% of early adopters. The newer cohort of 3D printing adopters seem to have looked to 3D printing to help them during the pandemic, with 57% of them “agreeing” or “strongly agreeing” that their internal 3D printing capabilities are helping to solve supply chain issues.

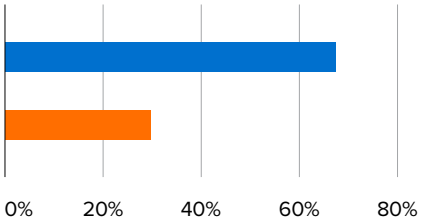
In addition to supply chain concerns, recent users are following cultural trends around sustainability. 70% of recent adopters cite sustainability as a significant or very significant benefit of 3DP, compared to 30% of the early adopters.

Fig 7.

% of Users Who Say 3D Printing is Helping to Solve Supply Chain Issues



% of Users Who Say Sustainability is an Important Benefit of 3D Printing



Recent Adopters

Early Adopters

Source:
The 2022 3D Printing Applications Report

“Over the next few years in supply chain and manufacturing, we will see more end-use applications of 3D printing designed to provide consumers with more personalized products. 3D printing will provide new possibilities for product designers and engineers to innovate and introduce novel ways for customers to access customized consumer goods like headphones and apparel at mass scale.”

Dávid Lakatos

Chief Product Officer, Formlabs

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Looking to the Future

Recent adopters of 3D printing are using the technology differently, for different reasons, and are planning relatively large investments moving forward. What else can we glean when we look towards the future? What are the barriers to future adoption? Our survey respondents provided insights into the future of additive manufacturing at their businesses.

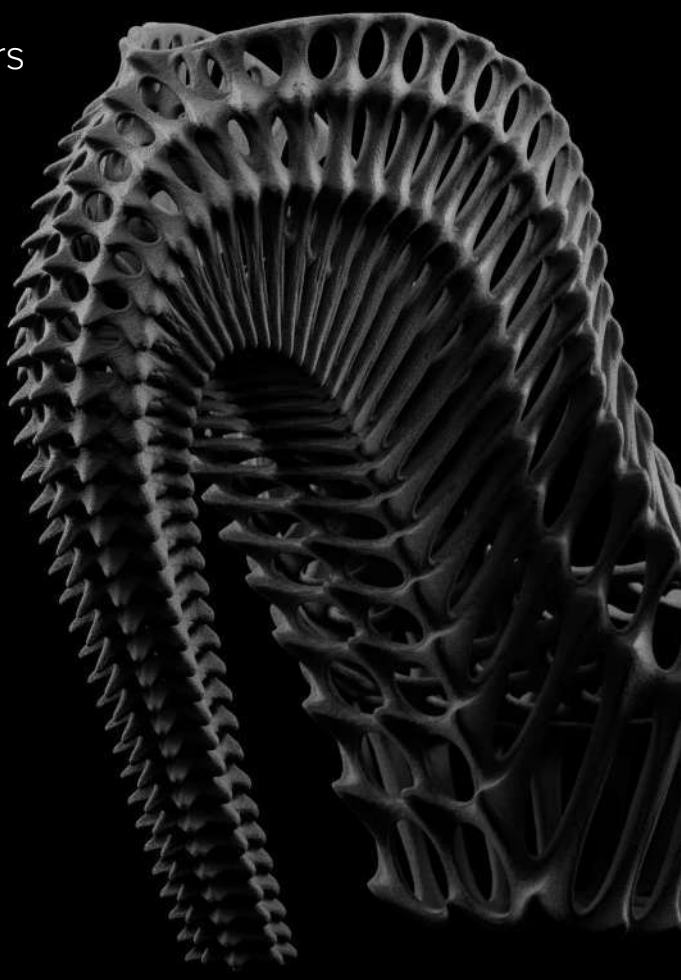
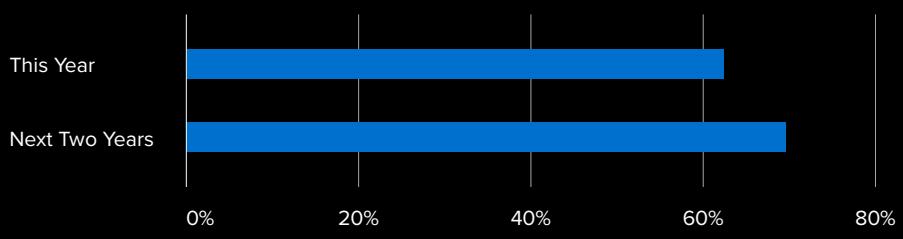


Fig 8.

% of Users Planning an Investment in 3D Printing



When it pertains to challenges of future adoption of 3D printing technologies, both non-current users and current users cite “lack of use cases” as a barrier. Of non-adopters, half cite “lack of use cases” as their biggest adoption challenge, while only 29% of recent adopters cited “lack of use cases” as a reason they may not invest further in the technology.

It may take years for knowledge of different 3D printing applications, from rapid tooling to end-use part manufacturing, to trickle down the non-adopters category. While additive manufacturing may not be suitable for 100% of businesses, competitive pressures may force late adopters to reconsider. We view this as a significant opportunity for continued growth for additive manufacturing, as it’s value proposition compared to traditional manufacturing continues to crystalize. This growth should come from two places: new businesses not currently using 3D printing, plus increased use (additional prints and materials) from existing users.

“As a designer in my past life, 3D printing made our entire product development and prototyping easier and shorter.”

Christina Perla

Cofounder & CEO, Makelab

Fig 9.

Users That Have Yet to Invest in 3D Printing Are More Likely to Cite Lack of Use-Case As the Reason Why

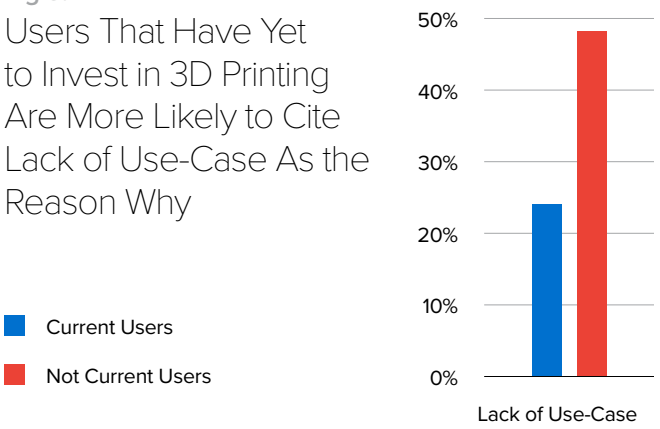
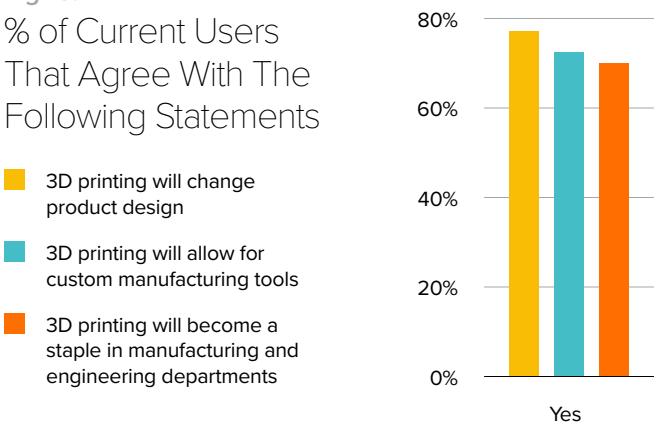


Fig 10.

% of Current Users That Agree With The Following Statements



Looking forward, respondents that have already deployed 3D printing had strong views about future capabilities. 76% agree that 3D printing will change product design, 72% agree 3D printing will allow for custom manufacturing tools, and 71% predict 3D printing will become a staple in manufacturing and engineering departments. Those that currently use 3D printing are less likely to cite “lack of use cases” as an obstacle, and are more bullish on how much 3D printing will impact their business in the future.

It follows then that **the pace of investment in 3D printing seems to be growing**, with 26% of respondents **predicting a large investment** in 3D technologies two years from now, and 33% predicting large investment in 3D printing five years from now.

Finally, we believe that CAD skills and 3D printing experience will continue to command a premium in the workforce of the future. This should put pressure not only on the labor market to adapt, but for institutions of higher education and trade schools to expand software and hardware offerings to train the next generation of workers.

“3D printing has shown me that there’s a lot more flexibility in design and lead times in manufacturing today.”

Genevieve Lee

Additive Manufacturing Engineer, Fast Radius

Insights from our partners

"We think product prototyping will be the main application in the 3D printing field, in particular, the engineering, automobile, electronic consumables and so on. Small volume manufacturing can also be implemented via SLS 3D printing more. 3D printing is also a cost-effective solution for medicine and healthcare. It gives medical staff the ability to design each printout to patients' various needs. It will certainly improve the lives of many people in the near future."

Smile Lin

President, Taiwan Teama Technology Co, Ltd.
Taipei, Taiwan

"On the macro aspect , direct end-use parts printing with customization features will be the application trend in the future."

Kenneth Ha

Sales Director, Intelligent CAD/CAM Technology Ltd.
Hong Kong

"We think 3D printing will be used more in different industries especially in the architecture and construction industry. In the future people can customize their own house with the unique design, and the construction's time will be shorter."

Vorawat Vadhanakovint

Managing Director, Septillion
Bangkok, Thailand

"Regarding supply chain shortages, our Formlabs customers are using 3D printing mostly for spare parts production, jigs, tools and fixtures. For industrial manufacturers, every minute lost in which their machine or production line does not work due to the need to replace a part is extremely valuable because they lose a lot of money. With 3D printing, they can quickly on site produce a complete replacement for the required spare part, or at least a temporary replacement, until the delayed original part arrives."

Ilian Ivanov

COO, B2N
Sofia, Bulgaria

Learn More

If you're not sure about which use-case might be appropriate for your business, contact a Formlabs expert to discuss your needs and what's possible with in-house 3D printing.