



**HP Digital
Manufacturing
Trends Report:
Catalyzing
Manufacturing's New
Global Value Chain**

Executive Summary

Manufacturing decision makers around the world say they're looking to industrial 3D printing to realize economic growth

Over the past several years, the global manufacturing paradigm has shifted due to the growing adoption of 3D printing and its ability to meet consumer demands that have skewed toward increased personalization and customization. In just the past year, the COVID-19 pandemic and geopolitical and economic uncertainty have accelerated that transition. Companies are leveraging the technology's speed, flexibility and design capabilities and ability to support distributed manufacturing and assembly.

The *HP Digital Manufacturing Trends Report* explores how manufacturing executives worldwide view 3D printing today and how they intend to use the technology going forward. More than 2,000 3D printing and digital manufacturing decision makers from Europe, Asia, the U.S., Canada and Mexico participated in the survey.

Overwhelmingly, the respondents said they believe the technology is integral to a new manufacturing value chain. They are looking to advanced 3D printing to improve their operations' agility, to modernize their supply chains, to trigger innovation and to enable mass personalization, which they anticipate will create new growth opportunities for their business and across the industry.





Key Trends

These findings demonstrate industrial users' intentions to deploy personalized, distributed, efficient and sustainable production to achieve business goals in the immediate, as well as long-term, future.



Economic Advancement

Industry leaders are nearly unanimous in their assessment of digital manufacturing as a means to spur economies around the world.



Accelerated Innovation

3D printing allows digital manufacturers to innovate, iterate and pivot fluidly in response to business demands.



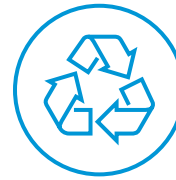
Personalization

3D printing will enable manufacturers to meet consumer demand for increased and cost-effective personalization and mass customization. For industries such as health and wellness including, orthotics and footwear, industrial tooling and metals growth potential is especially high.



Increased Collaboration

Collaboration is fundamental to 3D printing. To continue advancing the industry and grow the population of practitioners, digital manufacturers must offer more professional training to more workers.



Sustainable Production

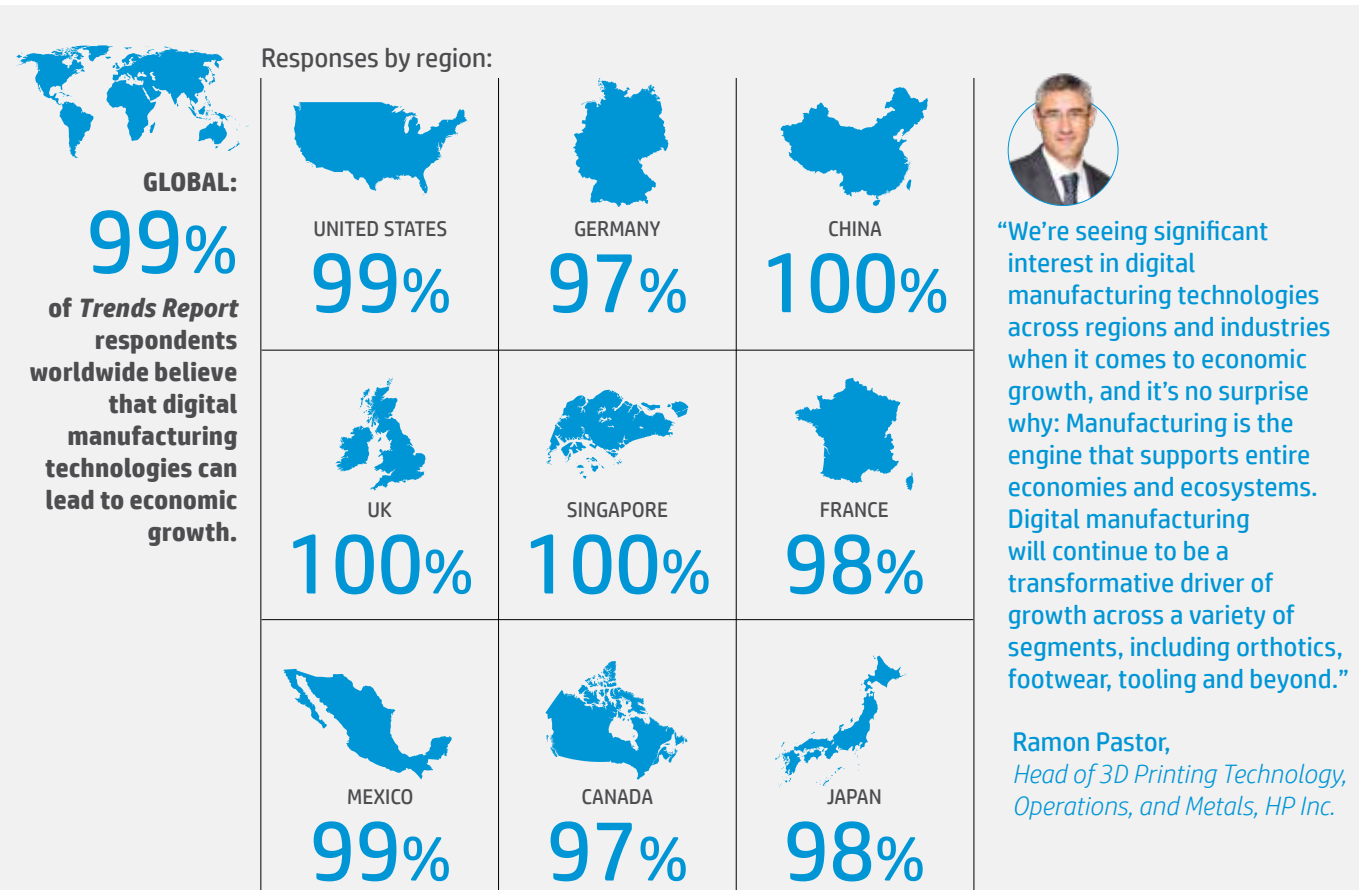
3D printing, which can reduce waste, lower carbon dioxide (CO2) emissions and enable a more circular economy, appeals to enterprises focused on limiting their environmental impact.

Building Momentum for Economic Advancement

3D printing has revolutionized manufacturing, enabling even the smallest companies to develop, iterate and distribute goods more efficiently. Whether producing component parts, medical devices or dental aligners, manufacturers have access to tools that offer vast opportunities for customization—and are likely to shape the future of many industries with these capabilities.

At the same time, manufacturers face challenges from the global economy at large, as well as from supply chain disruptions and shifts in consumer behavior. According to the *Trends Report*, 89% of respondents plan to evolve their business models in response to the global business environment, with over nine-in-ten investigating new supply chain models (59% evaluating hybrid models and 52% looking into localized production).

Nearly all the respondents (99%) believe that digital manufacturing technologies can lead to economic growth. Manufacturers are backing this belief with their budgets: Nearly three quarters (71%) of respondents plan to invest in digital manufacturing technologies by the middle of 2021, and 85% indicated their company is planning to increase its spending on 3D printing.



It’s worth noting that when asked how their company currently uses additive manufacturing, 72% of respondents see a major opportunity for general final production, serialized final production, or custom matched final production. Other growth areas include prototyping, design and development (50%), education and research (24%) and tooling and/or molds (24%).

Regionally, 37% of global respondents believe that Asia is expected to see the greatest industry growth in the next year, followed by Europe (27%) and North America (22%).

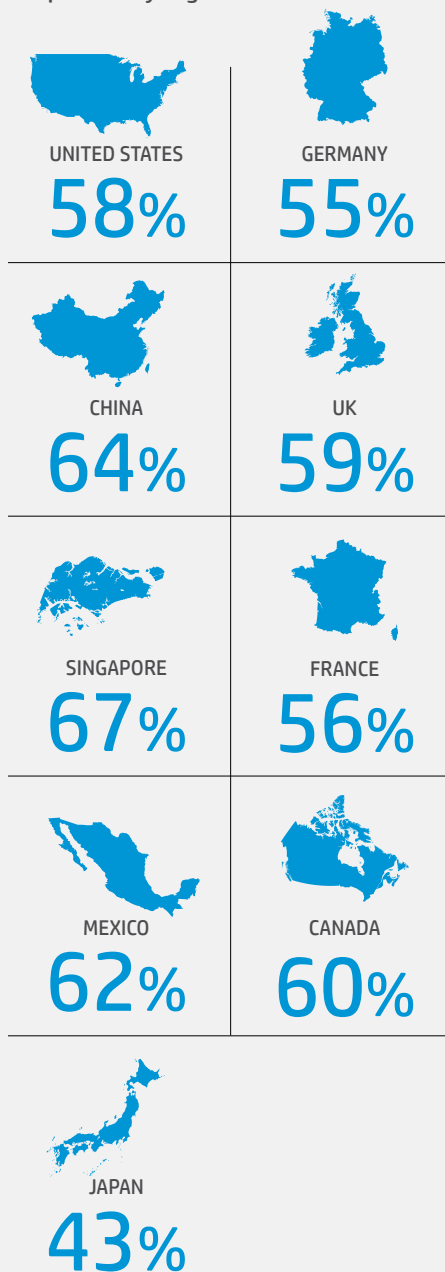


GLOBAL:

59%

of Trends Report respondents said that improved tools will have the biggest impact in growing their company's adoption of 3D printing over the next 5 years.

Responses by region:



Redefining Accelerated Innovation

The pandemic expanded the need for innovative approaches to manufacturing, especially in light of the increase in direct-to-consumer sales. But while 2020 proved to be a watershed moment for the industry, the need for accelerated innovation capabilities is not limited to a single moment in time. The transformation that digital manufacturing enables is a requisite for success in the modern marketplaces. With 3D printing, manufacturers can respond quickly to customer requests as well as to the needs of new industrial, medical and dental ecosystems.

Health and wellness, in particular, is an industry poised to see the most advancement in 3D printing, with 55% of global Trends Report respondents predicting that in the next five years, the medical industry will achieve the most innovation. The industrial sector isn't far behind at 50%.

Manufacturers are relying on continued innovation within the 3D printing industry to achieve new product breakthroughs. Nearly 6 in 10 (59%) believe the availability of improved tools is the most significant factor in their companies' use of 3D printing, followed by texture options (45%) and lattice design and generation (44%).

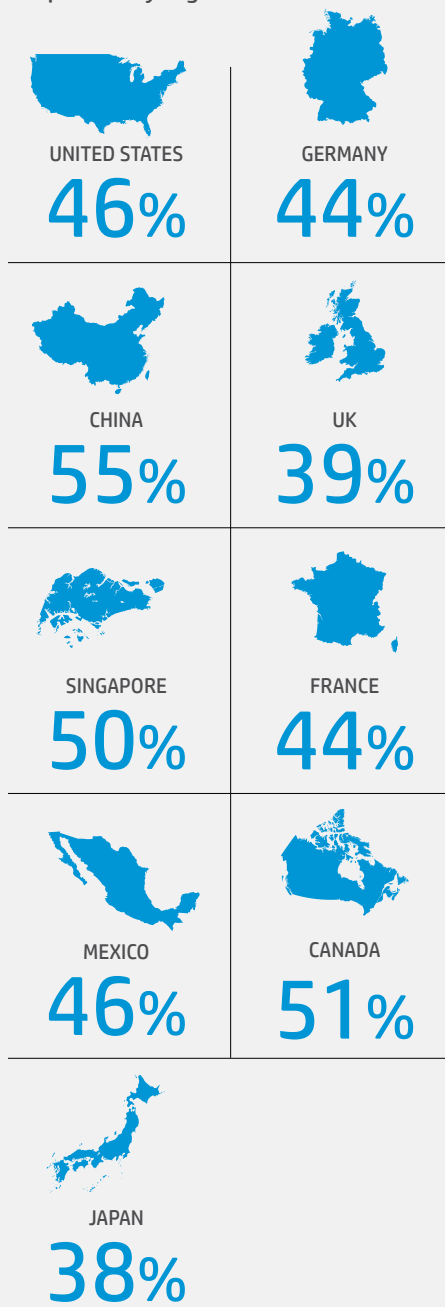


GLOBAL:

46%

of Trends Report respondents noted that bio-compatible parts will be a crucial area of advancement over the next five years.

Responses by region:



Specifically, the report identifies heat-activated 4D-printed parts, which change shape over time, as a promising source of innovation. Nearly half (48%) of respondents say these “smart” parts have the most potential for advancement among 3D printing technologies. In addition, 46% of respondents said bio-compatible parts will be transformative, followed by metal conductors in plastic parts at 42%. Bio-compatible materials, in particular, are used in the medical field, as they produce sterilizable components that enable doctors to perform their jobs more effectively with custom tools and models designed to fit the needs of each patient.

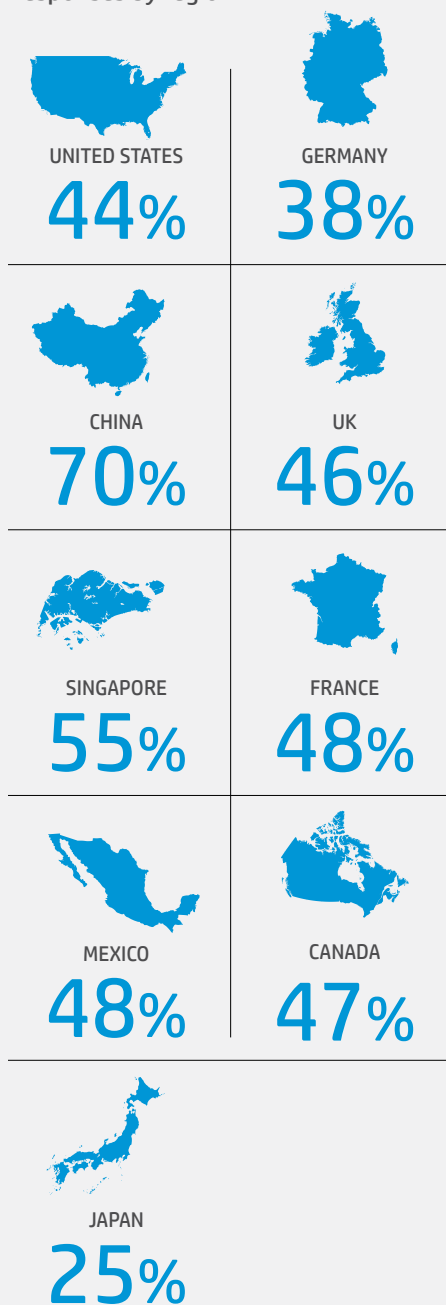


GLOBAL:

48%

of Trends Report respondents believe that heat activated 4D printed parts will show the most innovation and/or advancement in 3D printing over the next 5 years.

Responses by region:



“We’ve only brushed the surface of what 3D printing can do, and the next wave of innovation will present incredible opportunities. When we think about material development, substrates with heat-activated properties will enable us to cross into 4D territory, and dramatically advance what we’re able to do.”










Paul Benning,
Chief Technologist for 3D Printing, HP Inc

When it comes to data and software impacting digital manufacturing, 55% of global respondents reported that “accelerated innovation” will see the most advancement over the next five years, followed by 52% who said quality management will advance data and software and 50% who agreed data and software will enhance design for additive capabilities. New software innovations provide manufacturers with the tools and infrastructure to enable digital manufacturing at scale, leading to greater productivity.



GLOBAL:
55%
 of Trends Report respondents believe that accelerated innovation will see the most advancement when it comes to data and software impacting digital manufacturing over the next 5 years.

Responses by region:

 UNITED STATES 47%	 GERMANY 52%	 CHINA 67%
 UK 52%	 SINGAPORE 52%	 FRANCE 57%
 MEXICO 57%	 CANADA 60%	 JAPAN 46%



“Automation, software and data will be key to delivering mass customization of parts and unlocking the full potential of large-scale additive manufacturing. This in turn will help customers optimize and automate workflows, enable compelling new applications and produce sustainable, high-quality parts at scale.”

Ryan Palmer,
 Head of Software and Data, HP Personalization & Industrial Business

Mass Customization & Personalization

3D printing will accelerate the growing phenomenon of mass customization and personalization. For instance, SmileDirectClub is digitally transforming the \$12 billion orthodontics industry using 3D printing to customize products.

Nine out of 10 respondents (91%) in the report say they would pursue mass customization if they could personalize parts via 3D printing. But embedding personalization into existing workflows is no easy feat — more than half of the global respondents noted that large-scale personalization is the biggest challenge their companies face in incorporating personalization and design innovation into their businesses. Forty-eight percent report that manual versus automated processes are a secondary challenge, followed by data inoperability at 43%.



GLOBAL:

91%

of Trends Report respondents want to explore mass customization and believe it could be applicable to their business if parts could be personalized through 3D printing.

Responses by region:



UNITED STATES

91%



GERMANY

88%



CHINA

96%



UK

93%



SINGAPORE

91%



FRANCE

92%



MEXICO

95%



CANADA

89%



JAPAN

76%



“We’re seeing a rise in manufacturers seeking mass customization capabilities in response to the rapid shift toward product personalization. With 3D printing, we’re able to transform entire sectors by introducing a whole new set of capabilities. HP’s partnerships with leading orthotics companies and major golf manufacturers, for example, are proof of what’s possible when we take full advantage of digital manufacturing to create innovative designs and deliver individualized products.”

Philipp Jung,

Head of End to End Solutions,
Personalization & 3D Printing,
HP Inc.

Increased Collaboration to Build New Ecosystems

Collaboration is integral to the long-term adoption of digital manufacturing technologies, which has incorporated open-source files since the 2000s. In the early days of the coronavirus pandemic, that collaboration drove life-saving innovation. Manufacturers, academics and others swapped 3D printing files across borders, rapidly adapting them to the needs of medical professionals around the world.

This type of cross-sector collaboration is critical to the future of digital manufacturing, according to 85% of respondents. As companies look to deliver more value to end companies, they will form new alliances and operate within new ecosystems. To that end, 81% also indicated their company has future plans to collaborate with government entities on digital manufacturing products.

Workers, in turn, will need the skills necessary to use—and advance—3D printing. Two-thirds of the report’s respondents (64%) said more professional training services should be offered to further 3D printing.

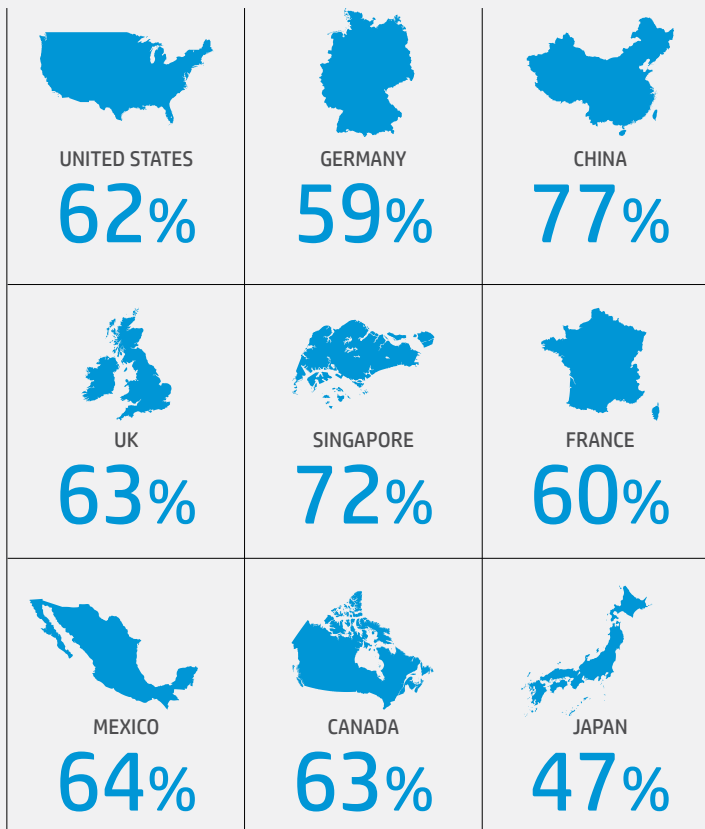
“With the scale of the COVID-19 crisis, we were suddenly facing all new challenges that needed new solutions in a timeframe that was unprecedented. We’re seeing more and more collaboration to address the pandemic in what is usually a very competitive advanced manufacturing industry.”

Francisco Betti,
World Economic Forum’s Head
of Advanced Manufacturing and
Production



GLOBAL:
64%
of Trends Report respondents want to offer more professional training services to prepare for 3D printing.

Responses by region:



“The adoption of industrial 3D printing is changing the face of manufacturing and is increasing demand for designers and engineers with diverse skillsets. A well-prepared workforce is a critical ingredient in the evolution of 3D printing. We must ensure that people around the globe have the training they need to use the technology — and to improve it.”

Ramon Pastor,
Head of 3D Printing Technology,
Operations, and Metals, HP Inc.

Focusing on Sustainable Production

Sustainability continues to be a key metric for business operations. As small businesses, governments and large enterprises increasingly assess and track their environmental impact, digital manufacturing is expected to play a key role. Half (50%) of the report's respondents indicated 3D printing's ability to reduce waste and promote a circular economy, with 90% noting the importance of the recyclability of 3D materials. Equally, 50% of respondents noted that better matching of supply and demand helps feed into a more circular economy, followed by shortening and simplifying traditional supply chains (47%) and improving service options that can prolong the life of products (47%). Highlighting the importance of public-private partnership in the future of sustainable production, 88% of respondents believes that it is important that governments create a sustainable ecosystem by incentivizing investment in and development of socially and environmentally beneficial digital manufacturing technologies.



GLOBAL:

50%

of Trends Report respondents noted that 3D printing can reduce waste and promote a circular economy by reducing the amount of materials used.

Responses by region:



UNITED STATES

49%



GERMANY

45%



CHINA

51%



UK

51%



SINGAPORE

48%



FRANCE

49%



MEXICO

59%



CANADA

49%



JAPAN

44%



"3D printing and digital manufacturing enables us to rethink how we design, create, build and move production closer to the point of consumption, while dramatically reducing carbon emissions and waste. Forward-thinking manufacturers have prioritized sustainability, and 3D printing and digital manufacturing is helping them optimize production and operations both digitally and physically, driving a cleaner, more sustainable industrial revolution."

Lihua Zhao

Head of 3D Printing Lab, HP Labs

In addition, 3D printing enables localized manufacturing, helping reduce the complexity and environmental impact of supply chains. It may also have the potential to prolong the life of products, thereby reducing waste.

Conclusion

A Path to Growth Amid Uncertainty

As the *HP Digital Manufacturing Trends Report* demonstrates, more and more manufacturers have embraced the shift to 3D printing, which fundamentally changes how products are designed, sourced, made and delivered. While the COVID-19 pandemic has highlighted many of the technology's benefits, 3D printing's impact on manufacturing as a whole will be longer lasting. Manufacturers plan to invest further in the technology and are looking to train more people to use it. Continued commitments such as these will drive the industry forward. Ultimately, as a new value chain emerges around the globe, manufacturers expect this transformation to spur economic growth and evolve supply chains, innovation, personalization and sustainability.

