



3D Printing: Moving Beyond the Hype

3D printing has long been pegged as a technology that could disrupt traditional manufacturing and revolutionize the way products are created and delivered to consumers. However, the promise of ubiquitous, desktop 3D printing has proven to be elusive and investors have cooled to the industry in recent years, even as the technology continues to establish itself among manufacturers.

Though this technology hasn't paid off on its early hype, it may be finally finding its footing thanks to new innovations, a changing market environment and a more realistic set of expectations.

The Hype and Disillusionment Cycle

In 2013, a Goldman Sachs report identified 3D printing as one of eight industries that would “remake the global economy,” because it offers “higher degrees of customization, lower costs for complex designs, and reduced overhead for short-run parts and products.”¹ Between 2012 and 2013, industry-leading companies like 3D Systems and Stratasys saw their stocks rise 333% and 800%, respectively.² The industry appeared to be booming, buoyed by optimism in the future of consumer-grade, in-home 3D printing.

But by early 2014, investors grew skittish and fled 3D printing stocks in droves. In January 2014, 3D Systems (DDD) peaked at \$96.42 per share. Two years later, it was trading in the neighborhood of \$6. What happened?

Like many new technologies, 3D printing went through what's known as the “hype and disillusionment cycle.” Excitement over (or perhaps a misunderstanding of) the technology's potential led investors to overlook the challenges to widespread, short-term consumer adoption. But once 3D printing companies began reporting disappointing earnings, it became clear that the industry's ambitions would not be realized anytime soon.³

¹ Rob Wile. Business Insider. “The Case for 3D Printing Stocks.” (2014).

² Kevin Kelleher. Time Magazine, “Was 3D Printing Just a Passing Fad?” June 10, 2015.

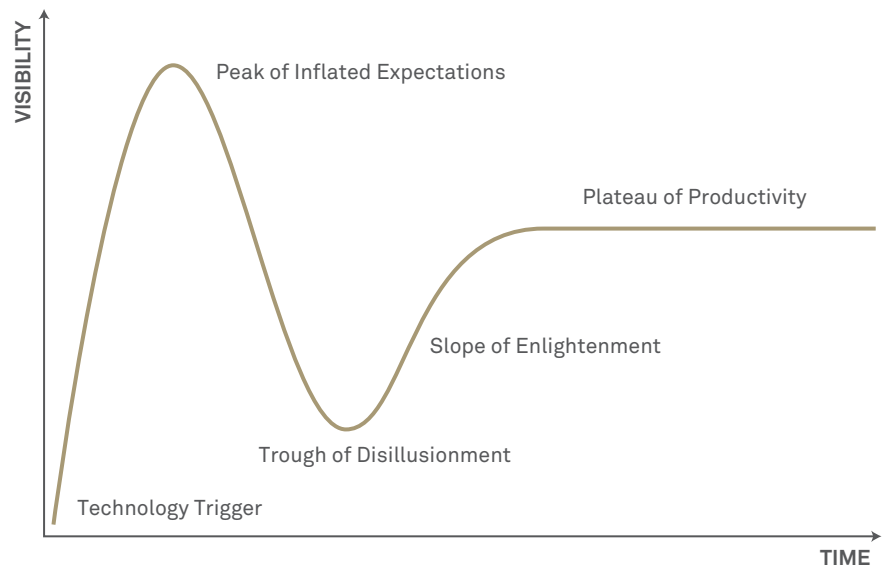
³ Steve Heller. The Motley Fool, “Why 3D Printing Stocks Had a Horrible 2014,” Jan 11, 2015.

The “hype and disillusionment cycle” refers to a methodology popularized by Gartner, an information technology firm that tracks the development of emerging technology. They project that new innovations must endure a period of hype, in which their potential applications are often exaggerated, and a subsequent disillusionment, after which expectations become more aligned with reality.⁴

Exhibit 1. The Decline in 3D Printing Stocks



Exhibit 2. The Hype and Disillusionment Cycle



There’s reason to think that 3D printing may be ready to emerge from the so-called “trough of disillusionment.” The industry has continued to develop, albeit more slowly than investors initially expected. By the end of 2016, 3D printing had grown to be a \$7.3 billion industry.⁵ It’s estimated that by 2020, it will become a \$21 billion industry.⁶ Two-thirds of American manufacturers have adopted it to some extent, whether to craft realistic prototypes of potential designs or in the actual manufacturing of final products.⁷

⁴ Gartner. “Hype Cycle Research Methodology”.

⁵ UPS. “3D Printing: The Next Revolution in Industrial Manufacturing.” 2016.

⁶ *Ibid.*

⁷ PwC. “3D Printing Comes of Age in U.S. Industrial Manufacturing.” 2016.

How Does 3D Printing Work?

Traditional manufacturing (also known as reductive manufacturing) takes a piece of metal or other material and carves away what is not needed. 3D printing (“additive manufacturing”) operates the other way around. Using instructions from a digital blueprint, 3D printers output layers of material one at a time, heating plastic, ceramic or metal powders to create a workable solid, adding only what is needed. Each layer is laid down like ink from an inkjet printer, and they are added on top of one another until the final product takes shape.

The advantage of traditional mass production manufacturing comes from an economy of scale. But that makes it uneconomical to produce short runs of customized products. It can be costly to develop new tooling to update or change products or conduct research and development.

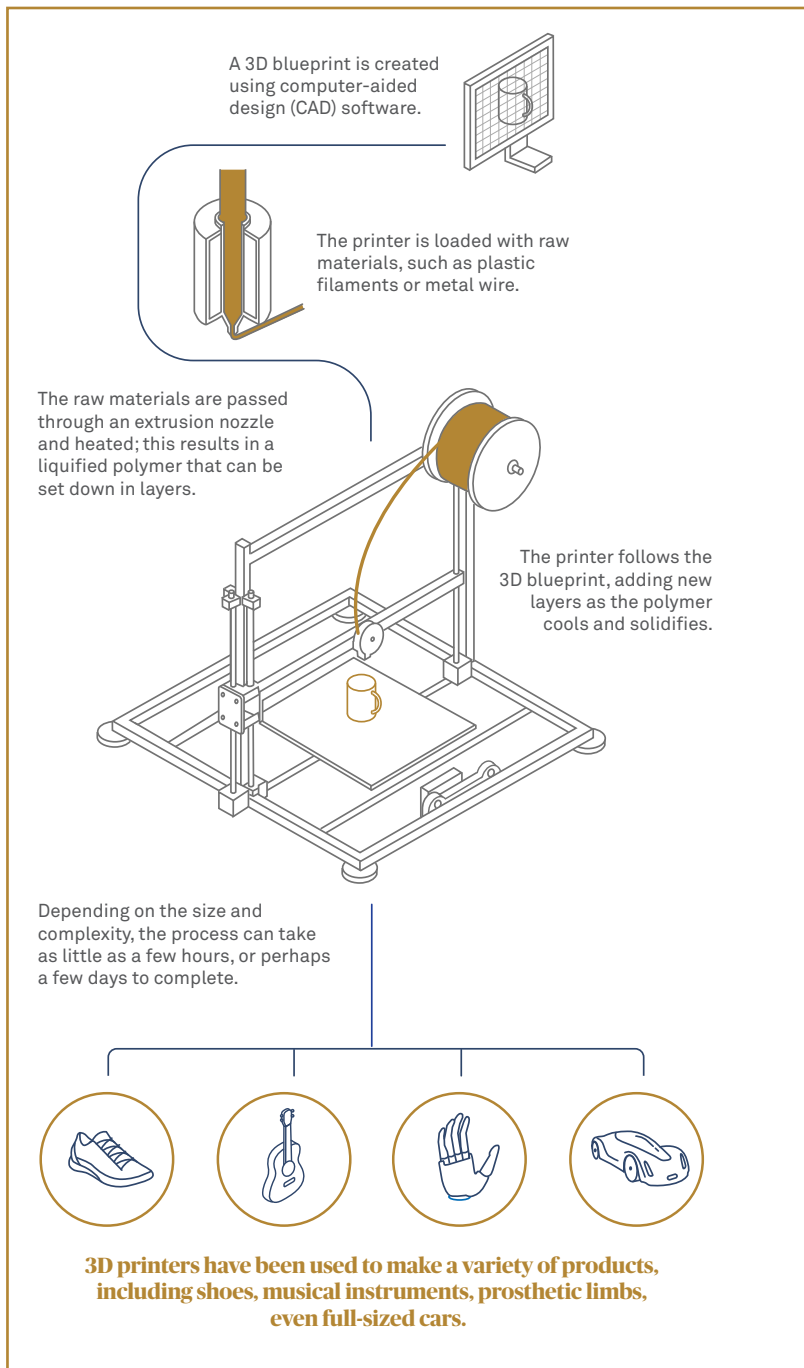
With 3D printing, manufacturers can simply update the digital blueprint that guides the printer. This makes rapid prototyping or the creation of small runs of products much more cost effective.

Where 3D Printing Is Making a Difference

3D printing also allows manufacturers to be bolder in their designs, giving them the opportunity to realize concepts that would’ve been impossible to create using traditional manufacturing methods.

For example, Under Armour’s Architech shoe features an intricate dynamic lattice in its midsole, which provides the wearer with additional cushioning and support. The company claims that the level of detail needed to create the vine-like lattice cannot be achieved with traditional equipment, and that the flexibility of 3D printing technology allowed them to quickly make small changes to the design in order to optimize the shoe’s performance.⁸

The aerospace industry has adopted 3D printing as a means of increasing both production and operational efficiency on commercial aircraft. Companies like Airbus and Boeing began using 3D printing to create small components, such as fuel inlet nozzles on the Boeing 787 or miscellaneous components like door hinges and parts for wing slats. They found that 3D printing airplane parts reduced waste during the manufacturing process and also decreased the weight of the airplane, which ultimately reduced fuel costs and carbon emissions. In the case of Airbus, it helped cut the company’s costs and supply lead times for tooling by 70%.⁹



⁸ Business Insider. “Under Armour 3D-Printed Soles for Its New \$300 Sneakers with Powder and Lasers.” (2016).

⁹ PwC. “3D Printing Comes of Age in U.S. Industrial Manufacturing,” 2016.

The consumer electronics, automotive and medical device industries are the biggest users of 3D printing technology, comprising 50% of the current revenue.¹⁰ The impact has been significant, allowing for some electronics manufacturers to reduce the amount of time it takes to evaluate design concepts from one week to one day. One automotive engine control company was able to reduce their prototyping time from 16 weeks to one week or less. The U.S. hearing aid industry switched from traditional manufacturing methods to 3D printing in just 500 days—now 98% of all hearing aids are made with 3D printers.¹¹

Implications for the Supply Chain

Though widespread consumer adoption may still be far off in the future, the efficiency and flexibility of 3D printing could flip supply chain logistics on their head, giving consumers more control and helping manufacturers streamline and better focus their efforts. A 2015 survey of manufacturing executives by PwC found that they believed that the restructuring of supply chains would be the biggest impact that 3D printing would have on U.S. manufacturing.¹²

3D printing could lead to a “greatly simplified, highly responsive and infinitely flexible supply chain” that fulfills orders on demand.¹³ Manufacturers could potentially eschew massive, up-front investments in building up product inventories in favor of a more customized, lightweight model.

3D printing may also revolutionize how products are distributed. The technology could allow manufacturers to decentralize production, moving the final assembly closer to the end user and reducing costs associated with warehousing and transporting goods. Instead of manufacturers creating and distributing the product itself, they could simply transmit the digital blueprints for the file, which would then be used to create the products closer to their final destination.

Companies like BMW, Honda and UPS are already working to equip their dealerships and warehouses with the tools necessary to print customized parts onsite,¹⁴ and Amazon has filed a patent for a mobile 3D printing delivery truck that would build an item while it’s on route to the customer’s house.¹⁵

¹⁰ UPS. “3D Printing: The Next Revolution in Industrial Manufacturing,” 2016.

¹¹ *Ibid.*

¹² PwC. “3D Printing Comes of Age in U.S. Industrial Manufacturing,” 2016.

¹³ Richard D’Aveni. Harvard Business Review. “The 3D Printing Revolution,” May 2015.

¹⁴ *Ibid.*

¹⁵ Richard D’Aveni. Harvard Business Review. “The 3D Printing Revolution,” May 2015.

What's Next for 3D Printing?

There may be reason for optimism, especially as the 3D printing process becomes faster and more efficient. Since 2014, there have been some interesting technological innovations in the space. For example, 3D Systems has introduced what they call “Figure 4” technology, which can produce parts more quickly than before. Up to 50 times faster, according to the company, potentially shrinking the production time for an object from 11.5 hours to just around 14 minutes. HP’s CLIP technology is said to be able to complete a similar object in just 6.5 minutes.¹⁶

The 3D printing industry may also benefit from some emerging economic trends. Wages are rising, not just here, but in China as well. That’s encouraging manufacturers to look for ways to further automate their workplaces, particularly when it comes to engineering and tooling.

The Trump administration’s talk of implementing border adjustment taxes may also spur manufacturers to reconsider offshoring the production of low-volume parts. If manufacturers are worried about a tax on imports, investing in U.S. manufacturing capabilities like 3D printing could make a lot of sense.

However, there are still open questions about how far and how fast the technology can advance. How much more can costs really be brought down? How much higher can the total output of these machines get? How much of the low-hanging fruit has already been addressed?

While it may not live up to the hype initially afforded it, 3D printing still has the potential to transform the relationship between manufacturers and consumers. Investors should temper their expectations, but be mindful of the effects that such a transformation could have on the market in the long term.

¹⁶ Beth McKenna, The Motley Fool. “3D Systems New Figure 4 3D Printing Tech...” September 17, 2016.



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