Micro

Innovation Report:
The Future of 3D Printing & Tooling it for the Manufactured World.

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Contents

Part I Introduction
Part II What is 3D printing and how is it changing?
Part III What will the future look like with 3D printing?
Part IV The factory of the future: How to integrate 3D
1. Rapid Prototyping
2. Tooling
3. Manufacturing Final Parts
4. De-Centralization
Part V The challenges
Part VI Concluding thoughts
Part VII Additional reading

Summary

As companies seek out more innovative approaches to manufacturing, we foresee the gap widening between forward-thinking and traditional manufacturers. The need to keep up with rising expectations, benchmarks, standards and efficiency requirements is making innovation a necessity, and the result is the industry undergoing massive transformation.

Michael Tucci,
CEO and President

Part I: Introduction

Embracing innovation is quickly becoming the most effective way to gain a competitive edge, and one way for companies to do this is with 3D printing.

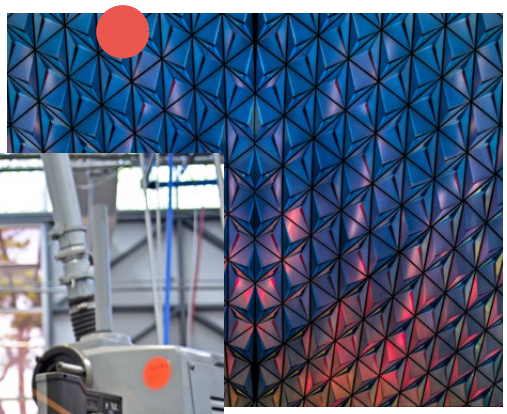
Part II: What is 3D Printing and How is it Changing?

3D printing, also referred to as additive manufacturing, is the process of directly forming a physical object from a 3D digital model via an additive process, typically by laying down and fusing many thin layers of a material using a device (naturally) called a 3D printer. Though not a new technology, recent advancements are starting to make a case for large scale commercial implementation of 3D printing, and understandably, many manufacturers have been exploring how additive manufacturing can improve and augment their traditional practices. In fact, according to Jabil, 93% of manufacturers expect to implement 3D printing into their parts production in some way in the next three to five years.

In past years many people have seen 3D printing simply as a cool gimmick, and did not see how it might scale economically. Today, however, scalability is becoming a reality. Additive manufacturing is reducing the time it takes for designers and engineers to conceptualize, create and test their prototypes for clients. Already, the "solution bandwidth" available to designers has drastically increased as alternative solutions can be explored and physically materialized very quickly using 3D printers. The very fact that 3D printing is available to designers provides them with options for broader and more creative solutions. What's more, Siemens predicts that 3D printing will become 50% cheaper and up to 400% faster over the next

To date, the most effective implementation of 3D printing has been in rapid prototyping, and it's no doubt been valuable in that sphere. However, there's more that we can and should consider in applying 3D printing to the factory of the future. New reports claim that it won't be long before 3D-printed assembly parts will be the norm in major commercial applications, including aerospace, transportation, automotive, medical and HVAC.

Part III: What Will the Future Look Like When it Comes to 3D Printing?



3D printing and additive manufacturing will evolve into a real commercial business solution, not just the prototyping tool for designers and students that it has been thus far. As 3D printing moves from a design tool to an economical assembly line technology, it will prompt large industry investment, which will in turn drive faster innovation of the machinery and technology for manufacturers. The future is bright.

Part IV:
The Factory of the Future: How to Integrate 3D Printing in Better Ways

"Factory of the future" may be a new term but it is quickly gaining traction as manufacturers recognize the disruption taking place across the industry, and 3D printing is almost always a significant part of this conversation. Here are the key ways that additive manufacturing will innovate and tool the manufacturing space in the coming years.

1. Rapid Prototyping

Rapid prototyping via 3D printing enables manufacturers to cater to ever-shorter client deadlines, allowing potential solutions and novel approaches to be explored in a fraction of the time required for conventional prototype construction. 3D printing also opens a world of opportunity for responding to urgent issues or sudden shifts in client needs, allowing manufacturing to bring more value than ever via real-time design problem-solving.

2. Tooling

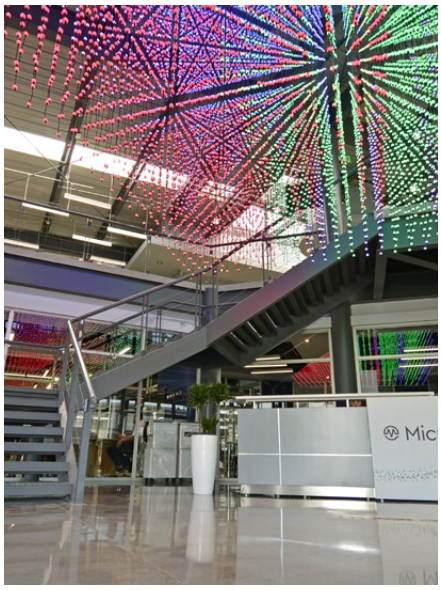
Wear and tear, part failure and other problems can occur on a manufacturing line. These challenges can halt production for repairs, which sometimes require parts that may traditionally have had significant lead times. With 3D printing and digital connectedness, rapid part replacement becomes a reality: instead of spending time and money procuring a critical part, it can be fabricated on-site, increasing efficiency and providing insurance against the possibility of missing client deadlines. In instances where micro tooling is required and precision is demanded, using 3D printing to print tooling parts perfectly will also be helpful, when seamlessly integrated into the process.

3. Manufacturing Final Parts

When we consider manufacturing in the future, there may be some instances where cumbersome tooling setups may not be preferred. For instance, where absolute precision is required, it may not be possible to deliver it using traditional setups. In these cases, tradition techniques can be bypassed altogether and perfection ensured by printing 3D parts directly. The market for production metal 3D printing is real and evolving very quickly, but it is important to consider not just the processes, but also the materials, to ensure that they meet all relevant requirements for precision fabrication.

A unique opportunity exists to seek out and use materials that historically couldn't be processed using traditional manufacturing. Instead of waiting for 3D printing capabilities to extend to the materials the industry knows well, we should consider advocating for change. As additive manufacturing continues to move from prototyping to production, component production should transition from traditional alloys suited to conventional production to a more exotic selection designed for additive manufacturing.

3D printing will likely make a lot of sense especially for high-impact, low-volume production. Additive manufacturing can cater to unique client needs without high setup costs, long timeframes and the huge



footprint associated with tooling and assembly line creation. Even in industries demanding high tensile strength and production quality, industrial grade thermoplastics are proving capable of delivering high enough performance for use in applications such as rockets and aerospace.

4. Decentralization

3D printing will enable possibilities for decentralization and globalization of manufacturing, changing the way we deploy parts around the world. With 3D printing, a digital thread can assist with distribution, logistics and rapid response times by distributing files to any location for faster part production and deployment wherever needed. This has the potential to revolutionize the way in which we manufacture, and when combined with other emerging technologies like AI and advanced automation, the factory of the future will likely look very different from the ones we have now.

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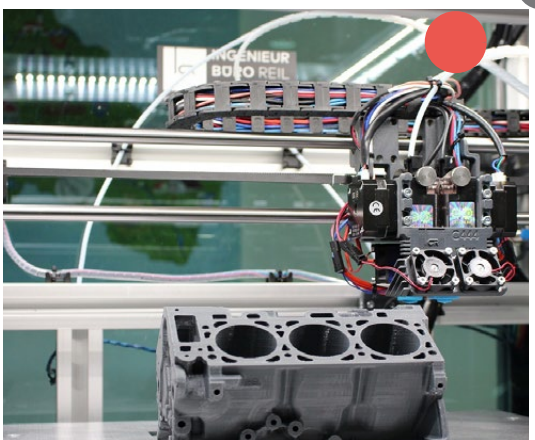
Part V: The Challenges

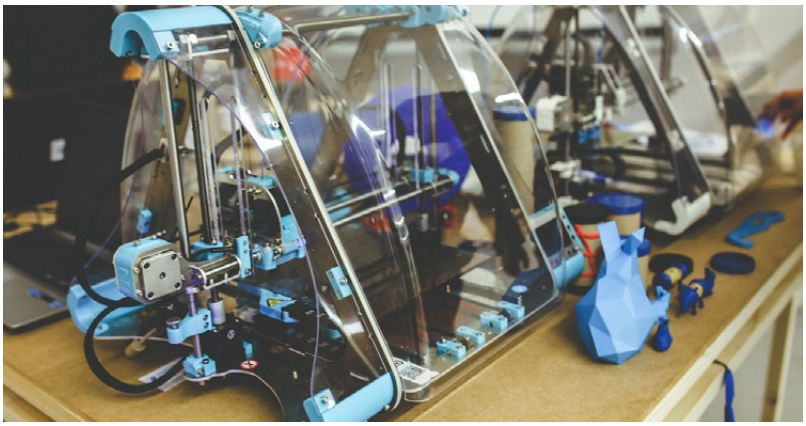
In the short term, the challenges associated with 3D printing continue to involve the ability to work with multiple materials economically and scaling production. Over time, these issues will be resolved. Compared to just two years ago, 3D printers now have faster production speeds, lower costs for commercial applications and enhanced material options (such as metal powder for 3D sintering). However, there is still a long way to go. As access to quality materials (such as thermoplastics) increases at an economical cost per part, 3D printing will become a viable option for manufacturers worldwide.

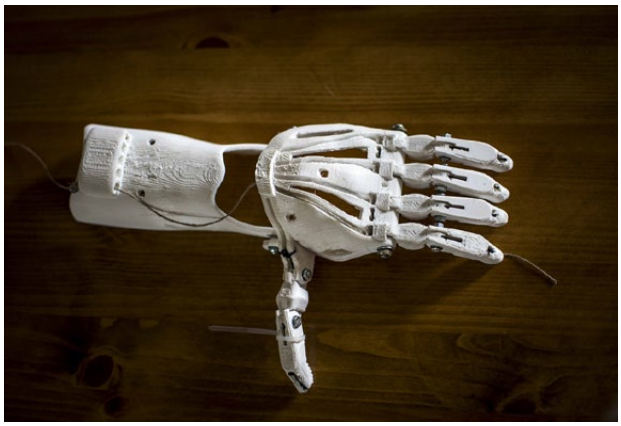
Part VI: Concluding thoughts

The commercialization of 3D printing is still very much in the trial period. As mentioned earlier, the use of 3D printing in design and prototyping stages is common (and helpful), but integrating additive manufacturing into production lines will take time, education and industry partnership. With that said, the future is encouraging. There is a clear knowledge gap in the industry and education is the key to exploring the options available to both manufacturers and clients. For instance, in the medical industry, equipment is expensive, but with micro-molding via 3D printing, designers don't need to worry about scale and complexity, and can ensure perfect part production. There will be a variety of considerations when comparing 3D printed molds to ones produced via conventional metal tooling, such as manufacturing time, cost, durability, and production quantities.

Experts agree that 3D printing will be a part of the factory of the future. Manufacturers that start planning for it now will be ahead of the game as advancements make it even more relevant for their production going forward.







Part VII:
Additional reading

- http://fortune.com/2015/09/17/3d-printing-future-of-manufacturing/
- https://www.forbesmiddleeast.com/en/how-3d-printing-is-shaping-the-future-of-manufacturing/
- https://www.manufacturingtomorrow.com/article/2018/01/the-future-of-3d-printing/10820
- https://medium.com/futuremakers/could-3d-printing-be-the-future-of-manufacturing-9d7d345e2c52
- https://www.jabil.com/insights/blog-main/future-of-3d-printing-additive-manufacturing-looks-bright.html

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