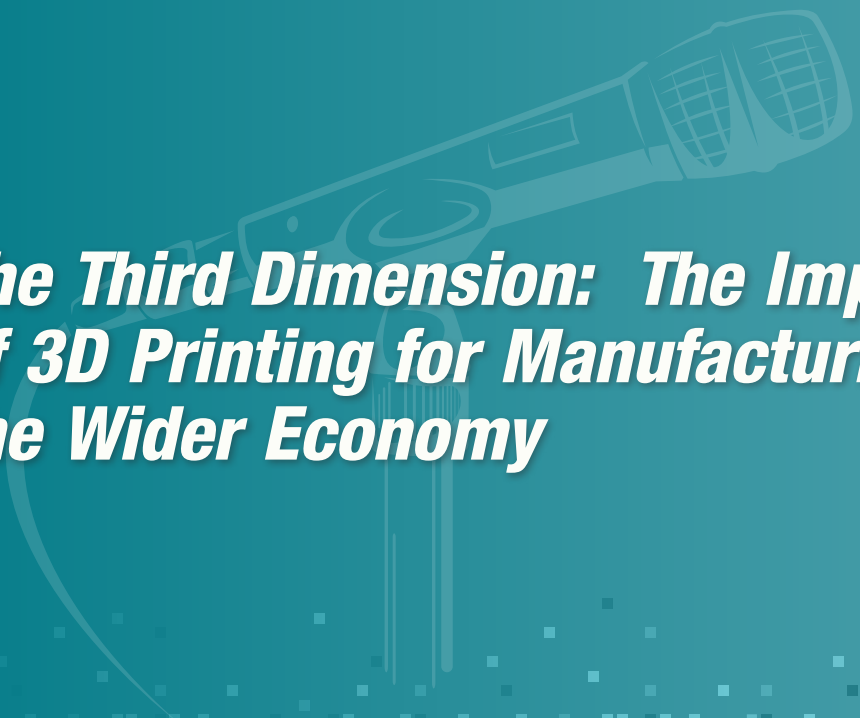
Capgemini Consulting

DIGITAL LEADERSHIP

An interview with

David Reis

CEO of Stratasys



The Third Dimension: The Implications of 3D Printing for Manufacturing and the Wider Economy

Transform to the power of digital

David Reis
CEO of Stratasys

"The 3D printing industry has been around for almost 25 years, but started gaining widespread adoption in the last 4-5 years."

3D Printing: Welcome to the Third Dimension

Capgemini Consulting: What are the key reasons for the increasing adoption of 3D printing?

David Kies: The 3D printing industry is not new. It has been around for almost 25 years and has been evolving ever since. However, it started gaining widespread adoption some four or five years ago when manufacturers realized the potential of 3D printing for design and manufacturing. 3D printers costs have also dropped dramatically: from $30,000 to $40,000 three or four years ago to anywhere between $1,000 and $15,000, sometimes even lower. 3D printers have also become far more user-friendly in terms of software, man-machine interfaces and network connectivity.

Capgemini Consulting: What are the key applications of 3D printing?

David Kies: There are three main applications: Concept Modeling, Prototyping and Manufacturing Tooling.

Concept Modeling allows designers to perfect product designs before taking them to the next stage. In Prototyping, the designer creates a functional prototype in order to verify and evaluate the design before production (see Exhibit 1 on PUMA). The third application, Manufacturing Tooling, includes the 3D printing of tools for manufacturing, such as jigs, as well as the production of end-use parts. For these applications, 3D printing is particularly useful for productions with tight deadlines and when a high level of customization is involved.

"There are three main applications for 3D printing in manufacturing: Concept Modeling, Prototyping and Manufacturing Tooling."

Capgemini Consulting: How does 3D printing benefit these applications?

David Kies: In Concept Modeling, after a product is designed, it can be 3D printed and brought to a focus group where design modifications are discussed. Here, 3D printing is used as a means of communication to clearly convey concepts to colleagues, marketers and clients.

"3D printing enables organizations to build prototypes quickly in-house."

In the Prototyping stage, 3D printing can help detect product flaws before they reach the manufacturing stage and enable improvements early in the design process (see Exhibit 2 on Xerox). By reducing the scope of error before actual production, manufacturers are able to avoid material waste and save on costs. 3D printing enables organizations to build prototypes quickly in-house, thereby reducing the time it takes for product completion.

In Manufacturing Tooling, traditional technologies such as injection molding are not always the most cost-effective and efficient. For example, let's say you need to manufacture a limited edition model of a car and later switch to a different model. In this scenario, you need to switch around the jigs used in the assembly process. Here, 3D printing is often more efficient in terms of time and cost in manufacturing these customized parts. By drastically reducing the production time for manufacturing tools, 3D printing offers manufacturers the flexibility to explore new opportunities and respond quickly to production needs.

"3D printing tools and parts prove to be highly efficient and cost-effective for customized or short-run production."

Exhibit 1: PUMA Reduces Its Prototype Creation Time by 75% With 3D Printing

- PUMA, a leading sports apparel brand, aims to become the most competitive, attractive and sustainable sports-lifestyle company. This requires a strong focus on style and creativity, a challenge for a company with geographically dispersed design and manufacturing. This involves extensive planning and multiple product iterations, often carried out across several continents.

A lengthy design process

- PUMA had an elaborate quality check process that was proving to be time-consuming and tedious. The quality check process involved first designing the shoe and then sending the design for tooling. However, the design and manufacturing teams were based in multiple locations and countries. This made collaboration during the design process difficult. Once the tooling process was completed, a product prototype was created, which would then get sent back to the quality assurance team – a process that would often take several days. PUMA needed a solution that would reduce the time required to create prototypes and improve collaboration across teams.

3D printing enabled more design iterations in less time

- As a first step, PUMA switched from outsourcing its prototypes to installing in-house 3D printers at three key sites – US, Germany and Vietnam. The 3D printers enabled the design teams at PUMA to create more design iterations and prototypes in less time. Today, the 3D printers at PUMA produce a prototype of the shoe sole for an initial design review, a second prototype for a construction review and a third model for metal casting. Each team is now able to print the same prototype model for review discussions, thereby helping them to communicate much more easily than before. These teams are now able to reference the same physical model and reach a consensus on overall product design.

Benefits

- With 3D printing as an integral part of the prototyping and quality check process, PUMA has been able to reduce the time required to create prototypes by 75%. While creating a single prototype used to take anywhere between three and four days, it now only takes a single day. 3D printing has also resulted in fewer iterations and design mistakes.

3D Printing's Impact on the Wider Economy

Capgemini Consulting: You recently mentioned that 3D printing is playing a pivotal role in bringing manufacturing back onshore to Europe and the US. Why do you believe 3D printing is contributing to this phenomenon?

David Kies: Outsourcing provides availability of cost-effective labor, which is extremely beneficial when large quantities need to be produced. In scenarios where a short-run production[2] is required for highly customized products, tooling costs tend to be higher. In such instances, the labor advantage becomes irrelevant due to the high tooling costs. For customized or short-run production – which is a key trend in the industry –the offshore model is not very competitive.

In such scenarios, 3D printing the tools and/or the parts themselves proves to be highly efficient and cost-effective while delivering a high level of accuracy. This highly-customized or short-run production manufacturing can therefore be brought back onshore with 3D printing.

Capgemini Consulting: Do you believe that the prospect of bringing manufacturing back to developed countries is pushing governments to popularize 3D printing?

David Kies: I think this phenomenon is certainly pushing governments to embrace 3D printing. We are already seeing governments across the globe contributing to the popularization of 3D printing. For instance, the US government has pledged funding of up to $60 million to the National Additive Manufacturing Innovation Institute (NAMII), which is a public-private partnership aimed at transitioning 3D manufacturing technology to the mainstream US manufacturing sector. In his 2013 State of the Union address, President Obama spoke about the industrial potential of 3D printing and the return of the tech-industry and other manufacturing jobs to the USA. The UK government, as part of its Industrial Strategy, has committed to an investment of £15 million towards the development of 3D printing projects. The EU, in its future industrial policy, identified 3D printing as a top priority for reviving the manufacturing sector.

> *"Nokia already allows you to 3D print your own customized cover for selected mobile phones."*

A Multi-Dimensional Future: The Road Ahead for 3-D Printing

Capgemini Consulting: What are some of the possible long-term growth areas for 3D printing technology?

David Kies: In my opinion, ten years down the line, I see three main growth drivers for 3D printing. The first is Direct Digital Manufacturing (DDM), where physical parts are easily created, directly from 3D CAD (Computer-Aided Design) files. For this technology to be widely used, we need to develop both suitable hardware, which, is robust and industrial grade, and better materials. This is important because 3D printed products should functionally and aesthetically mimic the products manufactured using traditional methods to ensure consistency in design. This is crucial when considering mechanical properties and part reliability.

The second growth driver is the Education sector. For example, many UK schools are proposing to introduce 3D printing as a part of their curriculum. Ten years from now, every high school and university should have more than one 3D printer.

The third growth driver is Prosumers – people actively customizing typically mass-produced goods for their own needs. This market consists of engineers, designers, architects and product manufacturers who use 3D printing either for semi-professional work or as a hobby. Stratasys recently announced its merger with MakerBot, which has become a world leader in this segment by targeting prosumers with relatively low cost, easy-to-use 3D printers.

> *"3D printing can be most effective when applied to specific parts of the manufacturing process."*

Exhibit 2: Xerox Slashes Costs Around Mold Creation By 91% Using 3D Printing

- Xerox is the world leader in business process and document management services. For its package manufacturing process, the company used thermoforming. This process involves heating a plastic sheet to a high temperature to make it pliable. The sheet is then bent into a specific shape using a mold and the excess portions are trimmed, resulting in a usable product. This process, which once was the norm, was proving to be expensive and time-consuming.

Too many iterations with traditional manufacturing processes

- In the past, Xerox used wooden molds for thermoforming. These wooden molds were created using traditional manufacturing processes, resulting in several iterations before a satisfactory result could be obtained. Moreover, geometric restrictions often made it impossible to improve the performance and reduce the cost of the thermoformed part. The entire process would typically cost $1,200 and it would take about a week to produce a single wooden mold. Xerox needed a process that would create molds faster and at a reduced cost.

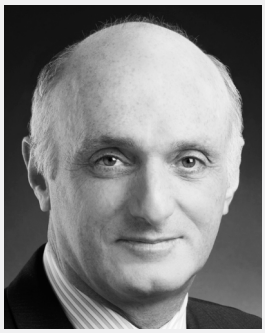
Using 3D printing to produce molds

- Xerox was already using 3D printers to produce prototype parts. The company soon realized the potential of 3D printers in producing fixtures and for assembly tooling in the manufacturing process. Using 3D printing, Xerox was able to do away with its expensive machining process and reduce the cost of producing a single mold by 91% – from $1,200 to as little as $100. Xerox was also able to accelerate its thermoforming process by drastically reducing lead time by 93%. Previously, the process would take a week but now it could be completed in just four hours.

References

1 Short-run production connotes the manufacturing of a relatively low volume of parts or products in comparison with high volume or mass production

2 Gartner, “Forecast: 3D Printers, Worldwide, 2013”, September 2013



David Reis

CEO of Stratasys

3D printing is gaining significant attention and momentum. Gartner predicts that worldwide shipments of sub-$100,000 3D printers will grow 49% this year[2]. In this edition of our Digital Transformation Review, we focus on Stratasys, one of the leaders in 3D printing. We interviewed David Reis, CEO of Stratasys, to understand the possible implications of 3D printing for the manufacturing industry and on to the wider economy.

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