

The Transformative Power and Potential Perils of 3D Printing—and What It All Means to Outsourcing

By Patti Putnicki, Business Writer



It almost seems like something from a science fiction movie; a brainchild of a clever writer or the product of a young child's fertile imagination. But, 3D printing is very real indeed, with the power to completely transform manufacturing, health care, engineering and retail—from the way parts and products are designed and produced to the way inventory is managed.

Although 3D printing has recently made nearly every analyst's "top ten industry disrupter" list and attracted the attention of the media and curious consumers alike, the technology itself isn't exactly new.

"Three-D printing is actually about 30 years old. Originally, it was very prototype focused, and it has stayed that way for the last 20-25 years," explained Kevin T. Lewis, director of Corporate Strategy for Xerox. "Today, new materials and new technologies enable 3D printing to print functional production parts. That's the factor that has driven the change."

Whereas 3D printing with plastics might work for prototypes, 3D printing with powdered metal transforms that prototype into an actual product, without soldering components together or the inherent limitations of traditional assembly line production.

All of a sudden, parts designers have more leeway for creativity—and possibilities. At the same time, production takes on the "what you need it, when you need it" quality of digital printing or, on the services side, cloud computing.

A Quick Primer on How 3D Printing Works

Let's say a designer has a great idea for a metal automotive part that was previously three parts soldered together. He or she creates a 3D image with a computer-aided design (CAD) package or with a 3D scanner, which transforms the image into a digital, 3D model. The image is fed into the printer, just as one would with a Word doc or PowerPoint image on a traditional printer.



The 3D printer then splices the object into sections and “builds” the object, layer-by-layer, bit-by-bit, from the ground up.

“In one method, a laser fuses together ultra-thin layers of the metal powder, raises it up, and then fuses another thin layer until the object is fully built,” Lewis of Xerox explained. “Other methods use nozzles or inkjet printheads. Think of what it looks like to pipe frosting to make a rosette on a birthday cake. This method works much the same way, jetting the appropriate material through a nozzle or printhead to build the object, layer by layer.”

This process, also known as “additive manufacturing,” could take thousands of repetitions from starting point to completed product.

Not only does 3D printing eliminate some past limitations around product and part design, but it also significantly reduces waste. Instead of cutting out an object from metal, or injection molding plastic, you’re building the article from a powdered or liquid version of that material. So, you waste less raw material. In some cases, it transforms production from a multi-machine process into a single printer process. And, because designers can bypass the traditional tooling that accompanies the testing, redesigning and retesting phases in prototype creation, 3D printing can cut design time in half.

“I think it’s important to point out that while 3D printing speeds the design process because it eliminates the need to build a jig, tool a prototype and repeat that physical process until a workable design is created, the actual production of that part via 3D printing doesn’t happen quickly. It’s a process that is best suited to small manufacturing runs, like producing 100 specialty engine parts,” Lewis said. “The technology is definitely not yet capable for a mass production runs, but over time, I think that will change.”

Where It’s Making an Impact

Although home 3D printers are readily available for a price, the consumer market is still currently very small compared to the commercial sector.

“Three-D printing is a \$2-\$2.5 billion market today, and at most, \$100, million of that is the consumer market. While the consumer market is the one that everyone writes about, because it’s sexier to talk about, it is still in its infancy,” Lewis said. “Because you do need some expertise to design for 3D printing, and to understand how to use the software itself, every consumer can’t buy a device and start using it proficiently. And, these printers are still very limited in the materials and color they can print.”



In lieu of a rapid home 3D printing market developing, Lewis anticipates more of a hybrid consumer model, in which people go to their local UPS Stores or other 3D print service facilities to print out spare parts, personalized craft products (a la Etsy) or similar fare.

But, commercial adoption is quite a different story.

According to Lewis, the aerospace, automotive and health care industries have all invested significantly in 3D systems, as have the governments of the United States and China.

One of the most visible commercial success stories is General Electric (GE) Aviation, which is using the technique to free its engineers to build ‘the perfect jet engine,’ an initiative recently publicized widely and showcased in a [YouTube video](#).

The medical community is also embracing 3D printing to produce prosthetics, which is a perfect use case, in that each artificial limb is custom designed for the individual. Even Invisalign® “customized teeth aligners,” the teeth-straightening alternative to traditional metal braces, are created using 3D printing systems. And the list expands from here.

While all of this is exciting stuff, Lewis (and industry consultant Wohlers Associates, which estimates the market for 3D printing will triple to about \$6 billion annually by 2017), believes we’ve only begun to explore what companies can do with these advanced systems.

“When you can print a 3D object and, at the same time, embed fully functional electronics, which is something our researchers at PARC (Xerox’s famed Palo Alto research facility) are working on right now, that’s when we see things change,” Lewis said. “Imagine a future where printing a human ear with a functional electronic hearing aid at the same time. That capability will truly disrupt how things are manufactured.”

And may have the potential to change the world.

Patents, Copyrights and Legalities—Oh, My

It is impossible to have a discussion about 3D printing without talking about the legal ramifications. If you believe the blogosphere, this new technology presents a significant threat to patent and copyright holders. Are we entering an infringement free-for-all?

“Three-D printing doesn’t change current patent laws at all. The designs and products are protected in the same way whether they’re produced on a printer or on an assembly line,” explained R. David



Donoghue, trial lawyer, partner and deputy practice group leader for Chicago-based Holland & Knight's Intellectual Property Group. "The technology probably will make it easier for companies and individuals to infringe on these patents, so we may see an uptick in lawsuits. But, I don't anticipate any laws changing, even as these systems increase market penetration."

Donoghue thinks that the biggest, most immediate change will be within patent holders' own internal processes.

"Companies will become more vigilant and put more safeguards in place to recognize infringement issues and effectively enforce these," Donoghue said.

But, what about the consumer side? What about the claims that 3D printing is destined to have the "Napster effect," and replicate the impact MP3 files had on the music industry.

"Digital music was consumer-driven, and downloading music was easy," Lewis of Xerox said. "It's not easy to design a product for 3D printing and, as far as forecasts go, no one is basing the industry's massive growth on consumer adoption."

Will there be proprietary CAD files for sale by fraudsters, or posted for free by some rogue web sites? No question. But, at the present time, our experts believe that threats posed by the consumer market aren't as substantial as the chatter might have you believe.

"I do see a potential scenario where a consumer decides, instead of purchasing a \$200 auto part, to go to a site, buy a CAD file and print a cheaper, plastic version of what he needs, and then ultimately have that 'self-produced' part fail," Donoghue of Holland & Knight said. "While my initial reaction is that neither the company that makes the real product nor the printer manufacturer would be liable in this case, incidents like this could increase legal costs and, albeit falsely, create a significant PR problem for the manufacturer. The problem is we won't know how much of this is going on until something goes wrong or a rogue part fails."

The Very Real Outsourcing Opportunity

Finally, let's talk about how companies are going to take advantage of all the possibilities this new world of 3D printing brings. Will this technology, like the data centers of old, be relegated to companies that can bankroll a large capital expenditure to get in the game?

Not if savvy outsourcers have something to say about it.



“Right now, about one-half of the 3D printing market is through service bureaus, or outsourcers, which makes perfect sense,” Lewis of Xerox said. “It enables companies to not only produce what they need but use 3D printing technology when they need it, without investing capital. Right now, seven different technologies are used for 3D printing, making the market very fragmented. So, unless you’re a GE Aviation, the service bureau model makes a great deal of sense—and probably will for a long time to come.”

No question, it’s going to be a very interesting future, coming to a city near you—in 3D.