The R & D Tax Credits and the U.S. 3D Printing Initiative

By Charles G. Goulding, Andressa Bonafe and Gary Savell

Charles G. Goulding, Andressa Bonafe and Gary Savell discuss the advances in 3D printing technology and urge manufacturers using 3D printing technology to take advantage of the R & D tax credits available to them.

In his State of the Union address, President Obama urged the Congress to "guarantee that the next revolution in manufacturing is made in America." To that end, the President highlighted the central role of one revolutionary emerging technology. In his own words, "3D printing [that] has the potential to revolutionize the way we make almost everything." The President emphasized benefits from innovation in this promising field, alluding to the transformation of "a once-shuttered warehouse" in Youngstown, Ohio, into the state-of-the-art National Additive Manufacturing Innovation Institute.[1]

Referring to his proposed creation of a network of manufacturing hubs, Obama insisted that there is no reason why 3D printing innovation initiatives should not spread around the entire nation. In fact, federal R & D tax credits are available to assist companies willing to take part in the imminent 3D printing revolution.

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The Research and Development Tax Credit

The federal research and development (R & D) credit came into existence with the enactment of the Economic Recovery Act of 1981.[2] It allows a credit of up to 13 percent of eligible spending for new and improved products and processes. Qualified research must meet the following four criteria:

- new or improved products, processes or software;
- technological in nature;
- elimination of uncertainty; and
- process of experimentation.

Eligible costs include employee wages, cost of supplies, cost of testing, contract research expenses and costs associated with developing a patent.

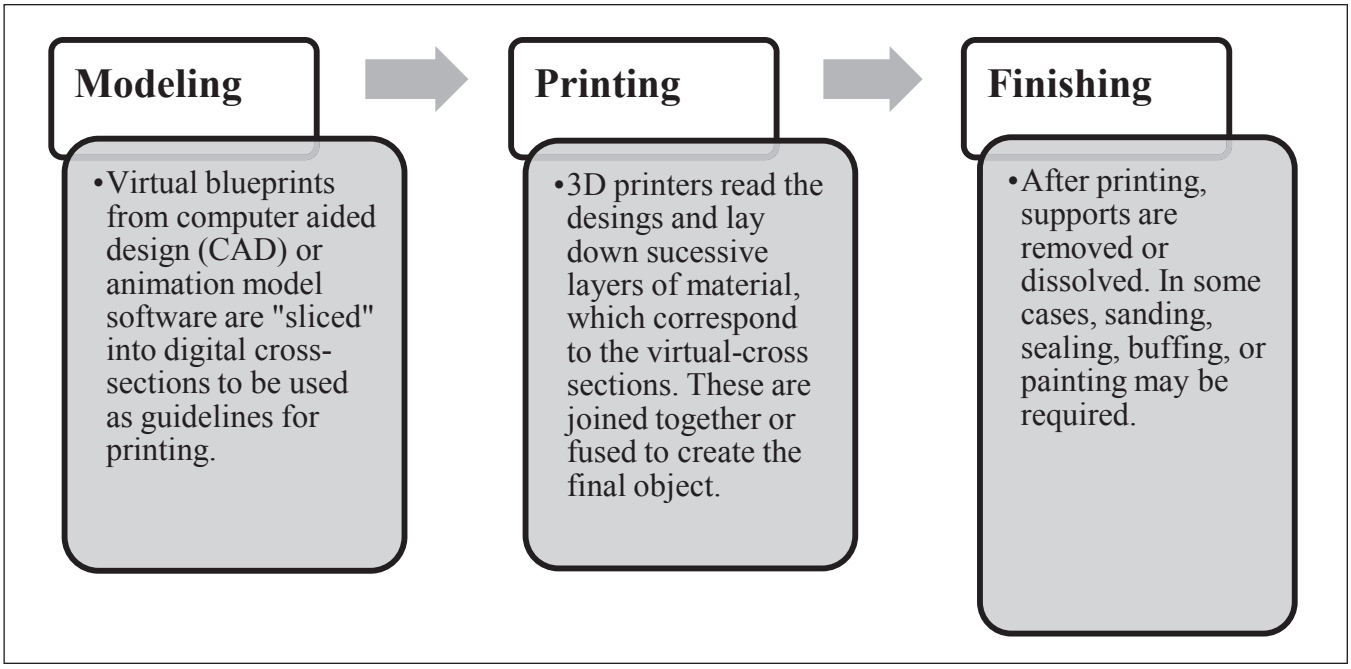
On January 2, 2013, President Obama signed the bill extending the R & D Tax Credit for 2012 and 2013 tax years.[3]

Understanding 3D Printing

3D printing, or additive manufacturing, is the process of building three-dimensional objects from digital models. This is achieved through

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Exhibit 1.

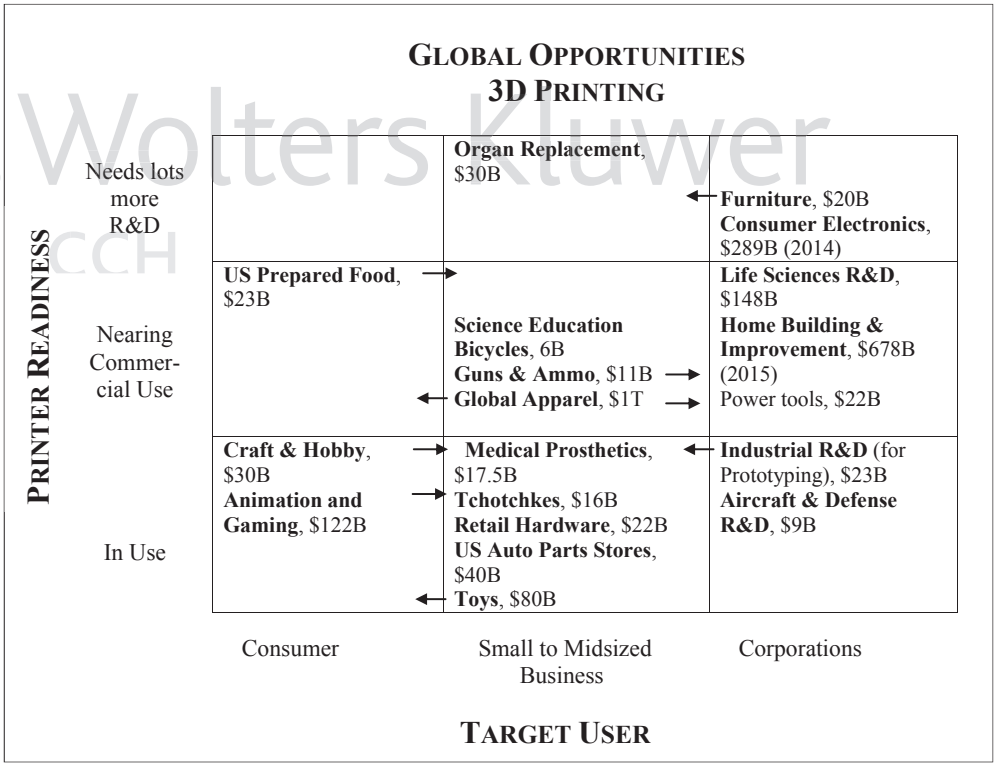


an additive technique, which consists in laying down successive layers of material. This process is clearly distinguishable from traditional machining techniques, which largely rely on subtractive methods (such as the removal of material through cutting or drilling). This revolutionary technology is based on three main principles shown in Exhibit 1.

Different 3D printing processes are available to process diverse materials. Examples include fused deposition modeling (FDM) used for thermoplastics, eutectic metals and edible materials; selective laser sintering (SLS) for thermoplastics, metal powders and ceramic powders; electron beam melting (EBM) used for titanium alloys; laminated object manufacturing (LOM) for paper, metal foil and plastic film; and stereolithography (SLA) applied to photopolymers.

The first crude 3D printer was invented about 30 years ago by Chuck Hull, co-founder of 3D Systems, a leading provider of 3D content-to-print solutions.[4] Since its first rudimentary application, the technology has become indispensable for a number of industries. It was initially used in the production of prototypes, particularly in aerospace and automobile companies. With time, however, 3D

Exhibit 2.



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printers evolved in capacity and ability to process different materials, which has allowed for its ever growing use in the creation of final products ranging from medical implants and footwear to jewelry.

Exhibit 2, originally published by Forbes Magazine,[5] presents an interesting overview of industries with 3D printing applications, the readiness of the technology and potential users (cross-segment uses are represented by arrows).

A Revolutionary Technology

Even though progress has been made, there is still a long way to go in the expected 3D printing revolution. Among the current challenges to existing technologies are the limited speed and volume at which objects can be printed and the high costs involved.

The revolutionary potential of 3D printing, however, is unquestionable. Many believe that this technology will change the world as we know it. Steve Faktor, founder of startup incubator IdeaFaktory, author of Econovation[6] and former head of the American Express Chairman's Innovation Fund, compares 3D printing to the internet: "Just like the web revolutionized entertainment, shopping and communication, 3D printing will power a local and personal industrial revolution."[7] Its effects on product availability, energy use, customization and waste will transform the way industries function, from construction, sciences and medicine, to art and, most clearly, manufacturing. A recent advancement at Cornell University exemplifies this revolutionary potential. Researchers announced, on February 21, 2013, the development of 3D printed artificial ears that are practically identical to real ones, both in resemblance and functionality.[8]

The future of 3D printing looks even brighter as research advances in the development of a new, and less onerous, method to produce titanium, largely used in printers. According to a recent article from The Economist,[9] Metalysis, a small British firm, has developed a promising process that uses electrolysis on powdered oxides, which would significantly reduce costs of 3D printing. The technology is expected to skyrocket with lower prices and foreign-built printers in 2014 at the expiration of key patents. The technology currently covered by patent is the SLS technology, which is the lowest cost method of 3D printing.[10]

In his recent book, Makers: the New Industrial Revolution, Chris Anderson highlights a fundamental aspect of the 3D printing revolution, which he denominates the emerging "Maker market." With access to open-source design and 3D printing, entrepreneurs are engaging in micro-manufacturing and creating a tsunami of highly customized products, produced in small quantities and at higher margins. The author points out that some of the industrial giants of professional design and engineering are shifting their focus to this emerging market. Autodesk, PTC and 3D Systems, for instance, have recently "released free design software for amateurs and even kids, along with service bureaus that let them upload their designs and have them 3D printed or laser cut."[11]

3D Printing R & D

R & D expenses are increasing throughout the entire 3D vertical industry, ranging from the 3D printing manufacturers themselves to their end-user customers. While the increase in 3D design software availability is directly affecting small businesses and individuals, a wide range of product manufacturers are inserting 3D printing in their core businesses. Exhibit 3 illustrates the recent exponential growth in R & D investment for two 3D printing industry leaders.[12]

Proto Labs went public on February 24, 2012, and has increased its R & D expenses from $5.22 million in February 2012 to $8.21 million in September of the same year. ExOne went public on February 7, 2013, and has announced it will invest its capital in innovative materials for its 3D printing systems. In a marked difference from its competitors, which focus both on the consumer and commercial sides of 3D printing, ExOne concentrates solely on printers for large industrial companies, such as aerospace and automotive.[13] On June 19, 2013, Statasys announced that they will be acquiring desktop 3D printing company, MakerBot, in a deal worth $604 million.[14] They also later announced 116 percent in revenue growth and that large companies such as UPS will begin selling 3D printing services in some of their retail stores.[15]

Exhibit 3.

Company	2010 R&D Expense	2010 Employees	2011 R&D Expense	2011 Employees	2012 R&D Expense	2012 Employees
3D Systems	$ 10,700,000	484	$ 14,300,000	714	$ 23,200,000	1,010
Stratasys	$ 9,800,000	414	$ 14,400,000	530	$ 16,250,000	1,100

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Conclusion

3D printing represents a unique opportunity to revamp the U.S. economics of manufacturing and restore the country's leading position as an innovator. The domestic production of such revolutionary printers is bound to boost revenue and job creation in the manufacturing sector. Additionally, the diffusion of such technology will significantly expand economic prospects for individuals and small businesses. Companies engaged in 3D printing R & D activities should take advantage of federal tax credits designed to accelerate the necessary breakthroughs that will open the way to a new future.

Endnotes

1 Josh Peterson, *Obama Talks 3D Printing, Calls on Congress to Create Network of Innovation Hubs,* Daily Caller, Feb. 13, 2013, available online at *http://dailycaller.com/2013/02/13/obama-talks-3-d-printing-calls-on-congress-create-network-of-innovation-hubs/.*

2 Economic Recovery Act of 1981 (P.L. 97-34).

3 American Taxpayer Relief Act of 2012 (P.L. 112-240).

4 Ashlee Vance, Bloomberg Businessweek, *3D Printers: Make Whatever You Want,* Apr. 26, 2012, available online at *www.businessweek.com/articles/2012-04-26/3d-printers-make-whatever-you-want.*

5 Steve Faktor, *How HP Could Reinvent 3D Printing … and Itself,* Forbes, Oct. 15, 2012, available online at *www.forbes.com/sites/stevefaktor/2012/10/15/how-hp-could-reinvent-3d-printing-and-itself/.*

6 Steve Faktor, Econovation, (John Wiley & Sons, 2011).

7 *Supra* note 5.

8 *Scientists Create Lifelike Human Ears Using 3D Printing Technology,* NY Daily News, Feb. 21, 2013, available online at *www.nydailynews.com/life-style/health/lifelike-ears-created-3d-printing-article-1.1270161.*

9 *A Tantalising Prospect, Exotic but Useful Metals Such as Tantalum and Titanium Are About to Become Cheap and Plentiful,* The Economist, Feb. 16, 2013, available online at *www.economist.com/news/science-and-technology/21571847-exotic-useful-metals-such-tantalum-and-titanium-are-about-become-cheap.*

10 Christopher Mims, *3D Printing Will Explode in 2014, Thanks to the Expiration of Key Patents,* Jul. 21, 2013, available online at *http://qz.com/106483/3d-printing-will-explode-in-2014-thanks-to-the-expiration-of-key-patents/.*

11 Chris Anderson, Makers: the New Industrial Revolution (New York, Crown Business, 2012).

12 Source: *http://ycharts.com/companies/DDD/r_and_d_expense_ttm.*

13 Brian Deagon, *ExOne Focuses on Different Materials for 3D Printers,* Investors' Business Daily, Feb. 25, 2013, available online at *http://news.investors.com/technology/022513-645627-exone-3d-printer-expansion.htm.*

14 Kelly Clay, *3D Printing Company MakerBot Acquired In $604 Million Deal,* Forbes, Jun. 19, 2013, available online at *www.forbes.com/sites/kellyclay/2013/06/19/3d-printing-company-makerbot-acquired-in-604-million-deal/.*

15 Brian Deagon, *Statasys Pumps Up 3D Printers as Revenue Jumps 116%,* Investors' Business Daily, Aug. 8, 2013, available online at *http://news.investors.com/technology/080813-666894-stratasys-second-quarter-earnings.htm.*

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