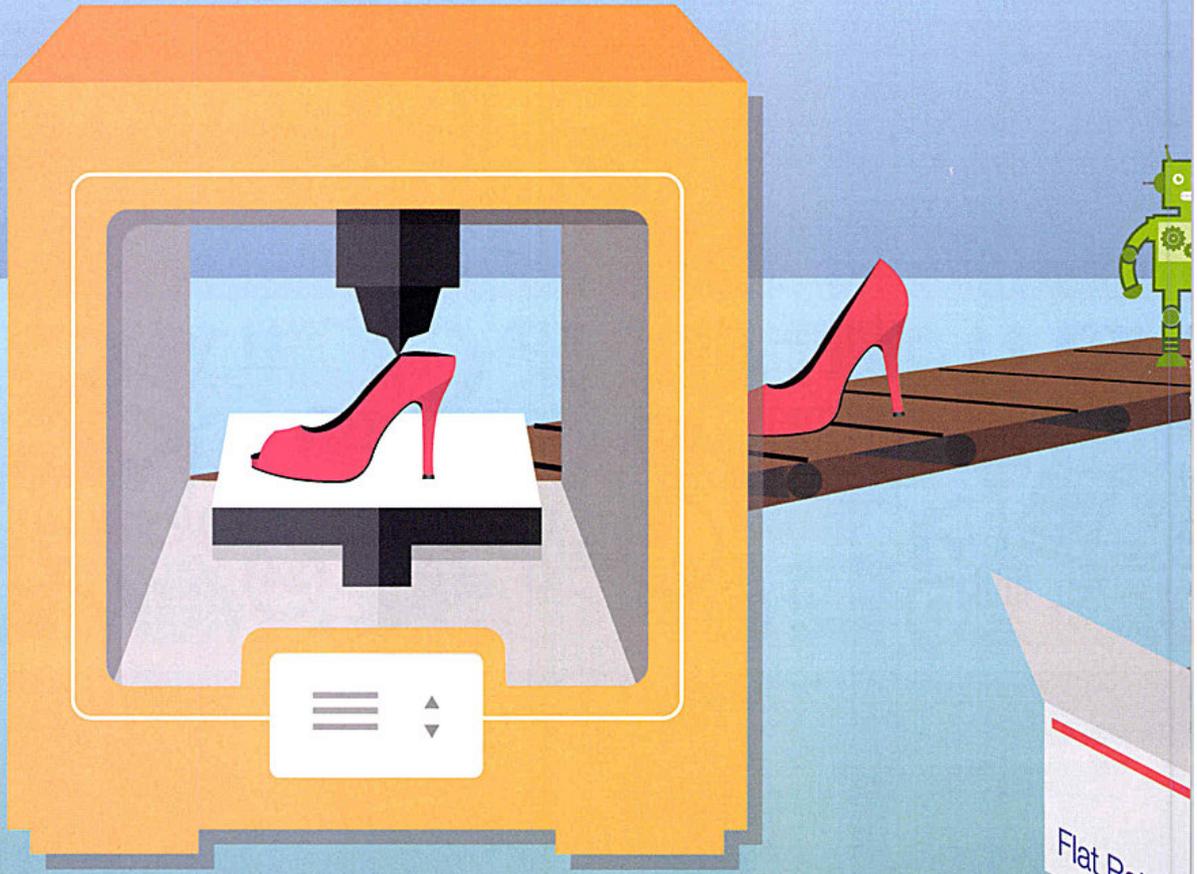


28 **3D PRINTING**

US Postal Service Office of Inspector General



# New dimension

HOW WILL THE DEVELOPMENT OF 3D PRINTING TECHNOLOGY AFFECT THE POSTAL INDUSTRY, AND WHAT ROLE WILL OPERATORS PLAY IN THE FUTURE?



**The development** of 3D printing – whereby digital files are converted into physical objects via a special printer that builds solid objects one razor-thin layer at a time using plastics, powders, metals, polymers or other materials – is set to have a big impact on the manufacturing industry. According to research by industry analysts Canalis, the 3D printing industry will grow from US\$3bn in 2013 to US\$16.2bn in 2018, while the McKinsey Global Institute estimates its total economic impact could be as large as US\$550bn per year by 2025. Industry expert Terry Wohlers believes that if 3D printing took over 2% of the US\$10.5 trillion global manufacturing industry, it would be a US\$210bn annual industry.

With numbers like this, it is clear to see why so many ancillary industries are keen to understand and capitalize on 3D printing, the postal sector included. In July 2014, the United States Postal Service (USPS) Office of Inspector General released a white paper entitled *If it prints, it ships: 3D printing and the postal service*, which sought to identify possible opportunities this new manufacturing market would bring to the postal industry.

In the white paper, USPS asked Laurits R Christensen Associates (Christensen Associates), an economic consulting firm with wide in-depth knowledge of USPS operations, to assess what impact a 3D printing revolution could have on USPS. To do so, Christensen Associates analyzed commercial package data from fiscal year 2013 (October 1, 2012 to September 30, 2013), focusing on industries and parts of the supply chain that would likely be affected by increased levels of 3D printing, such as the market for toys, electronics, jewelry and auto parts. Christensen Associates conducted a scenario analysis to account for differences in the future development of 3D printing and identified two scenarios that are directly relevant to postal operators: centralized 3D printing where businesses sell finished 3D printed goods to consumers, and decentralized 3D printing where people print goods at home instead of buying them.

**Centralized 3D printing** Given that 3D printing dramatically lowers the barriers to entry for manufacturing, small 3D printing

businesses are already cropping up. They primarily use industrial-grade printers, selling high-quality customized goods and/or printing services over the internet. As this burgeoning sector grows, these businesses could increasingly compete on speed. This could lead them to place their printing facilities near shipping nodes, which would enable them to get their products into the delivery stream more quickly. This creates a potential win-win opportunity for these businesses and USPS.

Christensen Associates projected that this scenario could lead to an 18% increase in USPS commercial package volume, which translates into around US\$485m in additional annual revenue, based on 2013 figures and assuming a medium level of 3D printing disruption. USPS's benefit from 3D printing will be tied to the strength of its network. Any weakening of this network – through reductions in important features such as service frequency, number of delivery points, track and trace services, or pick-up options – could result in the operator forgoing new opportunities in 3D printing.

USPS could market itself as a logistics partner for 3D printing businesses located near postal facilities, giving them a streamlined way to ship products quickly. In addition, USPS has more than 60,000,000ft<sup>2</sup> of excess space nationwide, much of which is in mail processing centers. These are industrial facilities that could accommodate the electrical power and ventilation needs of large 3D printers. USPS could lease some of this space directly to 3D printing businesses, making it even easier for them to ship products quickly.

**Decentralized 3D printing** Much of the buzz around 3D printing is based on the idea that people could one day use affordable, high quality in-home printers to make many, if not most, of the items they now purchase from retailers. This is highly unlikely. If in-home 3D printers become ubiquitous, they would probably only be used for relatively few items. Nevertheless, this improbable scenario would be massively disruptive to the retail supply chain. It could lead to big cuts in bricks-and-mortar and e-commerce sales, and a corresponding drop in the number of commercial packages shipped (Figure 1).



**VULNERABLE TO DISRUPTION**

If a broad swath of Americans were to use in-home 3D printers to create many of the items they need instead of buying those products from retailers, it could turn the retail sector upside

down. More than 900,000 retailers with some US\$1.16tn in sales could see some of their business supplanted. The sectors and their sizes are outlined below.

RETAIL SECTOR	NO. OF BUSINESSES	TOTAL SALES (MILLIONS)
MISCELLANEOUS RETAILERS	198,146	US\$48,611
CLOTHING	187,528	US\$190,960
GIFTS, NOVELTIES AND SOUVENIRS	103,351	US\$25,355
ELECTRONICS	103,214	US\$143,850
SPORTING GOODS	61,453	US\$38,985
JEWELRY	53,781	US\$44,979
AUTO PARTS	45,554	US\$162,322
GENERAL MERCHANDISE	37,518	US\$408,080
HOBBIES, TOYS AND GAMES	36,888	US\$26,059
SHOES	30,853	US\$25,804
SEWING, NEEDLEWORK AND PIECE GOODS	18,930	US\$10,189
HOUSEHOLD APPLIANCES	16,998	US\$14,346
MUSICAL INSTRUMENTS	11,731	US\$6,314
OFFICE SUPPLIES AND STATIONERY	10,958	US\$9,526

Source: USPS OIG graphic based on Christensen Associates analysis of 2011 retail sales data

Figure 1

Even though a vast range of products under this scenario would be printed at home instead of being shipped to consumers, every household doing frequent printing would need a variety of 3D printing materials so that they could continue to make the things they need. Analysis from Christensen Associates shows that the increase in shipments of printing materials could actually more than make up for the decline in deliveries of finished products. In part, this is because shipments of printing materials would replace bricks-and-mortar purchases that were not shipped through USPS to begin with. At a low level of disruption, this scenario could result in an increase of about 12% in USPS's commercial package volume. A high

level of disruption could mean a 28% increase, which, based on 2013 figures, translates into a US\$357m to US\$1.1bn annual increase in revenue.

However, this scenario is not only highly unlikely, but also highly uncertain. Many hard-to-predict factors could lead to very different outcomes for USPS package volume, including the development of a 3D printing material retail network that is largely non-existent today.

It is important to note that these scenarios are not mutually exclusive, and could happen at the same time. For example, businesses could begin to sell more 3D printed goods to consumers at the same time as people start to use in-home printers to create some items. If this

**To get the most out of a 3D printing revolution, the US Postal Service will need to match its strategic positioning to the expansion of 3D printing**

**La Poste embraces 3D printing**

In November 2013, France's La Poste began a partnership with 3D printing company Sculpteo to install 3D printers in three Paris-area post offices, as well as to offer an online marketplace where customers can order 3D printed products. Customers can submit their own designs or pick and customize from a catalog with about 40,000 designs. La Poste either delivers the products or holds them at the post office. La Poste benefits from increased foot traffic and package shipments, and awareness of its embrace of new technologies. Sculpteo is able to better connect with more customers by associating itself with the well-known brand of La Poste, which has a large physical footprint.  
 Source: Interview with Sculpteo representative

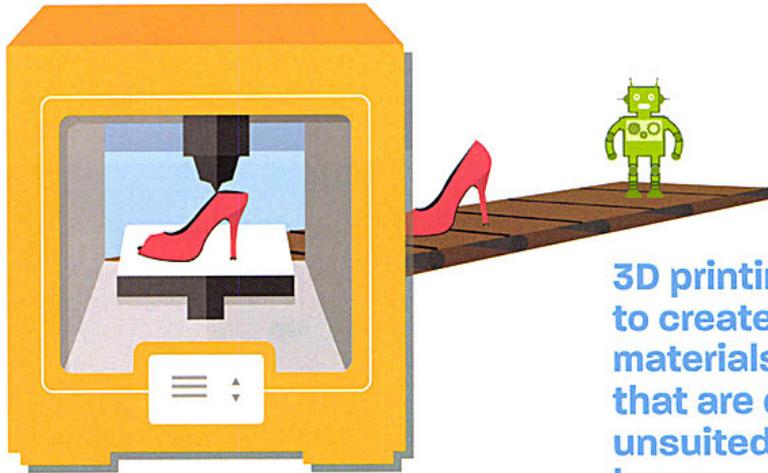
happened, then the effects on USPS in terms of new revenue and commercial package volume would likely be some combination of the effects of both scenarios.

**Playing a major role** Although USPS can greatly benefit from the growth of 3D printing merely by maintaining its existing network and keeping pace with delivery industry changes, it could take concrete actions to enhance or expand its role so that it can benefit even more from 3D printing. It could position itself to become a major player in the emerging 3D printing and delivery market. To get the most out of a 3D printing revolution, USPS will need to match its strategic positioning to the expansion of 3D printing. This would not only be good for USPS, but also good for the economy.

It is no secret that globalization has decimated US manufacturing jobs. Factories in a broad swath of industries have moved abroad, where labor is cheaper. However, 3D printing has the potential to



32 **3D PRINTING**



**3D printing might allow USPS to create customized packing materials for individual items that are oddly shaped or unsuited for ready-made boxes and packing supplies**

change that trend, bringing a new wave of manufacturing jobs back to the USA. As small and regional 3D printing businesses proliferate, the full economic benefit of those sales will stay in the USA. If USPS can help these companies compete and thrive, it could help usher in a brighter era in US manufacturing. A few potential strategies and ideas for USPS to consider include:

- How could 3D printing affect current focus and core assets? USPS's ubiquitous physical network and unrivaled first- and last-mile delivery capabilities give it a tremendous advantage in serving the 3D printing needs of consumers and businesses. Postal management can take action to ensure that USPS does not lose its current position of strength, and to utilize 3D printing to better optimize future changes.
- Establish new services targeted at 3D printing businesses. USPS could create a platform for 3D printing that uses its national retail network and last-mile capabilities. By doing so it would create a digital 'middle mile' where, at a basic level,

designs are sent to the platform and then 3D printed and shipped via same-day or next-day delivery. This could be considered a hybrid parcel product, similar to the concept of hybrid mail where digital communications are converted into physical letters. The platform could also include some type of intermediary role for USPS to facilitate the exchange or use of digital designs in a way that protects intellectual property rights. For example, the platform might host 'official' designs from toy manufacturers or other companies that are looking to connect with customers in a highly trusted forum. A platform for 3D printing might be most feasible if established through partnerships with private sector companies focused on 3D printing, as France's La Poste has done (see *La Poste embraces 3D printing* on page 31).

- Use 3D printing to improve internal operations. USPS could use 3D printers to create replacement parts for its vast fleet of aging delivery vehicles or its wide array of mail processing equipment. In some

cases, the companies that originally designed the machines are no longer in business and are therefore unavailable to provide spare parts. This makes it costly and time-intensive for USPS to fix the machines and it is likely that these repairs could be faster and cheaper with 3D printing. By reducing parts expenses and downtime, USPS could save significant resources and improve service. Additionally, USPS could use 3D printing as a way to facilitate employee suggestions and spread ideas for improving operations across the country. Finally, 3D printing might even allow USPS to create customized packing materials for individual items that are oddly shaped or otherwise unsuited for ready-made boxes and packing supplies.

**Conclusion** With 3D printing already changing major industries and promising to transform others, it is clear that we are witnessing a critical point in the evolution of technology and manufacturing. Although nobody knows exactly how big the market will get or what direction it will take, 3D printing is here to stay. It could have a major impact on USPS and other organizations in the USA and across the globe.

As 3D printing democratizes production and design, it could become a fierce engine of economic growth and job creation. We have not yet begun to see the rise of new businesses taking advantage of this technological revolution, and we are only in the early stages of new citizen demand for mass customization. By establishing a role in the 3D printing market, USPS could put a compelling 21<sup>st</sup> century twist on its historical mission to serve citizens and facilitate commerce. ■

**3D printing's impact on logistics**

3D printing could have a big impact on the way products move through the supply chain, presenting opportunities for USPS, such as:

- Some manufacturing will move back to the USA;
- Retail storefronts could convert to 'shop windows' for manufacturers, keeping only a model in stock and custom printing each item as ordered;
- Warehouses will shift from physical to digital, as spare parts are scanned into vast libraries for future on-demand printing.

Source: Transport Intelligence, *The Implications of 3D Printing for the Global Logistics Industry*, August 2012