

LUXURY MEMO SPECIAL REPORTS

The potential of 3D printing: Luxury Memo special report

February 9, 2018



3D printing can revolutionize how brands manufacture goods, but it has its drawbacks. Image credit: Safilo

By DANNY PARISI

The manufacturing of luxury goods connotes a specific assumption of handcrafted care, but 3D printing and other innovative manufacturing technologies are upending those expectations.

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Since its conception in the 1980s, 3D printing has mainly been thought of as a way of manufacturing industrial goods in a more efficient and cheap way. But recent developments have seen players in the luxury space experimenting with the unique properties of 3D printing, creating an interesting dichotomy between the industrial and mass-produced and the luxurious.

"One might think because 3D printing has the possibility of reproducibility inherent in its technological nature that this could dilute its potential for rareness, exclusivity and luxury," said Brendan McCarthy, BFA Fashion Design Program director at The New School's **Parsons School of Design**, New York. "But the reality is that when any craft, handmade or digital, is truly explored and pushed to its highest level, the number of people who can achieve these truly incredible heights of design innovation is very limited.

"In disciplines outside of fashion like the automotive industry and architecture, there is strong precedent for technology to yield luxury design," he said. "And within fashion already, we have tremendous examples like Iris Van Herpen and threeASFOUR who demonstrate the clear ability for 3D printing to be luxury.

"The Manus Machina: Fashion in an Age of Technology' exhibition at the Metropolitan Museum's Costume Institute [in New York] is a wonderful demonstration of the important relationship of the hand and technology in exquisite fashion design."

Top 5 trends in 3D printing

- Personalization
 - One of the upsides of 3D printing is the speed and efficiency with which things can be created, requiring only a digital mockup and no models or physical tools beyond the printer. Because of this, personalized items can quickly be designed and produced combining the individual nature of a handcrafted good with

the precision of something mass-produced.

- Efficiency
 - Three-dimensional printing was initially conceived as a way of manufacturing things more efficiently, and this holds true for the luxury business as well. With 3D printing, goods can be created quicker and with less waste or raw materials required.
- Impact on craftsmanship
 - One challenge of 3D printing is public perception of the quality of a 3D printed good. Luxury consumers, in particular, expect their luxury goods to be handcrafted with care and attention while 3D printing can give off an impersonal vibe. This perception is one 3D printing will have to overcome to be accepted as a luxury manufacturing technique.
- Manufacturing
 - Luxury brands can use 3D printing for a number of purposes, mainly streamlining manufacturing and easing the process of creating some of the more labor-intensive parts of a luxury good. For example, watchmakers have begun using 3D printing to print some of the tiny intricate gears for watches.
- Iteration
 - Three-dimensional printing is not just good for manufacturing, but it can also help in the design stage. With 3D printing, designers can quickly manufacture a number of prototypes with slight variations, allowing them to iterate on a design quickly until the perfect model is found.

What is 3D printing?

Three-dimensional printing, fundamentally, is the process in which a digitally-controlled machine creates a 3D object out of raw material by conjoining that material based on a computer model.

This is distinct from other forms of automated manufacturing in that a 3D printed object comes out in one single piece, usually made by adding material in stacked layers.

A standard 3D print is created in the following a manner. A 3D computer model is created on a computer, usually a CAD file, which is then fed to a computer-controlled printer.

Usually, the printer has a nozzle that can be moved around in three dimensions, which feeds out the material. Most small 3D prints are made with filament or wax.



Chanel's jacket made with 3D printing. Image credit: Fashionbi

The printer will then build the 3D model, layer by layer, by laying down flat sheets of the material, moving upward until the model is complete.

These models can take any shape that can be modeled on a computer, although logistical concerns such as size and balance need to be taken into account. For example, an unbalanced model - something that is not meant to stand up on its own - will often be printed with thin support pieces to keep it upright while it is being printed, which can then be removed once the print is completed.

Three-dimensional printing is sometimes called additive manufacturing, as opposed to subtractive manufacturing where pieces are sheared off a block of material to make a finished product. Instead, 3D printing is essentially the

opposite of this technique, taking raw material and shaping it into the 3D model.

In this way, 3D printing produces less waste and is more efficient than standard manufacturing.

Advantages of 3D printing

Three-dimensional printing offers a number of advantages for luxury brands.

Most notably, it allows them to more efficiently and quickly produce the products they need either to sell as goods themselves or as components of a larger piece.

Speed, in particular, is an important advantage of 3D printing. For example, Italy's Safilo is embracing 3D printing technologies to produce the prototypes of its eyewear frames in record time.

Safilo is the eyewear licensee of a number of high-fashion brands including Hugo Boss, Jimmy Choo, Christian Dior and Max Mara. By having the ability to quickly create 3D-printed models of potential eyewear designs, Safilo-licensed brands will be able to send new frames to market at a higher rate, which is a significant benefit due to the popularity of the eyewear category.

Safilo's 3d printed eyewear

Safilo has begun using full color, multi-material 3D printers provided by Stratasys to produce photorealistic frames for its licensees. Using the 3D method to create the prototypes has proved 60 percent faster than traditional methods ([see story](#)).

The efficiency of 3D printing, which requires far less equipment than traditional manufacturing techniques, will help brands produce goods with minimal excess resources needed, reducing waste and freeing up time and manpower to pursue other efforts.

Three-dimensional printing is also on its way up as more retailers take up the technology. A report from JWT Retail in 2014 found that 3D printing would be one of the two biggest trends in retail over the next few years ([see story](#)).

"One of the interesting advantages of 3-D printing technology is the ability for couture or bespoke designs to be generated that from an engineering perspective have not been achievable by hand to date," Parsons' Mr. McCarthy said.

"When Frank Gehry wanted to realize his designs for the Guggenheim Museum in Bilbao, he needed to find a new technology that would enable him to design and fabricate metal in wild shapes that were not possible with the existing technology at the time," he said. "In much the same way, 3-D printing can yield new, extraordinary types of garments, products in new forms and materials that can be made to fit specific, unique bodies impeccably, with a remarkable level of precision not achievable by hand.

"In this sense, there can be a deep, beautiful bridge built to the luxury traditions of couture."

Challenges of 3D printing

While enticing, brands should not rush into 3D printing without understanding the unique challenges presented by its use.

For one, 3D printing is still relatively new and comes with a steep learning curve. Designers must be able to create accurate 3D models of the desired product as well as account for the structural intricacies of the piece as it is being printed.

For example, designers will have difficulty designing an unbalanced or asymmetrical design as it would not remain upright as it is being printed. Instead, they would have to add temporary supports to the 3D model, which would be detached after the print is done.

Additionally, durability is another factor that can be a challenge. Most 3D printers use a type of malleable filament, which dries into a solid shape after the print is done. But even in its dried state, this filament can be quite brittle, making its use in many types of manufacturing difficult.



3D printed clutches from Odo Fioravanti. Image credit: Fashionbi

Finally, one of the biggest hurdles for luxury brands using 3D printing is convincing the public that a luxury good that has been printed is just as valuable as one that has been crafted by hand.

Much of the value of luxury goods comes from their perception. The perception of value of high-end luxury goods is essential to their nature, along with their exclusivity.

Part of that perceived value comes from the idea that these items were handcrafted, each one unique in its imperfections from all other products. Three-dimensional printing serves to eliminate those slight variations by making everything come from a single model.

While not an impossible difficulty to surmount, this perception is one that luxury brands will have to negotiate to have 3D printed goods placed on the same level as their handcrafted counterparts.

"Ironically, the critical aspects of engaging 3D printing and CNC [machine] innovations are the same in many ways as engaging handmade processes the craft must be integrated completely into the design and it all must be pushed to the absolute, highest possible level," Parsons' Mr. McCarthy said. "CNC is already being used for components and 3D for prototyping.

"What matters more is the overall creative vision and positioning, which allows designers to experiment with new technologies," he said. "At Parsons, our fashion students are opening up entire new landscapes for luxury by exploring territories that lie at profound new intersections of the handmade and the most advanced digital technology."

Workshop aid

Streamlining the manufacturing process is where 3D printing shines.

The quick production time as well as the minimal resources needed and the hands-off approach are all attractive features for brands, particularly younger or smaller brands with fewer resources, looking to increase their manufacturing efficiency.

Three-dimensional printing is particularly popular among watchmakers. The Swiss watch industry has been in troubled waters over the last few years, with manufacturing costs playing a significant role.

As the Swiss horology industry wades further into troubled waters, 82 percent of the sector's executives have said they hold a pessimistic outlook for the category's future, according to a Deloitte survey.



Dita Von Teese modeling Michael Schmidt's 3D printed dress. Image credit: Michael Schmidt

While there are many factors impacting horology, ranging from decreases in tourism, new laws in markets such as China and currency fluctuations, understanding industry outlook alongside brand and consumer trends can prove useful to Swiss watchmaker's navigating a volatile climate.

Per Deloitte, 64 percent of watch executives have begun using 3D printing technology as a tool for concept and prototype design. At this time, 32 percent do not use 3D printing at all, and a small amount, around 4 percent, have brought 3D-printed watch parts to market.

By 2020, 32 percent of executives see 3D printing becoming a very likely aspect of the watch industry ([see story](#)).

Printing players

While most 3D printing efforts are concerned with creating components for larger luxury goods or making simpler accessories such as sunglasses, one significant and growing use for the technology is in the creation of jewelry.

A number of designers, including Iris Van Herpen and Jenny Wu, have begun incorporating 3D printing into their processes for creating fashion and jewelry.

In jewelry, for example, the way it normally works is a designer creates a 3D model of the piece and then it is printed out of wax resin as opposed to filament.

The wax model of the piece is then cast in the desired metal, whether that is gold, silver, platinum or any other type. Finally, the piece can be set with jewels.

This hybrid of 3D printing and traditional metal casting is the most economical way that jewelers have found to create 3D printed jewelry, bringing together the best of both worlds into one process.

One brand that has been taking particular advantage of this trend is Ms. Wu's LACE, an online collection of luxury jewelry entirely designed and produced using 3D printing technology.

LACE has been making use of the unique properties of 3D printing in a number of ways. For example, in its new Rhea collection, pieces are made to order in accordance with customers' needs, a program that is made significantly easier thanks to the speedy process of 3D printed jewelry ([see story](#)).

Fashion designer Iris Van Herpen has been making 3D printed, runway-ready pieces since 2009, when the technology of 3D printing was not advanced enough to properly make a flexible, wearable dress so she had to improvise.



A 3D printed Iris Van Herpen design. Image credit: Iris Van Herpen

Since then, Ms. Van Herpen's 3D printed pieces have become more durable, more comfortable and more eye-catching at her shows.

One possible criticism some might have of 3D printing is that it takes a lot of the personal touches out of design since so much of it is done on a computer. But Ms. Van Herpen told *Vogue* that using 3D printing has not made her feel further from her work, but rather has allowed her to focus more on designing through the traditional means of sketching and draping ([see story](#)).

While the luxury fashion industry traditionally prides itself on the craftsmanship and handiwork that goes into creating a garment or leather good, it may be starting to warm to the idea of using 3D printing in production.

At Chanel's haute couture show in 2015, some of the tweed pieces that were modeled on the runway were created using 3D printing. Having one of the biggest names in high fashion embrace the technology may open the doors for expanded use of 3D printing among luxury labels, which has the possibility of altering the definition and positioning of luxury ([see story](#)).

Printed garments also got their time in the public spotlight during the Victoria's Secret Fashion Show in 2013, with a set of angel wings and a sculptural corset created using the technology.

Within retail, Neiman Marcus featured two jewelry pieces by Shapeways in its holiday gift guide in 2013. The made-to-order pendants, priced under \$400, could be monogrammed for a personal touch ([see story](#)).

One of the major players in popularizing 3D printing in luxury fashion is a Berlin-based group called VOJD Studios.

The company is focused on using 3D printing to make jewelry and fashion accessories and has created collections in collaboration with some of the biggest names in luxury, including Alexander McQueen, Loewe, Carolina Herrera, Akris, Prabal Gurung, A.F. Vandevorst.



3D printed jewelry from Neiman Marcus. Image credit: Neiman Marcus

The company has also been one of the biggest evangelists of 3D printing, being profiled in a number of outlets and expounding on the myriad ways that 3D printing can aid luxury.

Other types of material printing have also caught on in the luxury world.

For example, digital fabric printing allows designers much of the same customization, efficiency and reliability of 3D printing applied to fabric patterns and textiles.

Printing company Epson is one of those at the forefront of this area and has recently launched an online platform for designers to design, create and print their own fabrics.

The company's digital fabric printing allows fashion designers to design a textile pattern in a computer model form before printing it from a machine in a similar fashion to 3D printing.

Counterfeit potential

One of the bigger concerns for 3D printing is the increased potential for counterfeiting.

Luxury brands work hard to establish a positioning based on quality and artistry, but while this appeal lures in customers, it also makes them an attractive target for knockoffs.

Counterfeit sales have expanded thanks to globalization, giving fake sellers the chance to impersonate and steal sales from brands on an international level, duping consumers into purchasing what they often believe to be the real deal.

Aside from stealing business from the luxury brand of which they are copying, counterfeiters put luxury labels' top asset their brands at risk. Counterfeiting is a booming business.

An Organization for Economic Co-operation and Development (OECD) report from 2016 estimates that total imports of fake goods were \$461 billion in 2013, more than double the figure from 2005.



Jimmy Choo's Vivy sunglasses are licensed by Safilo

While luxury brands only represent a portion of this total market, which also includes categories such as electronics and chemicals, the industry is nonetheless impacted by this significant trade. Counterfeits account for about 2.5 percent of all imports around the world ([see story](#)).

With 3D printing, counterfeiting could theoretically become easier. If the 3D models used to build a 3D printed object were to be obtained by counterfeiters, it would be as easy as feeding that model into a printer to create a nearly indistinguishable replica.

"If any product can now be printed at the touch of a button, does that not just open the door for more and easier counterfeiting?" said Bob McKee, global fashion industry strategy director at [Infor](#), New York. "Since the product will be printed line by line or bit by bit, might it now be possible to actually embed anti-counterfeiting technology into the product?"

But there are potential countermeasures that brands could employ.

"To protect themselves, the really forward-looking luxury companies will create their own applications that enable the 3D printing of their products, and with that they protect their brand identity, copyright and trademark," Mr. McKee said.

The future of 3D printing

Three-dimensional printing offers a lot of enticing new abilities to the luxury brand looking to employ it.

From more efficient production to custom pieces to quick iteration times, 3D printing help brands innovate in how they design and produce their products.

But, 3D printing also comes with pitfalls. Counterfeiting, less durable products and a perception of cheapness can all stand in the way of a luxury brand fully embracing the possibilities presented by 3D printing.

In spite of this, brands from across the luxury industry, from Chanel to Alexander McQueen, have decided to take the gamble and invest in 3D printing.

Best-practice tips for brands considering 3D printing:

- Brendan McCarthy, BFA Fashion Design Program director at The New School's [Parsons School of Design](#)
 - "Sustainability is increasingly emerging as a new, important territory for luxury brands. Interestingly there is also a very important sustainability aspect to 3-D printing technology. The precise design and production control 3D printing and CNC production technology offers enables designers and producers to waste significantly less material. For example, CNC knitting machines can actually make shoes with exactly the amount of fabric necessary with zero-waste. Developing strong sustainability strategies through technological innovation and the storytelling around these innovations is incredibly important for many luxury brands."
- Yana Bushmelva, chief operating officer at [Fashionbi](#), Milan
 - "From the customer's point of view 3D printing and innovative materials are not luxury. For decades we

used to think that exotic leather, diamonds, gold, etc. are the precious materials of the luxury goods. Such perception can be changed through the time and maybe only for a new generation of customers."

- "Some of the sportswear brands are using the 3D during the development of the products prototypes, instead of re-sending the sample all over the world, the brand and the producer can exchange the files to print the revised sample."
- **Thomai Serdari**, a professor of luxury business marketing at New York University, New York
 - "The most beneficial aspect of 3D printing is that it forces brands to rethink their production process. Therefore, I would strongly advise anyone who wants to incorporate 3D printing to first study their existing production methods. At which point does the new technology allow for additional creative freedom? That's an added benefit."
 - "Furthermore, luxury brands should examine their supply chain. Are there steps of the supply chain that allow experimentation with 3D printing? This means that the final luxury product may not be 3D printed but that a tool that allows the creative to construct it may very well be."

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