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# 3D Printing and its Effect on the Fashion Industry: It's More Than Just About Intellectual Property

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# 3D PRINTING AND ITS EFFECT ON THE FASHION INDUSTRY: IT'S MORE THAN JUST ABOUT INTELLECTUAL PROPERTY

**Rania V. Sedhom\***

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## INTRODUCTION

3D technology is becoming an increasingly important factor in several industries, and no one can afford to ignore 3D headlines concerning healthcare, art and even food. The same certainly holds true for fashion, yet many people in that

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industry are unaware of the inroads already made. As such, while 3D Printing is going to continue to affect the fashion industry, the seminal question is whether the changes attendant with the technology will be beneficial or disadvantageous.

When most people think about 3D printing and the fashion industry, they immediately focus on the intellectual property consequences. While there certainly are a myriad of intellectual property issues that must be addressed right now, there are several other areas that will be equally affected.

This paper will discuss how 3D technology will affect the supply chain, employment opportunities, entrepreneurialism, tariffs, and other subject matter. Since the technology is in its evolutionary cycle, many of the concerns to be discussed are forward-looking and of-the-moment; consequently, a deep dive into any given area is impractical. Rather, this paper will address topics from a bird's eye view and conclude with thought provoking and sometimes unanswered (or even unanswerable) questions that readers should store in the back of their minds as they watch the technology improve and unfold.

#### I. WHAT IS 3D PRINTING AND HOW DOES IT WORK?

When working with fashion clients to either embrace 3D printing or mitigate the risks associated with the technology, I first ask each client whether he or she properly understands the technology. How can anyone prepare for something they do not understand? Interestingly, before even understanding the technology, several fashion clients have already formed an opinion that it is not something they need to utilize or worry about for a very long time. I do not share that opinion with my clients, and am curious to know the readers' thoughts after reading this paper and considering the issues discussed.

So, what is 3D printing? 3D printing is also known as additive manufacturing and is a process of making three-dimensional solid objects from a digital file by laying successive layers of material until the entire object is created; each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object.<sup>1</sup>

In order to utilize a 3D printer, the first step is to make a

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1. What is 3D printing?, 3DPRINTING.COM, <http://3dprinting.com/what-is-3d-printing> (last visited Feb. 13, 2015).

virtual design of the object you want to print or create, and then to prepare a digital file in a compatible program suitable for printing; when the appropriate file is uploaded in the 3D printer, the printer creates the object layer by layer.<sup>2</sup> The 3D printer reads every slice, which is sometimes referred to as a 2D image, and proceeds to create the object by blending each layer together, with no sign of the layering visible, to create one, three-dimensional object.<sup>3</sup>

Of course, not all 3D printers use the same technology to realize their objects since there are several ways to do it, such as melting or softening material to produce the layers, or using laser sintering, or fused deposition modeling to print the creation.<sup>4</sup> Another common method of printing is to lay liquid materials that are cured with different technologies.<sup>5</sup> To me, 3D printing is a combination of design (or fashion design), architecture, and software technology.

This is all fine and good, but what does 3D printing have to do with fashion? Everything! Believe it or not, several of the fashion pieces that consumers are enjoying today are 3D printed. We are already seeing jewelry (both costume and fine), clothes, shoes, makeup and accessories coming out of a 3D printer and into a purchaser's hands. Moreover, there are several new and budding designers now utilizing the technology to bring their designs to you. If you go to <http://.etsy.com><sup>6</sup>, you will find several fashion pieces that are being manufactured solely via 3D printer. Yes, 3D printing is in its early stages, but I predict it will supplant several areas of fashion manufacturing and will also lead to headaches for designers, brands and retailers who do not learn enough about the technology to either embrace it, or mitigate the risks that will be forthcoming, as the technology becomes more sophisticated, quicker, and more attainable.

## II. SUPPLY CHAIN

Supply chains are the key to the fashion business (really,

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2. *Id.*

3. *Id.*

4. *Id.*

5. *Id.*

6. Etsy - Your place to buy and sell all things handmade, vintage, and supplies, ETSY.COM (last visited Feb. 13, 2015) (a general search on the website for 3d printed items results in thousands of 3d printed products for sale).

any business that involves sales of products). For example, in fashion, the supply chain accounts for every action taken from idea to sale—from the first piece of thread used in a garment to the individual(s) creating the garment; to the transportation of the garment to the port (if being imported or exported); to the garment's travel to the store and into a consumer's hands, and everything in between. Every fashion house, distributor, designer, retailer, etailer, etc. creates its own supply chain protocol to maximize profits and to win the supply and demand game.

While seemingly simple on the surface, the fashion supply chain is not only quite complex, but also ever changing. For homogenized products such as t-shirts, socks and other basics, the supply chain is generally viewed as stable, as such items are produced in mass quantities. In other words, the supply chain presumes that consumers will continue to purchase a healthy amount of basic products that they seemingly utilize on a daily, or very frequent, basis. With most other products, however, market demands are volatile and consumers are fickle, making it difficult for manufacturers and designers to guesstimate an appropriate amount of inventory. Because of gigantic retailers like Walmart, Kohl's and Costco, to name a few, minimum production is becoming the norm for some suppliers and manufacturers. Even premier and luxury brands must fulfill the supply requirements of their retailers. And, regardless of brand, there is a sharp accumulation of inventory. To offset excess inventory, several retailers and brands have decided to reduce the availability of products. However, when consumers cannot find what they are looking for in one store, they move on to another. As such, there is a fine line between controlling inventory and having the wrong inventory. That is where the art of inventory comes in and where brand managers, operating officers and buyers work together to create supply and demand synchronization.

Accordingly, the challenge facing all stores, designers and manufactures is finding the balance between minimizing inventory while maximizing revenue and profits—3D printing presents a fascinating new way to address those supply chain issues. While the technology is currently too slow to produce large quantities of items quickly, as 3D printers improve, they will certainly become quicker. When they do, I predict that in-store shopping will change in every way. Imagine walking into a store that carried only enough inventory so that customers

could try on garments and touch the material to ensure it meets their demands and expectations. Then, images of the garment in various colors and textiles would be made available to the consumer. Perhaps some stores will even carry swatches. Once the shoppers decide which one(s) to buy, they pay for the item and wait for them to be printed. While it may seem farfetched now, it may not seem so unlikely five or ten years from now. Chief operating officers will likely tell you that effective supply chain management is the ability to optimize inventory while meeting market demand. In that context, 3D technology may be a blessing in disguise for excess inventory devaluing companies and ruining their profit and loss statements.

Additionally, 3D technology will allow budding designers to introduce their wares to the world. Such designers have several challenges, including having to deal with long lead times and minimum orders. With 3D technology, emerging designers can simply print orders as they are placed rather than have to scrounge to obtain enough financing for minimum orders and being stuck with unsold stock. If nothing else, 3D printing will enable them to create a sample quickly and cost-effectively. The technology also provides opportunities for those designers to test the market on a small scale by printing limited quantities of their product to determine whether their item is acceptable to the marketplace. Additionally, once a designer develops expertise with 3D modeling, they will incur less waste.

Finally, it is important to note that consumers may be offended by the prospect of sales merchandise either being unavailable or available only in limited quantities. After all, if retailers are printing the products as buyers want them, there will likely not be a need for those stores to hold sales. 3D technology may, therefore, have a profound effect on Black Friday and after Christmas sales. More importantly, however, as 3D printers enter the home, the purchase of basics may change fundamentally. Many consumers may opt to print their white and black socks and undershirts but shop for basics in other colors. It is my prediction, therefore, that as 3D printers become readily available, affordable, and quicker, it will ameliorate the supply chain of high-end brands but severely disrupt the supply chain for stores selling basic goods.

### III. PERSONALIZATION OR CUSTOMIZATION

Something that fashion is embracing with fervor is customization. Companies from Nike (Nike ID) to Manolo Blahnik are offering consumers the ability to personalize their fashion by allowing them to choose different colors and materials. For example, for shoes Neiman Marcus customers can select the heel height and color of the shoe.<sup>7</sup> Also at Neiman Marcus, fans of Stuart Weitzman can “build their own boot” by choosing a heel height and then selecting from an array of available fabrics and colors.<sup>8</sup> Neiman Marcus even allows you to monogram your UGG boots.<sup>9</sup> Nike led the way to customized shoes using NIKE ID to allow shoe lovers to create their own sneakers.<sup>10</sup> Nike was, by all accounts, the first brand to allow consumers to create their own fashion. Now, Nike also allows customers to create their own backpacks and duffel bags.<sup>11</sup>

Most certainly, customization will not be limited to shoes, athletic bags and sneakers. Indeed, customization will change fashion as we know it, as 3D printing will allow companies and brands to create, in real-time, items tweaked and personalized by the consumer. Imagine yourself walking into a store and changing the length of a handbag strap, lowering the neckline on a shirt, or selecting a color for your dress! The frustrations attendant with shopping from what’s available versus shopping for what you want will end. 3D printing will facilitate contemporaneous customer-designer or customer-store collaboration.

In that context, several other brands are allowing

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7. Custom Manolo Blahnik BB Heels at Neiman Marcus, NEIMANMARCUS.COM, <http://www.neimanmarcus.com/Shoes/Custom-Shop/The-Made-to-Order-Blahnik-BB-Boutique/cat47330748/c.cat> (last visited Feb. 13, 2015).

8. Stuart Weitzman Build Your Own Over-The-Knee Boot, NEIMANMARCUS.COM, <http://www.neimanmarcus.com/Stuart-Weitzman-Build-Your-Own-Boot-Made-to-Order/prod174840379/p.prod> (last visited Feb. 13, 2015).

9. Monogram your UGG Boots! Jean Custom Shop at Neiman Marcus, NEIMANMARCUS.COM, [http://www.neimanmarcus.com/Shoes/Custom-Shop/Monogram-your-UGG-Boots/cat51620736\\_cat52090763\\_cat000141/c.cat](http://www.neimanmarcus.com/Shoes/Custom-Shop/Monogram-your-UGG-Boots/cat51620736_cat52090763_cat000141/c.cat) (last visited Feb. 13, 2015).

10. NIKEiD Customize Shoes and Accessories, NIKE.COM, [http://www.nike.com/us/en\\_us/c/nikeid](http://www.nike.com/us/en_us/c/nikeid) (last visited Feb. 13, 2015).

11. *Custom Gear*, NIKE.COM, [https://secure-store.nike.com/us/en\\_us/pw/nikeid-gear/1k9Zbqt](https://secure-store.nike.com/us/en_us/pw/nikeid-gear/1k9Zbqt) (last visited Feb. 13, 2015).

consumers to create their own jewelry by swapping out diamonds for rubies or white gold for yellow gold, etc.. Others are allowing consumers to choose their own necklace charms. While I am not at liberty to reveal those clients' current or future projects, suffice it to say that 3D printing is being used by some of them to obtain a stronghold on the marketplace by using the technology to cater to consumer demand and uniqueness.

That said, even though 3D Printing and fashion make good bedfellows, most consumers are likely unaware of the prevalence of 3D-printed fashion that is available in stores and online. While several uber high-end brands are slow to embrace the technology, many others are not. Everything from jewelry (costume and luxury) to sunglasses, and shoes to clothing, and handbags to cosmetics and more are already being sold and range in quality from functional to luxurious.

Consume customization may be the catalyst for more high-end brands to embrace the 3D printing technology. After all, one of the most significant aspects of luxury is its exclusivity; and, one can argue that there is nothing more exclusive than a one-of-a-kind piece. Regardless of whether you want to embrace the technology, there are several things to consider as 3D printing in fashion touches and concerns several other areas of law and life.

#### IV. OTHER CHANGED SHOPPING EXPERIENCES

As discussed above, personalization is emerging in fashion and will, in my opinion, become the norm over time. While this may breathe new life into retail and help brands reach millennials and other generations who expect to be able to buy what they want when they want, it may have other consequences that the consumer may not have realized and which may prove disadvantageous.

As shoppers, we may all have noticed changes in store policies regarding shipping fees, exchanges and returns. Some may have also noticed that many deeply discounted items are now non-returnable and non-exchangeable. My prediction is that if items are 3D printed in real time on a consumer's behalf and also, if items are customized (a buyer choosing the color and material of the item, for example), they will be non-returnable and non-exchangeable. Perhaps if the item is being purchased as a gift, and the sales person is so informed, the store will make a short window available to that person for an

exchange or store credit.

## V. EMPLOYMENT-RELATED ISSUES

As discussed above, the supply chain as we know it will be interrupted. Gone will be the days where a designer or retailer waits weeks or months for products to be produced by a veritable army of dressmakers or sewing experts. As technology advances and brands and designers learn how to leverage the technology, they will either change the nature of, or reshape, their workforce. Fundamentally, jobs for seamstresses, pattern makers and warehouse managers will either be drastically reduced or replaced with some of the new jobs discussed below. Depending on the size of the company in question, brands and retailers may find themselves faced with several employment and employee benefits-related issues and responsibilities if they undergo a reduction in force.

For example, the Worker Adjustment and Retraining Notification Act (“WARN Act”), 29 U.S.C. §§ 2101, *et. seq.* and the regulations promulgated thereunder, 20 C.F.R. Part 639, were created in order to protect workers by requiring certain employers to provide 60 days’ advance notice of plant closings and mass layoffs.<sup>12</sup> This notice must be provided to either affected workers or their representatives (e.g., a labor union) and to different members of the government.<sup>13</sup> Several states also have state WARN Acts, and an employer must abide by both state and federal Acts. Importantly, several state WARN statutes are stricter than the federal WARN Act and, as such, fashion companies should seek the advice of counsel before sending appropriate notices.

The federal WARN Act requires written notice of the intention to lay off more than 50 employees during any 30-day period as part of a plant closing.<sup>14</sup> Additionally, the WARN Act requires employers to give notice of any mass layoff that does not result from a plant closing, but will result in an employment loss of 500 or more employees during any thirty-day period.<sup>15</sup> For smaller employers, the federal WARN Act has the same notice requirements for job losses of 50-499 employees, if they make up at least 33% of the employer’s

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12. 29 U.S.C. § 2102(a).

13. *Id.*

14. *Id.*

15. *Id.* § 2101(a)(3).

active workforce.<sup>16</sup> In all cases, an employer need not count those employees that were laid off if they were employed for less than six months in the past twelve-month period or employees who work an average of less than twenty hours per week.<sup>17</sup>

Under the federal WARN Act, an employer may be subject to financial penalties for failure to provide adequate notice; specifically, an employer may be required to pay back pay and benefits to each un-notified employee, for up to sixty days.<sup>18</sup> Additionally, failure to notify the proper governmental entities may subject the employer to a civil penalty of up to \$500 per un-notified day<sup>19</sup> This penalty can be avoided if the employer pays each affected employee within 3 weeks after the plant closing or layoff.<sup>20</sup>

Almost simultaneously therewith (depending on the circumstances), employers who offer defined benefit plans to eligible employees must also notify the Pension Benefit Guaranty Corporation (“PBGC”) of their company’s partial plan termination.<sup>21</sup> Depending on the specific facts, the PBGC may request that employers post a bond in an amount to cover pension liabilities over the next five years.<sup>22</sup> If the employer is a signatory to a collective bargaining agreement they will also be given an invoice for their proportionate share of withdrawal liability.<sup>23</sup>

Whether a partial plan termination occurs is based on a facts and circumstances test. The general rule of thumb in the context of a reduction in force leading to severances from employment is that a partial plan termination occurs if such employer-initiated severances from employment result in a 20% or more decrease in the number of plan participants.<sup>24</sup> If a partial plan termination occurs, affected participants must be made fully vested to the extent their benefits are funded as

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16. *Id.*

17. *Id.* §§ 2101(a)(2), (3), (8).

18. *Id.* §§ 2104(a)(1), 2102(a).

19. *Id.* §2104(a)(3).

20. *Id.*

21. *Id.* §§ 1343(a), (c)(4); *see also* §§ 1301(a)(1), (4) for the definitions of “‘administrator,’” and “‘corporation.’”

22. *See id.* § 1363(c).

23. *Id.*

24. *See Matz v. Household Int'l Tax Reduction Inv. Plan*, 388 F.3d 570, 577-78 (7th Cir. 2004); *see generally* 29 U.S.C. § 1341(b)(5)(B)(ii).

of the date of the partial plan termination.<sup>25</sup>

## VI. QUALITY CONTROL

Quality control comes down to two fundamental issues: (1) how will a brand maintain control over the quality, or perceived quality, of its merchandise as access to printers and quality raw materials becomes more prevalent?, and (2) who bears the liability when a consumer 3D prints his/favorite piece of fashion? Once 3D printers become so customary that they are in several homes, designers will have an uphill battle with quality control.

The first issue is easier to manage than the second. It can be mitigated by a retailer, designer and brand embracing customization. If a consumer can obtain the item that they want directly from the brand or store, that individual is less likely to print the item at home. While some people may initially enjoy the thrill of the print, consumers will almost certainly continue to enjoy the shopping experience. Retailers and designers will need to become flexible and offer the fashionista that resides in so many consumers with options of color, textiles, size and other characteristics for any particular item. Designers and retailers will need to conduct a cost-benefit analysis between risking a consumer self-printing and widening the variety of products offered (or available for print and/customization in-store or online). By providing, or making available, the product, designers, retailers and etailers can ensure the quality of the product being sold and offer the same product guaranty that it is currently providing.

The second issue, however, is much trickier to prepare for and mitigate. If someone is able to print a handbag, for example, the brand and store have no control over the quality of the item being produced. As that same handbag is carried, consumer sentiment may change to the brand if the printed bag's quality is visibly less than the one offered in stores. The challenge for the brand will be educating consumers on the difference between a self-made or self-printed handbag and the one available in stores.

Brands and retailers will have to learn how to communicate with consumers so they understand that self-printing a handbag or dress may not be all that it is cracked up to be; certainly, the printers that will be available for home

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25. *Matz*, 388 F.3d at 573.

use will have less functionality than those for professional use. Also, home printers will certainly be slower. Therefore, self-printing a bag or dress that someone already owns in a different color may achieve similar aesthetics and function, but it will likely lack craftsmanship. If the item has obvious (or even subtle flaws), the brand may suffer reputational harm as onlookers begin to dislike (or like less) the brand.

Therefore, fashion companies and retailers must teach customers about the brand's heritage and craftsmanship in order to maintain its quality and dissuade consumers from self-printing.

## VII. TARIFFS

Before discussing how 3D printing will affect importing and exporting and attendant tariffs, it is essential to provide a brief description to the reader regarding how this area of law works. Almost every material imaginable that is imported to, or exported from the United States (and other countries) is governed by CITES,<sup>26</sup> the Convention on International Trade in Endangered Species of Wild Fauna and Flora and the HTS, Harmonized Tariff Schedule. Approximately 5,600 species of animals and 30,000 species of plants are protected by CITES.<sup>27</sup> All of the species fall within 3 categories known as Appendices in CITES.<sup>28</sup> The categories are: Appendix I which protects endangered species, Appendix II which protects those species which are not yet endangered but may become so if their trade is not regulated and Appendix III which are those species that a specific country is locally protecting and wishes to protect globally and, thereby, requests protection for it under CITES.<sup>29</sup> Although each species falls within one of only three categories, determining the cost (tariff) of a fashion item is complicated. This is partially due to the fact that the HTS is hyper specific. The Harmonized Tariff Schedule classifies a good based on its name, use, and the material used in its construction and assigns it a ten-digit classification code number. There are over 17,000 unique classification code numbers.<sup>30</sup> For

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26. *The CITES Species*, CITES.ORG, <http://www.cites.org/eng/disc/species.php> (last visited Feb. 15, 2015)

27. *Id.*

28. *How CITES Works*, CITIES.ORG, <http://www.cites.org/eng/disc/how.php> (last visited Feb. 15, 2015).

29. *Id.*

30. *Harmonized Tariff Schedules*, U.S. GOVERNMENT BOOKSTORE,

example, if you would like to import and sell a coat, it is not enough for the retailer to first determine whether the coat has a material in it that is protected under CITES and then look up the cost of importing a coat on the HTS. Instead, a retailer or importer must first determine what type of coat it is – children’s, men’s or women’s. Then it must look at the material of the coat – is it 100% wool, a wool blend, leather other than crocodile, crocodile leather, a combination of several materials, etc. Once someone obtains the full material content of each and every piece being imported, it can then determine the appropriate duty that needs to be paid. For the majority of retailers and resellers, the tariff imposed by the government is directly passed on to consumers and, as such, understanding the tariff and importing and exporting rules are of paramount importance.

Some fashion companies, especially in the jewelry industry, rather than import or export already-made jewelry like earrings and rings, instead, import the raw materials needed to create the jewelry that is eventually available to consumers for purchase. The majority of the time, importing raw materials and creating a product from it is a substantial cost savings over importing the jewelry itself. And, 3D printing will have a profound effect on this aspect of importing and exporting.

Currently, most jewelry purveyors will buy product and import it into the United States for resale. When you see that “Made in Italy” stamp as a consumer, you can be almost certain that you will be paying a premium because the retailer from whom you are purchasing had to pay a hefty tariff. Now, imagine that you walk into your favorite jewelry store and the ring that you were eyeing last year is considerably less expensive now. You excitedly go to the counter and inspect it and notice that it no longer says “Made in Italy.” Instead, it simply is stamped with “18k” to denote the gold weight of the ring. In the future, it is likely that because your favorite jewelry store imported only the materials it needed to 3D print your ring and a few more for sale, consumers will see less “Made in” other country stamps on jewelry. As such, 3D printing may revolutionize fashion commerce. As the technology becomes more readily available, there will probably

be a decrease in importing already-made jewelry and an increase in the importation of raw materials. This can be exciting for consumers, manufacturers and designers alike. Consumers may see a decrease in the cost of non-unique pieces such as plain bands, simple necklaces, hoops, etc. And, would-be jewelry designers may utilize the 3D printers to reveal their designs to the marketplace. This can have the following possible effect on importing and exporting laws and jewelry:

- (1) An amendment to the HTS, perhaps increasing the cost of importing raw materials;
- (2) New regulations attendant with importing raw materials;
- (3) New materials being used in jewelry design; and
- (4) Increased availability of various styles of jewelry.

#### VIII. SUSTAINABILITY

3D printing may appeal to environmentalists on several fronts. First and foremost, 3D printing will allow fashion companies to have less production waste. Now, depending on several factors, a designer must produce a minimum number of items from their prototype. With 3D printing technology, the minimum can be reduced to a single item. As discussed above, retailers and designers can also wait for customer demand before producing an item, thereby, effectively eliminating the waste associated with unpurchased and returned items.

3D printing also allows designers and consumers to recycle materials. Imagine that you've worn your favorite pants to death. While the material may be unsalvageable as a pant, an advanced 3D printer may allow you to put your tattered pants into the printer so that you can use it to create another item like a shirt or socks or something else substantially smaller than pants.

Lastly, many consumers simply throw away garments that need relatively simple, but hard to find, replacement parts like specialty buttons and embellishments. 3D printers allow consumers to print the impossible-to-find button, for example, to revive their favorite sweater.

#### IX. NEW FASHION JOBS

Until now, when someone thinks of fashion, they generally think of designers, artists, manufacturers, retailers and sales people. However, with 3D printing, the types of jobs in fashion

and the professionals needed to make 3D printed fashion are changing. For example, I work with several fashion companies who work collaboratively with architects to create a 3D design. Who would have thought that an architect is needed to create a dress? But, with 3D technology modeling utilizing similar technology to Auto Cad, an architect is now a perennial consultant to fashion.

One of my predictions is that new jobs, and new types of jobs will emerge. For example, I coined a few fashion job expressions; one being “fashion technologist.”<sup>31</sup> That is, someone with a design and technology background who can take a sketch or idea and create it properly for 3D printing purposes. It is not enough in my opinion to simply work with an architect. Designers need to collaborate with individuals who understand the technology but also understand textiles and how they move. The 3D printers are now used to print garments made of wearable fabrics that don’t have a name – they are neither cotton nor silk nor wool, etc., but rather something else. A “fashion technologist” is the person who can assist the designer or manufacturer to create textiles that hang properly. While an architect is a seeming expert on Auto Cad and certain aesthetics, she/is unlikely to understand how to bend the wearable textile properly so it does what the designer wants it to do – be flouncy, stay pleated, have high volume, no volume, etc.

Another new job may be a “fashion alchemist.”<sup>32</sup> The “fashion alchemist” will most probably work with 3D jewelry designers to transform metals and other substances into bespoke pieces. Imagine liquefying a metal that is not commonly used for jewelry-making, only to be left with something beautiful and wearable. Or, better yet, the fashion alchemist can create a new substance that can be liquefied and then molded into rings, pendants, earrings and the like.

Yet another new job is “fashion printing manager.”<sup>33</sup> This individual will understand the ins and outs of the 3D printer and know when to calibrate the machine so that the fashion is printed properly. She will be able to teach the other printing specialists how to best utilize the printer and train new hires

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31. I have developed descriptive job expressions such as this one as examples of those that might emerge in the industry as this technology continues to advance.

32. See *supra* note 31.

33. See *supra* note 31.

on how to optimize use of the 3D printer.

The final new job that I have invented is a “fashion software designer.”<sup>34</sup> The meat of the 3D printer, so to speak, is in its software. The software, as briefly discussed above, is what talks to the machine and orders it to produce x, y or z in a specific shape, material, etc. The “fashion software designer” will be a highly sought after professional who both protects and helps create the designer’s design of the fashion by changing the printer’s software to meet the designer’s specific needs.

#### CONCLUSION AND OPEN QUESTIONS

The only thing that is clear is that 3D technology will be taking fashion by storm. Although 3D printing has already proven to be a wonderful complement to fashion designers, there is still much work to be done and many issues to resolve. While some may be unanswerable, fashion professionals, including attorneys, should consider the following:

1. If a consumer works with a designer or a store to customize an item and the store 3D prints that item for the consumer, who is the rightful owner of that design?
2. Does the response change if the consumer simply made the changes themselves and printed the product at home?
3. Will 3D printing help high-end brands maintain their exclusivity or will 3D copycats dilute the brand by making too many pieces available in the marketplace?
4. Will 3D printing enhance the relationship between consumer and brand or retailer/and brand through collaborative design?
5. How will 3D printing re-characterize jobs in fashion?
6. How many new jobs will be created and how many will be made obsolete?
7. What effect, if any, will 3D printing have on importing and exporting rules?
8. What steps can fashion designers and stores take in order to mitigate quality control risks?
9. What types of new, wearable materials will emerge?
10. Can traditional fabrics be integrated into 3D-printed fashion?
11. How will 3D printing change the shopping experience for consumers?

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34. *See supra* note 31.

12. How will 3D printing affect pricing?
13. How will 3D printing affect production times?
14. How will 3D printing affect a retailer's return and/  
exchange policy?
15. Will 3D printing make inroads against excess waste?

While most of these many questions are yet to be answered, one thing already holds true: the fashion industry can ill afford to ignore the inevitability of 3D printing. Those who embrace it will either prosper or mitigate their risks; those who don't will suffer an ill fate. In a word, (actually four)—3D printing means business—and must be taken seriously.