

You Can 3D Print Your Dress and Wear It Too: A Seminal Look at the Possible Legal Issues of 3D Printing in the Philippine Fashion Industry

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I. INTRODUCTION

In the Philippines, there is as yet no serious consideration of the legal issues surrounding fashion and its connections with information technology. The area of “fashion” as a legal specialization is virtually unknown in the Philippines, let alone its vital intersections with digital innovations that are shaping up to be the major disruptors of production in our globalized world. This Article aims to remedy this oversight by introducing one emerging trend in fashion — the use of the technology of Three-Dimensional (3D) printing.

3D printing, at times also referred to as additive manufacturing, is a “process of making 3D solid objects from a digital file.”¹ This is achieved

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through an additive process — successive layers of material, each based on a template file, are stacked together until an entire object is formed.² Each layer is a thin horizontal cross-section of the object.³ The use of 3D printing technology is considered as one of the emerging trends in fashion today.⁴

Every designer worth his or her stripes must undergo the basics of a fashion degree, or at least obtain fashion exposure to color theories, garment construction, pattern making, draping, and even computer-aided design (CAD). With the ongoing socio-legal reforms in Philippine education, and the thrust of making Filipino graduates globally competitive, particularly in making the curricula comparable or equal to that of their counterparts in the ASEAN region, it is the Author's hope that Philippine fashion designers would have the opportunity to work first hand with 3D printers and exploit their creative possibilities. Fortunately, there exists a local industry in 3D printing, with several companies offering 3D printing services and other related services to the public.⁵ In fact, there is an online forum devoted to 3D printing.⁶ There is also a site where one can buy or sell 3D printed

Law and, on the side, pursues his passions in the arts, such as jewelry design, poetry, and fashion.

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1. 3Dprinting.com, What is 3D Printing?, *available at* <http://3dprinting.com/what-is-3d-printing/#whatitis> (last accessed Apr. 22, 2016).
2. *Id.*
3. *Id.*
4. See TEDx Amsterdam, 3D: The face of future fashion?, *available at* <http://tedx.amsterdam/2013/07/3d-printing-the-face-of-future-fashion> (last accessed Apr. 22, 2016).
5. See, e.g., 3D Printing in the Philippines, *available at* <http://3dprintingindustry.com/2014/07/10/3d-printing-philippines> (last accessed Apr. 22, 2016); 3D 2 Go, *available at* <http://www.3d2go.com.ph> (last accessed Apr. 22, 2016); Puzzle Box 3D, *available at* <http://www.puzzlebox3d.com> (last accessed Apr. 22, 2016); 3D-Fied, *available at* <http://3dfied.com> (last accessed Apr. 22, 2016); 3D Printing Philippines, *available at* <http://3dprintingphilippines.com> (last accessed Apr. 22, 2016); 3D Zhaidazz 3D Printer, *available at* <http://zhaidazz.wix.com/3dprinter> (last accessed Apr. 22, 2016); & WASP: 3D Printing, *available at* <https://www.facebook.com/WASP.3Dprinting/info> (last accessed Apr. 22, 2016).
6. See Reprap Forum, *available at* <http://forums.reprap.org> (last accessed Apr. 22, 2016).

products, 3D services, and new or used 3D printers;⁷ and another site where one can buy new 3D printers, filaments, 3D “doodle” pens, and related materials.⁸

The interest and activities generated by the 3D printing industry in the Philippines were enough to warrant the holding of the Philippine 3D Printing and Digifab Expo and Conference in 2015.⁹ The program was marketed to “architects, industrial designers, entrepreneurs, makers, key players from the education sector, medical industry, creative arts, fashion industry, jewelry manufacturers, information technology industry, government, marketing specialists, hobbyists, direct consumers, [and] students.”¹⁰ The list of speakers included a lawyer, a medical doctor, an artist, and others in the 3D printing industry.¹¹ The fashion industry, however, was not represented. This must change in the future if the country seeks to be competitive in this ever-changing field.

Through this Article, the Author seeks to promote Fashion Law as a relevant and dynamic field of law. He also aims to introduce the reader to the idea of using 3D printing technology in the Filipino fashion industry. He further plans to identify the seminal legal issues that 3D printing poses for designers, creators, consumers, and even (possible) regulators of the fashion industry, in the context of mainly Philippine laws.

This Article is not meant to be, and by no means contains, the exhaustive list of possible legal issues in the exciting field of Fashion Law. However, it is the hope of the Author that by exploring these possible repercussions, more legal scholars will find interesting points of discussion in the intersecting realms of fashion, technology, and law.

II. FASHION AS A MEANS AND MEDIUM OF LIFE COMMUNICATION OR WHY WE SHOULD ALL CARE

Fashion as a legitimate area of law specialization has, for the longest time, been neglected in the Philippine legal academe. To the Author’s knowledge, none of the Philippine law schools offer any elective course in Fashion Law and probably will not be scrambling to offer one soon. A subject on Fashion

7. See OLX, 3D Printer, *available at* <https://www.olx.ph/all-results/q-3d-printer> (last accessed Apr. 22, 2016).

8. See Lazada, 3D Print, *available at* <http://www.lazada.com.ph/shop-3d-printing> (last accessed Apr. 22, 2016).

9. See Neotrade, 3D Printing. Philippines. Now., *available at* <http://www.neo-trade.co/2015/05/3d-printing-philippines-now.html> (last accessed Apr. 22, 2016). The conference took place on 7 and 8 August 2015 at the SMX Convention Center in Taguig City. *Id.*

10. *Id.*

11. *Id.*

Law may be perceived as having “ephemeral” value, as ever-changing as fashion fads. Thus, some may believe that the topic is not worthy of any serious consideration, due to misperceptions of its apparent “frivolous” concerns. Despite the fact that it is a trillion dollar global industry,¹² until recently, in the United States (U.S.), the reluctance of legal circles to recognize and embrace Fashion Law was due to what Professor Susan Scafidi, “the first professor ever to offer a Fashion Law course,”¹³ had astutely observed —

The relative neglect of the fashion industry by the legal profession and certainly by the legal academe over the years has less to do with the importance of fashion and more to do with what I have called its status as a pink-and-lavender discipline, one primarily associated with women and gay men, as well as men of color (and those willing to wear it).¹⁴

While this may be true at some level in the Philippines, the Author believes that the lack of awareness about the crucial intersections between Fashion and the Law might also be a major culprit.¹⁵ A crisis in leather accessories caused by the embargo of python skins due to concerns regarding animal rights,¹⁶ or the dangers of trademark protection accorded to a type of color in the sole of women’s shoes,¹⁷ do not exactly make for compelling legal news in the Philippines. To the devotees of Fashion, the worshippers of Style, and the lawyers who serve them, this is unfortunate, and perhaps, even tragically myopic.

12. Statistic Brain, Fashion Industry Statistics, *available at* <http://www.statisticbrain.com/fashion-industry-statistics> (last accessed Apr. 22, 2016).

13. Fordham University, Susan Scafidi, *available at* https://www.fordham.edu/info/23380/susan_scafidi (last accessed Apr. 22, 2016).

14. Susan Scafidi, *Introduction: Fashion Law Triumphant — Designing Success in a New Legal Field*, in NAVIGATING FASHION LAW, LEADING LAWYERS ON DEVELOPING CLIENT BRANDS IN A CHANGING MARKET AND MONITORING KEY LEGAL DEVELOPMENTS 13 (2015 ed.).

15. Noel G. Ramiscal, Fashion Law in the Philippines, *available at* <https://noelthefashiongemplawyer.wordpress.com/2015/04/10/fashion-law-in-the-philippines-copyright-by-dr-atty-noel-g-ramiscal> (last accessed Apr. 22, 2016). In line with the Author’s Fashion Law advocacy, he established the first blog on Philippine Fashion Law (<https://noelthefashiongemplawyer.wordpress.com>), with the first article entitled “Fashion Law in the Philippines.” *Id.*

16. *See* Matt McGrath, Python skin trade worth a billion and — often illegal, *available at* <http://www.bbc.com/news/science-environment-20509720> (last accessed Apr. 22, 2016).

17. *See* Christian Louboutin S.A. v. Yves Saint Laurent Am., Inc., 696 F.3d 206, 206-29 (U.S.).

Coco Chanel famously said that “[f]ashion is not something that exists in dresses only. Fashion is in the sky, in the street[;] fashion has to do with ideas, the way we live, what is happening.”¹⁸ Whether we care to admit it or not, fashion has always been with us, since that prescient time when human beings realized the value of adorning, as opposed to simply wearing “stuff” to cover their bodies.

The “fashioning” of a whole culture, an era, a civilization, extends beyond the loom, the silversmith, the factory, the CAD workspace and mood boards, or the atelier of a haute couture designer. True fashion would encapsulate the identity, belief systems, rites, and even language of its devotees. Consider, for example, the ancient shell beads that have been excavated at several sites all over the world.¹⁹ One scholar noted that these beads “can indicate social or marital status []. But you need to have a complex system of language behind that. To me [these beads] are very powerful archaeological evidence that these people were able to speak like us.”²⁰

Shells were also used as a medium of exchange²¹ from ancient times up to the 19th century in the trading centers and routes in South Asia, East Asia, and Africa.²² The discoveries of gold and silver, and the beliefs and techniques invented by the ancients which made them fashionable objects of desire and adornment also led them to become valuable commodities, and “mediums of exchange and stores of wealth.”²³ These signify that fashion or the regard given for its manifestations, had occupied an economic status that has continued to this day.

Fashion as a form of protection for both the body and psyche of humans can be gleaned from the Genesis story of Adam and Eve, where after partaking of the fruit of Knowledge in disobedience of God’s decree, “the Lord God made for Adam and for his wife garments of skins, and clothed

18. KAREN KARBO & CHESLEY MCLAREN, *THE GOSPEL ACCORDING TO COCO CHANEL: LIFE LESSONS FROM THE WORLD’S MOST ELEGANT WOMAN* 221 (2009).

19. Anna Gosline, *Ancient Beads Imply Culture Older Than We Thought*, *New Scientist*, available at <http://www.newscientist.com/article/dn9392-ancient-beads-imply-culture-older-than-we-thought> (last accessed Apr. 22, 2016).

20. *Id.* (citing Interview with Francesco D’Errico, Researcher, Institute of the Prehistory and Geology of the Quaternary, in Talence, France (June 22, 2006)).

21. Gosline, *supra* note 19.

22. RONALD LOUIS BONEWITZ, *SMITHSONIAN NATURE GUIDE ON GEMS* 207 (2013).

23. *Id.* at 42.

them.”²⁴ Witness also the evolution of the helmet, gauntlet, gorget, breastplate, greaves, and chain mail as body armor during the Crusades, and the Kevlar ballistic fabric and spider silk of modern-day warfare, all of which have influenced socially-conscious contemporary designers.²⁵

Fashion adornments have been linked with metaphysical and mystical beliefs —

By 3000 BCE, [“magical”] amulets were being cut from agate, carnelian, turquoise, and lapis lazuli in Egypt and Mesopotamia. ... The remnants of a Babylonian text states that a gem referred to as the [“Ka-Gi-Ma”] would help a man destroy his enemies, a seal made of rock crystal would help extend a man’s possessions, a green serpentine seal would draw blessings[.]²⁶

The wearing of jewelry containing gemstones associated with certain healing properties was, and still, is a popular way of not only displaying the beautiful gemstones, but of empowering and protecting the wearer.²⁷ Cassandra Eason writes

earrings protect the mind from psychological attack; necklaces and pendants shield the heart from emotional manipulation and bring love; bracelets or arm bands reach out to attract abundance and opportunities. ... Rings on any finger symbolize lasting love, friendship[,] and health continuing in a never-ending cycle.²⁸

Creation stories from Africa, the American Indians, and even the Greek myth of Arachne, possess the archetypal symbol of the Spider woman as the weaver of histories and destinies of humankind.²⁹ In Asian rites of magic, clothes, blankets, and mats that contain the motifs of the eye and key to indicate openings, closures, beginnings, and endings are quite popular. These

24. Susan Scafidi, *F.I.T.: Fashion As Information Technology*, 59 SYRACUSE L. REV. 69, 76 (2008) (citing *Genesis* 3:21 (Revised Standard Version)) [hereinafter Scafidi, *F.I.T.*].

25. JAY CALDERIN, *FASHION DESIGN ESSENTIALS: 100 PRINCIPLES OF FASHION DESIGN* 22 (2011).

26. BONEWITZ, *supra* note 22, at 37.

27. The Author’s website on gems and fashion, and his jewelry designs featuring gems associated with healing and the seven chakras, serve as a good reference for the symbolic representations of these adornments. See Noel G. Ramiscal, Noel the Fashion Gem Lawyer, available at <https://noelthefashioningemlawyer.wordpress.com> (last accessed Apr. 22, 2016). See also Noel G. Ramiscal, Introduction and Invitation, available at <https://noelthefashioningemlawyer.wordpress.com/2015/04/21/an-introduction-and-invitation-copyright-by-dr-atty-noel-g-ramiscal> (last accessed Apr. 22, 2016).

28. CASSANDRA EASON, *THE COMPLETE CRYSTAL HANDBOOK* 7 (2010).

29. Scafidi, *F.I.T.*, *supra* note 24, at 76-77.

designs are used by female weavers, healers, and “sorcerers to communicate with divinity.”³⁰ The mark of greatness lies in the fact that “[t]he finer the weave/the more powerful is she.”³¹ These designs attest to the universal connectedness of all beings with one another and that whatever fate befalls one, affects all. It also attests to the “circularity of human wisdom, its infinite reach into the involute universe of the self.”³²

Fashion can also serve as a testament and defiance against tyranny and oppression. The quilts produced during the period of slavery of African Americans supposedly encoded the route to safe houses in the Underground Railroad.³³ The contemporary Guatemalan weavers incorporate in their *huipils*,³⁴ the tragedies of injustice and violence, moving one poet to write — “I’ve traced on the breasts/of your huipil/something within me burns/I’m imaging: girls with beads/and chapped mouths/bodies soaked/in grime and blood/your coarse hands/pounding the maize/weaving stories/that fires and bullets take.”³⁵

Fashion, or the right to create, consume, and enjoy it, has also been seen as part of the essential “democratic” human freedom of expression. In the aftermath of the 11 September 2001 terrorist bombings of the World Trade Center Towers in New York City, New Yorkers fought hard to recover their sense of balance and from wallowing in their grief.³⁶ To do this, they launched careful fashion campaigns staged at crucial times, to awaken the sense of continuity of life, and stem the economic downturn that the terroristic attack had appeared to ingrain in the American consciousness.³⁷ The right to shop, to don, and to express fashion in its multifarious realizations became an antidote — a defense to, and resistance against — the numbing effects and horrors of terrorism.³⁸

30. MARJORIE M. EVASCO, *DREAMWEAVERS: SELECTED POEMS 1976–1986*, front cover (1987).

31. *Id.* at 51.

32. *Id.* at 42.

33. Scafidi, *F.I.T.*, *supra* note 24, at 77.

34. Huipils are the most common traditional garment worn by indigenous women in Central America. Each village has its own traditional pattern, highlighting the uniqueness of each garment. See Humble Hilo, What is a Huipil, *available at* <http://humblehilo.com/pages/what-is-a-huipil> (last accessed Apr. 22, 2016).

35. Noel G. Ramiscal, *Huipil*, in NOELSES: SELECTED POEMS IN ENGLISH, TAGALOG AND SPANISH, 1985–2005: Ybanag verses co-written with Juanita Ramiscal 51 (2005).

36. Minh-Ha T. Pham, *The Right to Fashion in the Age of Terrorism*, 36 SIGNS 385, 385 (2011).

37. *Id.* at 386.

38. *Id.*

As this short disquisition shows, fashion is more than the sum of its myriad parts. It can show us certain aspects of ourselves, certain strands of our complicated humanity that no other medium of communication can, with tactile, visual, and sometimes visceral impact. Indeed, in this globalized world where people and entities go for differentiation as their edge, where the power of one can trump the power of the pack over matters of style and substance, fashion, in all its sleek, and at times vainglorious and arguably ridiculously pricey manifestations, can be the harbinger of change and a new order, no matter how fleeting.

If only for these (and so much more), Philippine lawyers who are interested in fashion, and those in the fashion sector who are interested in protecting the rights and interests of the stakeholders in this wildly creative industry, have the responsibility to understand the intersections of law and fashion, how to interpret the emerging legal issues surrounding the use of technology in fashion in a way that brings about better understanding for all, and help to keep the flame for real time fashion alive, even in the age of digital avatars and Second Life fashionisti.

III. THE BASICS OF 3D PRINTING

Most people would have no idea that fashion is the mother of what we now know as computer technology. The nascent origins of the now ubiquitous computer lie in a loom that Joseph Marie Jacquard was granted a patent for in 1804.³⁹ This mechanical loom “specified a unit of information pertaining to such critical data as the angle and color of each line of thread, enabling the machine to produce automatically multiple copies of the same design.”⁴⁰ Charles Babbage, who is recognized as the inventor of the first modern computer that performed mathematical operations, copied “[] Jacquard’s idea lock, stock, and barrel” and proclaimed —

the system of cards which [Jacquard] invented are the *means* by which we can communicate to a very ordinary loom to weave *any* pattern that may be desired. Availing myself of the same beautiful invention[,] I have by similar means communicated to my Calculating Engine orders to calculate *any* formula[,] however complicated.⁴¹

It comes as no surprise then that fashion would actually jibe with 3D printing, which relies on the computational powers and processes of a computer.

39. Scafidi, *F.I.T.*, *supra* note 24, at 78 (citing JAMES ESSINGER, JACQUARD’S WEB: HOW A HAND-LOOM LED TO THE BIRTH OF THE INFORMATION AGE (2004)).

40. *Id.*

41. *Id.* at 78-79 (emphases supplied).

It is useful at this stage to look at some of the basics of 3D printing to appreciate the underlying technological issues that presage the future legal and related issues that Philippine fashion designers using this technology may grapple with.

The most crucial step in the 3D realization of a fashion design is rendering the image drawn by a designer on a sketchpad or mood board into digital form. CAD software, which fashion design students should be exposed to, is generally used in this respect. The translated e-file would generally have an extension name like .stl or .amf.⁴²

Another way of generating a 3D printable file would be to scan the object that will be printed.⁴³ Scanners can be of the non-contact, automatic variety. For example, Makerbot Industries developed 3D Scanner Mounting Kit that employs a scanner composed of a projector and a webcam connected to a computer equipped with modeling software.⁴⁴ The object to be scanned must be placed directly in front of the webcam and the projector.⁴⁵ The webcam takes pictures of the object as it is bathed with stripes of light by the projector.⁴⁶ The kit's software will superimpose the pictures to create a 3D model.⁴⁷ Human intervention is not required in these essential processes.⁴⁸ Scanners can also be of the contact, manual variety. The D-Sculptor 2 and iModeller Pro, for instance, allow a user to take several two-dimensional pictures of an object using a digital camera, and then upload them via their software to "recreate" the 3D image.⁴⁹

42. The extension name "stl" is short for stereolithography, while "amf" is short for additive manufacturing format. See 30 Years of Innovation, 3D Systems, available at <http://www.3dsystems.com/30-years-innovation> (last accessed Apr. 22, 2016). "stl" is also sometimes referred to as "Standard Tessellation Language." The ".amf," which can handle more variety in terms of colors, materials, and even detailed internal structures, may soon replace the ".stl" completely. See Lucas S. Osborn, *Of PhDs, Pirates, and the Public: Three-Dimensional Printing Technology and the Arts*, 1 TEX. A&M L. REV. 811, 814 (2014) (citing HOD LIPSON & MELBA KURMAN, *FABRICATED: THE NEW WORLD OF 3D PRINTING* 100-02 (2013)).

43. Osborn, *supra* note 42, at 814.

44. Bre Pettis, *New! Makerbot 3D Scanner Kit!*, available at <http://www.makerbot.com/blog/2010/09/14/new-makerbot-3d-scanner-kit> (last accessed Apr. 22, 2016).

45. *Id.*

46. *Id.*

47. *Id.*

48. Haritha Dasari, *Assessing Copyright Protection and Infringement Issues Involved with 3D Printing and Scanning*, 41 AM. INTELL. PROP. L. ASSOC. L.J. 279, 302 (2013).

49. *Id.*

The 3D printing process is also known as rapid prototyping or additive manufacturing.⁵⁰ The whole idea behind it is to print an object layer by layer from the ground up with the computer acting as the guide.⁵¹ The inventor of 3D printing, Charles W. Hull, described his invention “stereolithography” as a process that involved “[slicing] a computer-aided design [] file into two-dimensional cross-sections and [using] an ultraviolet laser to [“]print[”] the cross-sections layer by layer in a photosensitive resin.”⁵² Once the 3D model is created, the printing process can start. Preeta D. Reddy describes the process —

[3D] printers use materials that are reduced to powder or liquid form and are then fused into 3D objects using lasers[.] A blade within the printing chamber reads the CAD model and spreads even layers of powder on the surface of the chamber. Then[,] a laser scans across the powder, melting and fusing it to form the first layer of the object. This process is repeated until the object is completely built. Customization and a high level of precision are possible because the layers can essentially be broken down to the micron level.⁵³

IV. 3D PRINTED FASHION

The key in the printing process is the “ink.” “Think of an ink cartridge to a regular printer, only instead of ink[,] a user starts with any substance at its liquidated state such as metal, plastic, or even chocolate.”⁵⁴ Other materials include polyamides, epoxy resins, wax, polycarbonates, food byproducts,⁵⁵ sugar, and even human cells.⁵⁶ The printer “mechanically creates the object, from the bottom up, by placing layers of the [“]ink[”], on top of one another.”⁵⁷ From such materials, human body organs, medicines, cars, airplane parts, even entire houses, and buildings have been printed.⁵⁸

50. Osborn, *supra* note 42, at 812.

51. *Id.*

52. Michael Rimock, *An Introduction to the Intellectual Property Law Implications of 3D Printing*, 13 CAN. J. L. & TECH. 1, 3 (2015) (citing U.S. Patent No. 4,575,330).

53. Preeta Reddy, *The Legal Dimension of 3D Printing: Analyzing Secondary Liability in Additive Layer Manufacturing*, 16 COLUM. SCI. & TECH. L. REV. 222, 225 (2014).

54. Sarah Swanson, *3d Printing: A Lesson In History: How to Mold the World of Copyright*, 43 SW. L. REV. 483, 484 (2014).

55. Reddy, *supra* note 53, at 225.

56. LIPSON & KURMAN, *supra* note 42, at 103.

57. Dasari, *supra* note 48, at 287-88.

58. See Reddy, *supra* note 52, at 227 & Nicole A. Syzdek, *Five Stages of Patent Grief to Achieve 3D Printing Acceptance*, 49 U.S.F. L. REV. 335, 336 (2015).

In terms of fashion, the promise of 3D printing, combined with artistic and scientific ingenuity, is paying off handsomely. Designer Shamees Aden, together with Dr. Martin Hanczyk from the University of Southern Denmark, developed a synthetic biological substance using the protocell technology which Aden incorporated into state-of-the-art running shoes.⁵⁹ The protocells are non-living molecules that can be combined to create materials that react to movement, pressure, heat, and light, and are 3D printable. These cells make it possible for the shoes to fit an individual foot perfectly and they regenerate themselves so the shoes do not wear out.⁶⁰ Victoria's Secret had partnered with Shapeways and Swarovski to create the perfect angel wing accessories for its lingerie show, worn by a model during its 2013 show.⁶¹ The wings were 3D printed to fit the model's body perfectly and encrusted with millions of Swarovski crystals.⁶² The creation of a 3D printed bra that would fit exactly the size of a woman's breasts to stave off any issues with the neck, shoulders, and back pains was bandied about as the future.⁶³ When Dita von Teese, the famous Burlesque Queen icon, donned a 3D printed dress designed by Michael Schmidt, executed with the help of architect Francis Bittoni, everyone who was anyone in the fashion world took notice. The dress comprising of over 13,000 Swarovski crystals embedded on 3,000 joints of nylon produced by "laser sintering" was the first "fully articulated" dress that required a conglomeration of knowledge in materials science, mechanical assembly, and 3D design.⁶⁴ Following on the heels of von Teese, Dutch haute couture designer Iris van Herpen 3D printed an amazing dress that looked like it was made from ice using the stereolithography technology. The dress was printed from a "vat [] filled with liquid photopolymer, after which a beam of ultraviolet light [focused] on the parts that [were] printed ... until the polymer harden[ed]"⁶⁵ to a dress.

59. See Jelmer Luimstra, 3D Printed Self-Repairing Running Shoes Made of Regenerating Cells, *available at* <http://3dprinting.com/news/3d-printed-self-repairing-running-shoes-made-regenerating-cells> (last accessed Apr. 22, 2016).

60. *Id.*

61. See Laurie Segall, Victoria's Secret model wears 3-D printed wings, *available at* <http://money.cnn.com/2013/12/10/technology/victorias-secret-3d> (last accessed Apr. 22, 2016).

62. *Id.*

63. See Jelmer Luimstra, Tailored, 3D Printed Bras Could be the Future, *available at* <http://3dprinting.com/news/tailored-3d-printed-bras-future> (last accessed Apr. 22, 2016).

64. See Robert Dehue, Dita Von Teese Wearing a Beautiful 3D Printed Gown, *available at* <http://3dprinting.com/fashion/dita-von-teese-wearing-a-beautiful-3d-printed-gown> (last accessed Apr. 22, 2016).

65. Jelmer Luimstra, Iris van Herpen 3D Printed an Ice-Like Dress, *available at* <http://3dprinting.com/fashion/iris-van-herpen-3d-printed-ice-like-dress> (last accessed Apr. 22, 2016).

These are just some of the examples of the fantastic, arguably confrontational, and visually arresting pieces of fashion created using 3D printing.

V. LEGAL ISSUES CONCERNING 3D PRINTING

A. Intellectual Property Rights Issues

Perhaps the most discussed and well-known legal issue pertaining to 3D printing would be Intellectual Property Rights. The most discernible concern with 3D printing when it comes to intellectual property creation is the fact that this technology is an enabler of infringement. 3D printing can, in a very real, actual sense, allow anyone who owns a 3D printer and knows how to scan or create a CAD file, print anything that has been previously designed or created by somebody else, exactly, without having to pay the original designer or creator or even obtain the latter's permission. Furthermore, 3D printing can also provide exact replicas of specific fashion materials that are quite distinctive, and in the past, due to their exclusive, fragile, perishable, or unique features could not be sourced from elsewhere. Articles that carry the trademarks of famous brands or are patented can therefore be reproduced with impunity, without their owners' or inventors' knowledge and consent, resulting in loss of licensing opportunities and incomes.⁶⁶

One must remember that in the case of 3D printed objects, the tangible expression of the idea of the designer prior to the printing of the sought-after object would be the CAD file created by the designer himself or herself, or the CAD file created through the scanning of the object. In the latter case, the point that must be clarified is that there must be some form of human creativity that was involved in the scanning, in order for the scanned CAD file to be plausibly linked to, or seen as created by a human author.

Under the Philippine Intellectual Property Code,⁶⁷ a CAD file can arguably be characterized as a "literary work,"⁶⁸ a "design for a work of art,"⁶⁹ an "original ornamental design,"⁷⁰ a "model for an article of

66. There is a great debate going on as to whether the intellectual property regimes of copyright, patents, trademarks, and even geographical appellations, are applicable to 3D printed items. The Author is of the opinion that these traditional intellectual property regimes are applicable to those goods that are produced using traditional methods or machines and are protected from infringement essentially by physical and financial constraints. If imposed on 3D printed technologies and objects, there are a lot of legal, philosophical, and practical issues that would make these regimes unenforceable, irrelevant, even unduly oppressive, and unjust. But this is the subject of another paper.

67. An Act Prescribing the Intellectual Property Code and Establishing the Intellectual Property Office, Providing for its Powers and Functions, and for Other Purposes [INTELLECTUAL PROPERTY CODE] Republic Act No. 8293 (1998).

68. *Id.* § 172.

69. *Id.* § 172.1 (g).

manufacture,”⁷¹ a pictorial “[3D] illustration or work relative to architecture,”⁷² or a “computer program,”⁷³ depending on the proponent’s arguments and the court’s appreciation of its nature. Assuming that it would fall under any of these categories, the author of the CAD file can assert economic and moral rights over the CAD file, which comprises his or her copyright. This would give the creator of the original work the right to sue a copycat, or a person who uses his or her work without consent, for infringement.⁷⁴ How will this play out in the online world? Let us contextualize it in a hypothetical high fashion scenario.

In the “Savage Beauty” retrospective of the late British designer, Alexander McQueen, at the Metropolitan Museum of Art, there was a ball gown culled from his 2001 spring/summer collection called the “Voss.”⁷⁵ This was a sleeveless gown made from long stripped varnished clamshells picked from a Norfolk beach.⁷⁶ It was a dress made by McQueen not for any utilitarian function, but purely for art’s sake. It was a dress meant to be viewed, not worn. It was meant to celebrate the ephemeral beauty of the passing of seasons and perhaps to serve as a reminder of how anything, given the proper touch, can be transformed into something extraordinary.

Now imagine if those shells, through the ravages of global warming, have become highly sought after as collector pieces, much in the same way that ammonite is now considered a rare gem. If you have just one piece of that clamshell, you can scan it and print a clone of it, using the different raw materials you researched and mixed, that would make up the filament ink for it. These materials are in great abundance on their own, so scarcity is not an issue. You can print this special shell for as many times as you wish, provided you never run out of the raw materials. There will never be wastage because you will only print as many as you need for your creation. And whatever is left of the filament materials, you can reuse for your other creations.

But what if you do not have *the* clamshell, since that type of shell had already become extinct, and you could not risk breaking into the Metropolitan Museum of Art to pluck one clam from the Voss dress?

70. *Id.* (h).

71. *Id.* (g).

72. *Id.* (i).

73. INTELLECTUAL PROPERTY CODE, § 172.1 (n).

74. *See* INTELLECTUAL PROPERTY CODE, § 216.

75. Metropolitan Museum of Art Dress, VOSS, Spring/Summer 2001 by Alexander McQueen, available at <http://blog.metmuseum.org/alexandermcqueen/dress-voss-3> (last accessed Apr. 22, 2016). *See also* Allison DeVore, *The Battle Between the Courthouse and the Fashion House: Creating A Tailored Solution For Copyright Protection of Artistic Fashion Designs*, 35 THOMAS JEFFERSON L. REV. 193 (2013).

76. *Id.*

You look online to decide what clam shell “model” you will utilize for your one-off haute couture Voss-inspired mermaid bridal dress. You find a model in the open-source community called “Thingiverse,”⁷⁷ licensed freely to the public under a Creative Commons license.⁷⁸ You decide to explore its possibilities. You follow the instruction for the mixture of the filament materials and wait for the layers of the clam to be fully printed. But the final material you develop is too coarse to the touch and has the tendency to splinter. You look for other sources. One online source is a licensed copyright protected clam model. But it is too expensive for your budget. In another site, you find the same model in a cracked version, which you download for free. This cracked version is a duplicate copy of the copyright protected model, but even then, the final product printed is too dull for your taste. So, learning from your experience, you decide to concoct your own mixture and design for the clamshell. You succeed in finally printing the perfect clamshell with a consistent finish no matter how many times it is printed. You start to promote your bridal dress, and it turns out that your creation is a runway success! What is more, unlike McQueen’s Voss, your dress’s wearer can sit down and move comfortably in it, and it can even be passed on to new generations of brides. Can you claim intellectual property ownership over your mixture and your design of the shell, and commercialize your model?

This example illustrates the very complex and difficult issues posed by intellectual property regimes, such as those in the Philippine Intellectual Property Code, on creators and designers — such regimes impose stranglehold provisions on economic rights, without regard to the fact that intellectual properties are not created in a vacuum, but are a confluence of all the social, cultural, historical, economic, political, even educational factors that creators and designers experience and process in their lives on the way to giving birth to their creations.

With respect to the open-source model you utilized, the mere acknowledgment of the model’s author might be sufficient to stave off any claim of infringement. But what if a condition of using the open source

77. See Thingiverse, available at <http://www.thingiverse.com> (last accessed Apr. 22, 2016). See also Defcad, available at <http://www.defdist.org> (last accessed Apr. 22, 2016) & Jeanette Cuzella, *Fast Fashion: A Proposal For Copyright Protection of 3d-Printed Apparel*, 13 COLO. TECH. L.J. 369, 369-93 (2015).

78. A Creative Commons license is a copyright license which grants to its users, for free, the option to customize which rights they want preserved in their published online works and which rights they waive. Essentially, it is intended to allow authors of creative works who publish their works on the Internet the opportunity to share their work with others and given them for free, while theoretically still taking credit for the work. See Creative Commons, *About the License*, available at <https://creativecommons.org/licenses> (last accessed Apr. 22, 2016).

model is that any subsequent licensee who utilizes the model, improves upon it, and incorporates it in his or her own version, is prevented from commercializing or profiting from the same but is legally obligated to disclose and upload the improved version for the open source community to utilize? If you keep to yourself the innovative clamshell and commercialize it, that would violate the terms of the open-source license. You must understand that the license's terms are simply an outgrowth of the open source philosophy of keeping the various manifestations of knowledge within the public domain.⁷⁹

B. Cybercrime Aspects

Under current Philippine laws, intellectual property infringement is not merely a civil infraction, but also a criminal offense.⁸⁰ The cracked version you downloaded from a black market site is arguably illegal, and your act is punishable under the Philippine Cybercrime Prevention Act⁸¹ in relation to the Philippine Intellectual Property Code⁸² and the Philippine e-Commerce Code.⁸³ You may deny, protest, and feign ignorance, thinking that the law enforcement agents or the author of the legitimate version would likely never discover your act of downloading the cracked version. But what if the author installed some form of digital rights management tool that can track down all the illegitimate versions of his or her model, and the police, in conjunction with the service provider and the online site where you downloaded the cracked version, had information consisting of your subscriber information, internet protocol address, log-in information, download information, traffic data, and other metadata that identifies you? Through the conduct of a valid search and seizure of your computer and electronic devices, and using cyber-forensic procedures, information that

79. See Brian Rideout, *Printing the Impossible Triangle: The Copyright Implications of Three-Dimensional Printing*, 5 J. BUS. ENTREPRENEURSHIP & L. 161, 163-64 (2011).

80. INTELLECTUAL PROPERTY CODE, § 217.

81. An Act Defining Cybercrime, Providing for Prevention, Investigation, Suppression, and the Imposition of Penalties Therefor and for Other Purposes, [Cybercrime Prevention Act], Republic Act No. 10175, § 6 (2012).

82. INTELLECTUAL PROPERTY CODE, § 217.

83. An Act Providing for the Recognition and Use of Electronic Commercial and Non-Commercial Transactions and Documents, Penalties for Unlawful Use Thereof, and for Other Purposes [e-Commerce Act of 2000], Republic Act No. 8792, § 33 (2000).

incriminates you could easily be retrieved, regardless of your efforts to destroy it.⁸⁴

In this example, can you argue that your mixture and your model are your creations and that they were merely inspired by, and not copied from the cracked version? You (or more precisely your lawyer) would certainly have to make this case, perhaps contending that the copyright regime under the Philippine Intellectual Property Code imposes a very low level threshold of originality, and that your expression of the mixture and the model of the shell are sufficiently distinct and different from the cracked version. You may also try to convince the judge that you had no intention to misappropriate the works of the author of the cracked version of the shell models, although this defense lies on dubious grounds.⁸⁵

A closely related issue involves your product liability as a designer of the 3D printed shell. If a hemophiliac consumer from Brazil ordered your special shells online as an accent to his or her costume in the annual LGBT Mardi Gras carnival in Rio de Janeiro, and, while wearing the costume, he or she was injured allegedly because of the constant splintering of the shells, resulting in significant loss of blood and infection, whom would he or she sue? The issue of jurisdiction will arise. If the consumer is from Brazil, the 3D printer service is in the U.S., and the designer is from the Philippines, can the consumer sue both the 3D printer service and the Philippine designer in Brazil for damages arising from the defective product? Assuming the incident led to the death of the consumer, where can the consumer's relatives file a cybercrime case? Under the Cybercrime Prevention Act, the damaged party, or his or her heirs can file a cybercrime case in the Philippines because the designer is a Philippine citizen, in accordance with the long arm jurisdiction provision of this law.⁸⁶

These are issues that fashion designers need to be apprised of when they have to deal with, and use 3D CAD files available online, or when they themselves upload their own 3D CAD files online for whatever purpose.

84. See Sameer Hinduja, *Computer Crime Investigations in the United States: Leveraging Knowledge from the Past to Address the Future*, 1 INT'L J. OF CYBER CRIMINOLOGY 1, 1-26 (2007).

85. See *In the Matter of the Charges of Plagiarism, etc., Against Associate Justice Mariano C. del Castillo*, 642 SCRA 11, 93-210 (2011) (J. Sereno, dissenting opinion).

86. Cybercrime Prevention Act, § 21.

C. Possible Misappropriation or Dispossession of Certain Techniques, Designs, and Knowledge from Certain Originators

From 1947 up to 2011, Chanel's women suits featured braids that had only been produced by one woman, Madame Raymonde Pouzieux.⁸⁷ She developed her own looms and invented techniques of weaving silk and cotton together in distinctive braids that the House of Chanel became famous for.⁸⁸ Before she passed away, she completed an order of fifteen meters of braid for the House.⁸⁹ The apprentices sent by Chanel were confounded by the loom's intricacies.⁹⁰ Her wry personality and "Rumpelstiltskin" ways of weaving resulted in her braiding secrets dying with her.⁹¹

It is a fact that certain indigenous motifs and techniques of weaving are sacred and secretly nurtured, taught, and passed on to generations of weavers, healers, and diviners. In Australia, several cases have been decided which have upheld the exclusive rights of certain aboriginal communities to create, develop, and exploit their own indigenous symbols and designs.⁹² These designs and techniques may suffer the same fate as Madame Pouzieux's braids if the younger generations of concerned indigenous communities do not take the time and patience to learn them.

3D printing, in this regard, presents both a solution and potentially grave legal issues. 3D printing may provide a way of bringing back to life a forgotten piece of fashion detailing or adornment, if no person currently exists who knows how to create such pieces, so long as an actual piece is left which could be digitally rendered or scanned and printed.

The secret techniques an artist or artisan has developed over a lifetime may very well constitute a trade secret that can be protected under the Intellectual Property Code⁹³ and the infringement of which is criminalized

87. Angèle Hemu, Raymonde Pouzieux, passementière, Maison d'Exceptions, available at <http://www.maisondexceptions.com/en/raymonde-pouzieux-passementiere> (last accessed Apr. 22, 2016).

88. *Id.*

89. *Id.*

90. CALDERIN, *supra* note 25, at 72.

91. Hemu, *supra* note 87.

92. See *Milpurruru v. Indofurn Pty. Ltd.*, 54 IPR 240 (Austl. 1994) & Colin Golvan, *Aboriginal Art and Copyright: The Case for Johnny Bulun Bulun*, 10 EUR. INTELL. PROP. REV. 347, 347-54 (1989).

93. "Trade secrets" may be considered as "undisclosed information" that is protected under the Intellectual Property Code. See INTELLECTUAL PROPERTY CODE, § 4.1 (g).

under the Revised Penal Code.⁹⁴ However, it is not clear if the 3D printing technology has any infringement recognition measure that will prevent this type of criminal act. Trade secrets, by their very nature are not known. Publication destroys their secrecy. It would not be likely then for a 3D printer to be equipped with a preventive measure that recognizes trade secrets. Thus, the replication of the product containing the trade secret using the 3D printing technology, without the assistance and consent of the artist or artisan, is totally possible.

In the same vein, 3D printing can also provide a way of misappropriating the sacred knowledge, techniques, and motifs of indigenous communities, by virtue of the technological process. The Indigenous Peoples' Rights Act (IPRA) established a communal intellectual property right for indigenous cultural communities.⁹⁵ The IPRA granted to the indigenes covered their right to own, control, develop, and protect "the past, present[,] and future manifestations of their cultures, such as but not limited to, archaeological and historical sites, artifacts, designs, ceremonies, technologies, and visual and performing arts and literature, as well as religious and spiritual properties."⁹⁶ Under the system established by this law, it is necessary to secure the prior informed consent of the concerned indigenous community, before one can use a protected indigenous piece of knowledge.⁹⁷

But 3D printing will not respect the parameters of the sacred, the secret, and the protected. Anyone who has a copy of an indigenous cultural artifact, like a piece of weaving with an indigenous design, can have it scanned and 3D printed by a 3D printing service like Shapeways, which will deliver it straight to the customer's doorstep. 3D printing will render inutile any existing legal protection for trade secrets and the mechanisms provided under the IPRA, which were meant to protect our indigenous communities from the unlawful misappropriation and "bastardization" of their cultural knowledge.

94. See An Act Revising the Penal Code and Other Penal Laws [REVISED PENAL CODE], Act No. 3815, arts. 291 & 292 (1950).

95. An Act to Recognize, Protect and Promote the Rights of Indigenous Cultural Communities/Indigenous Peoples, Creating a National Commission on Indigenous Peoples, Establishing Implementing Mechanisms, Appropriating the Funds Therefor, and for Other Purposes [The Indigenous Peoples' Rights Act of 1997], Republic Act No. 8371, § 32 (1997).

96. Rules and Regulations Implementing the Indigenous Peoples' Rights Act, Republic Act No. 8371, rule II, § 1 (j) (1998).

97. The Indigenous Peoples' Rights Act, § 32. See also Noel G. Ramiscal, Plenary Speaker and Technical Consultant, National Commission on Culture and Arts, A Blueprint for Recognizing and Protecting Community Intellectual Property Rights, Address at the ASEAN Intellectual Property Rights Experts Meeting (Oct. 9, 2009).

D. Health and Environmental Considerations

The latest advances in technology have made their impact on the textiles industry. Aesthetic and functional finishes on fabric to make them soft, flame retardant, wrinkle-resistant, and more, have actually made the clothes that we wear behave and “breathe” in ways that were not possible in the greater part of the past millennium.

Nano-finishes make textiles resistant to wrinkles, stains, and soil. Silver particles and other chemicals like triclosan are used to kill bacteria and get rid of odor in fabrics. Cotton chino, for example, is very popular for pants fabrics for both sexes due to the fact that these undergo nano-finishing. One source has noted that it is not established if the nano-molecules utilized in the finish would not harm the wearer or pollute water supplies.⁹⁸ The same source maintained that it is also not certain what the long-term effects of these finishes have on the environment when the clothes they are applied to are eventually discarded.⁹⁹ There are studies that show that the particles of nano-silver finishes, when released into an aquatic ecosystem, enter the embryos of fish eggs and are lethal to certain types of small fish.¹⁰⁰ A study of six textiles with silver nano-finishes revealed that two of the textiles “limit the viability of human cells to a lesser extent.”¹⁰¹ Triclosan finishes were also found to cause a tendency for “endocrine disruption” and negatively affect small fish.¹⁰²

3D printers print the final objects by the use of filaments. These are stored on spools which are located in the printer’s head. Jeanette Cuzella describes the process thus —

To print an object, the printer head then liquefies the [] filament and disperses it onto the printing platform in thin layers. Objects are created by slowly placing one thin layer of filament on top of another. Some printers have more complicated designs that may involve two printer heads allowing objects to be made in two different colors.¹⁰³

98. GAIL BAUGH, *THE FASHION DESIGNER’S TEXTILE DIRECTORY* 91 (2011).

99. *Id.* at 43-46.

100. See Faheem Uddin, *Environmental Concerns in Antimicrobial Finishing of Textiles*, 3 *INT’L J. OF TEXTILE SCI.* 15, 15-20 (2014).

101. Uddin, *supra* note 100, at 18 (citing Boris Mahltig & Hajo Haase, *Comparison of the effectiveness of different silver-containing textile products on bacteria and human cells*, 103 *J. OF THE TEXTILE INSTITUTE* 1, 1-5 (2012)).

102. Uddin, *supra* note 100, at 18 (citing Andrea B. Dann & Alice Hontela, *Triclosan: environmental exposure, toxicity and mechanisms of action*, 31 *J. OF APPLIED TOXICOLOGY*, 285-311 (2011)).

103. Cuzella, *supra* note 77, 373-74 (citing Signe Brewster, *How Does a 3D Printer Work? The Science and Engineering Behind This Emerging Technology*, available at <http://gigaom.com/2013/08/26/how-does-a-3d-printer-work-the->

Of interest here is the type of materials that make up the filaments that are processed by the printers.¹⁰⁴ Much of what is commonly produced at this time in 3D printed fashion consists of plastic. Designers and printers should be aware of the ethics of printing non-recyclable material. One textbook advises, “[u]sing polyurethane membrane or mixing their fiber contents in your apparel will make recycling your design impossible.”¹⁰⁵

Apart from non-recyclability, what should be of grave concern to designers here is the fact that “3D printers are now used to print garments made of wearable fabrics that [do not] have a name — they are neither cotton[,] nor silk[,] nor wool, etc., but rather something else.”¹⁰⁶ The filaments used to produce wearable fashion may contain nano-finishes and other types of materials, which in combination may harm the wearer and the environment.

Then, too, there are recent studies which pose questions about the possible hazards of 3D printing. The most troublesome finding is that

[s]ome of these [3D] printers emit ultrafine particles (UFPs) at concentrations that may be hazardous in confined spaces. Right now, 3D printers use heated plastic resins that the printer sprays from [“]very fine nozzles.[”] The process of heating and spraying the plastic [—] which causes it to decompose slightly [—] creates a form of indoor air pollution. UFPs are known to deposit in lungs and can lead to stroke, asthma, and death. A group of scientists from the Illinois Institute of Technology[,] led by Dr. Brent Stephens, found that the levels of UFPs emitted from 3D printers is [“]significant.[”] In discussing the study, one commentator noted that [“]care should be taken when using 3D printers in indoor environments without adequate particle filtration and ventilation.[”]¹⁰⁷

science-and-engineering-behind-this-emerging-technology (last accessed Apr. 22, 2016)).

104. *Id.*

105. BAUGH, *supra* note 98, at 117.

106. Rania V. Sedhom, *3D Printing and its Effect on the Fashion Industry: It's More Than Just About Intellectual Property*, 55 SANTA CLARA L. REV. 865, 878 (2015).

107. Elizabeth J. Kennedy & Andrea Giampetro-Meyer, *Gearing Up for the Next Industrial Revolution: 3D Printing, Home-Based Factories, and Modes of Social Control*, 46 LOY. U. CHI. L.J. 955, 963 (2015) (citing 3D Printers May Pose Indoor Air Pollution Risk, *available at* <http://gallondaily.com/2013/07/29/3d-printers-may-pose-indoor-air-pollution-risk> (last accessed Apr. 22, 2016); Thomas Burke, 3D Printing is the Future, But Safety Comes First, *available at* <http://www.networkcomputing.com/applications/3d-printing-is-the-future-but-safety-comes-frist/a/d-id/1113457> (last accessed Apr. 22, 2016); Tyler Falk, 3D Printers Have a Dirty Secret, *available at* <http://www.smartplanet.com/blog/bulletin/3d-printers-have-a-dirty-secret> (last accessed Apr. 22, 2016); Lyndsey Gilpin, The Dark Side of 3D Printing: 10 Things to Watch, *available at*

UFPs make up the smallest size fraction in what is a continuum of airborne particles known as ambient particulate matter, with diameters ranging from a few nanometers to several micrometers.¹⁰⁸ In one study, it was said —

Both animal and human studies provide evidence for respiratory and cardiovascular effects associated with exposure to UFPs. Observed effects in selected studies include lung function changes, airway inflammation, enhanced allergic responses, vascular thrombogenic effects, altered endothelial function, altered heart rate and heart rate variability, accelerated atherosclerosis, and increased markers of brain inflammation.¹⁰⁹

The legal environment for textiles leaves much to be desired as far as 3D printed fabrics are concerned. For instance, in the European Union's (EU) Textile Labelling Regulation No. 1007/2011,¹¹⁰ information need only be provided in the case of garment textiles about the fibres, but not the so-called auxiliaries like finishes.¹¹¹ The EU's 1998 Biocidal Product Directive requires the specification of any biocidal chemical used in any product that is marketed in the EU.¹¹² In the 2012 Biocidal Products Regulation of the EU, the "protection agents for fibres, leather, rubber, and polymeri[z]ed materials ... are subject to an evaluation and approval of their active ingredient substances at the European level and, subsequently, to a national product authorization procedure which includes the evaluation of proposed uses."¹¹³ In Germany, certain flame retardants are banned, and azo dyes that can come into direct contact with the human skin and mucosa should not exceed 30 miligrams per kilogram of textile because they can be cleaved into

<http://www.techrepublic.com/article/the-dark-side-of-3d-printing-10-things-to-watch/> (last accessed Apr. 22, 2016); & Dominique Mosbergen, 3D Printers May Be As Hazardous To Your Health As Cigarettes, According to New Study, *available at* http://www.huffingtonpost.com/2013/07/24/3d-printers-health_n_3646133.html (last accessed Apr. 22, 2016)).

108. HEI Review Panel on Ultrafine Particles, Understanding the Health Effects of Ambient Ultrafine Particles (A Research Paper Published by the Health Effects Institute) 1, *available at* <http://pubs.healtheffects.org/getfile.php?u=893> (last accessed Apr. 22, 2016).

109. *Id.* at 3.

110. Commission Regulation No. 1007/2011, art. 5, 2011 Official Journal (O.J.) (L 272) (E.U.).

111. Bundesinstitut für Risikobewertung [BfR], *Introduction to the problems surrounding garment textiles*, Updated BfR Opinion No. 041/2012, 1 (July 6, 2012) (citing Commission Regulation No. 1007/2011, art. 5, 2011 O.J. (L 272) (E.U.)).

112. Uddin, *supra* note 100, at 17. (citing Council Directive No. 98/8/EEC, art. 3, 1998 O.J. (L 123) (E.U.)).

113. BfR, *supra* note 111, at 2 (citing Regulation No. 528/2012, art. 4, 2012 O.J. (L 167) 106 (E.U.)).

carcinogenic amines.¹¹⁴ Anti-microbials and pesticides used in textiles can only be registered with the U.S. Environmental Protection Agency if they are found not to be harmful to human health and the environment.¹¹⁵ None of the laws and regulations from these different jurisdictions refer to textiles or fabrics printed from 3D printers as part of their regulatory regimes. Neither do they talk about the regulation of 3D printers for their emission of UFPs.

In the Philippines, the pertinent laws on fabrics and textiles¹¹⁶ do not expressly mention anything about textile finishes, biocides, and pesticides that are utilized on fabrics, particularly 3D printed textiles, and their specific regulation. There is no current Philippine law on 3D printing and UFP emissions.

The Philippine Textile Research Institute (PTRI) was mandated under an Executive Order¹¹⁷ to conduct, amongst others, applied research and development for the textile industry sector and to transfer its completed research to end-users or via linkage units of other government agencies.¹¹⁸ Its ongoing research under its different programs — Bio-nano Fiber and Composites Technologies Program,¹¹⁹ Nano-Functional and

114. *Id.*

115. Uddin, *supra* note 100, at 17.

116. *See, e.g.*, An Act Prescribing the Use of the Philippine Tropical Fabrics for Uniforms of Public Officials and Employees and for Other Purposes, Republic Act No. 9242 (2004); Office of the President, Further Amending Executive Order (E.O.) No. 537 Dated May 24, 1979, Creating the Garments and Textile Export Board, Abolishing the Embroidery and Apparel Control and Inspection Board, and for Other Purposes, Executive Order No. 823 [E.O. No. 823] (Aug. 19, 1982); Creating the Garments and Textile Export Board (GTEB) Defining its Powers and Functions, Providing Funds Therefore and for Other Purposes, Presidential Decree No. 1440 (1978); Office of the President, Letter of Instructions No. 558 [LOI No. 558] (June 17, 1977); & An Act to Promote the Textile Industry of the Philippines by Exempting, Under Certain Conditions, Importations of Needed Raw Materials, Chemicals, Dyestuffs and Spare Parts and the Subsequent Manufacture and Sale of Products Derived Therefrom, from Duties and Taxes, by Creating a Special Fund for Vital Research, and for Other Purposes, Republic Act No. 4086 (1964).

117. Reorganizing the National Science and Technology Authority, Executive Order No. 128, [E.O. No. 128] (Jan. 30, 1987).

118. *See* Philippine Textile Research Institute, Goals and Objectives, *available at* <http://www.ptri.dost.gov.ph/index.php/transparency/goals-and-objectives> (last accessed Apr. 22, 2016).

119. Philippine Textile Research Institute, Bio-nano Fiber and Composites Technologies Program, *available at* <http://www.ptri.dost.gov.ph/programs-and-projects/bio-nano-fiber-and-composites-technologies-program> (last accessed Apr. 22, 2016).

Nanocomposite Finishing Technologies,¹²⁰ and Bio-Functional Materials and Textile Technologies¹²¹ — are concerned with, among others, developing local materials like abaca, pineapple, and banana into intelligent fabric materials, and using technology such as microencapsulation, which can have beneficial health effects and mitigate environmental degradation. The PTRI has not come up with any study concerning 3D printed textiles, or the health risks posed by this kind of fabric production in the Philippine setting.

All these should be a cause of great concern. Misguided or nefarious entities may claim that 3D printed textiles are microencapsulated and bio-functional to sell their creations. Microencapsulation is the process of “encapsulating liquid or solid substances in tiny thin-walled natural or synthetic bubbles. Microspheres [(which are incorporated into fabrics)] gradually release active agents by simple mechanical rubbing, which ruptures the membrane over time.”¹²² The healing properties of the active agents like moisturizers, therapeutic oils, and insecticides are released to the skin of the wearer.¹²³

PTRI itself has a project entitled “Beta-cyclodextrin Microencapsulation of Menthol-Based Oils for Textiles with Cooling and Aromatherapeutic Potential” which it describes as the “microencapsulation of menthol-based oils[,] [where,] at the end of the research, PTRI shall have developed a patentable technology on microencapsulation of beta-cyclodextrin containing camphor, peppermint, and tea tree oil for textiles with aromatherapeutic and cooling potential.”¹²⁴ Microencapsulation’s medical purposes are currently being explored through its use in work-wear, lingerie, and swimwear. It is “becoming a common treatment for fashion clothing.”¹²⁵

120. Philippine Textile Research Institute, Nano-Functional and Nanocomposite Finishing Technologies Program, *available at* <http://www.ptri.dost.gov.ph/programs-and-projects/nano-functional-and-nanocomposite-finishing-technologies-program> (last accessed Apr. 22, 2016).

121. Philippine Textile Research Institute, Bio-Functional Materials and Textile Technologies, *available at* <http://www.ptri.dost.gov.ph/programs-and-projects/bio-functional-materials-and-textile-technologies> (last accessed Apr. 22, 2016).

122. New Zealand Ministry of Education, Smart Fibres: Microencapsulation, *available at* <http://technology.tki.org.nz/Resources/Case-studies/Technologists-practice-case-studies/Resistant-materials-textiles/Smart-Fibres/Microencapsulation> (last accessed Apr. 22, 2016).

123. BfR, *supra* note 111, at 2 (citing Regulation No. 528/2012, art. 4, 2012 O.J. (L 167) 106 (E.U.)).

124. *See* Philippine Textile Research Institute, Bio-Functional Materials and Textile Technologies, *supra* note 121.

125. New Zealand Ministry of Education, *supra* note 122.

3D printed fabrics that are embedded with or incorporate microencapsulated agents or elements may be considered “devices” or “drugs” under current Philippine laws. The Consumer Act of the Philippines¹²⁶ provides the following definition for “devices” —

an instrument, apparatus, implement, machine, contrivance, implant, in vitro reagent, or other similar or related article, including any component, part[,] or accessory which is ... intended for use in the diagnosis of disease or other condition or in the cure, mitigation, treatment[,] or prevention of disease, in man or other animals.¹²⁷

The same law defines “drugs” to include “articles intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in man or other animals; and ... articles (other than food) intended to affect the structure or any function of the body of man or animals.”¹²⁸ Under this law, the government is mandated to promulgate and adopt consumer product standards,¹²⁹ publish the same,¹³⁰ and is empowered, after due notice and hearing to the seller, distributor, manufacturer, or producer of a product which it finds to be injurious, dangerous, and unsafe, to recall and ban the product, and even seize it from public sale or distribution.¹³¹ But in the case of 3D printed fabrics or clothes that may be considered a medical device or drug, there are no consumer product standards in place issued by the government that can be enforced.

Under the Food and Drug Administration Act of the Philippines,¹³² microencapsulated 3D printed fabrics may be regulated by the Food and Drug Agency (FDA) if they are considered “drugs,” i.e., they are determined to be “articles intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in man or other animals.”¹³³ They may also fall under the law’s definition of a “medical device,” which is

126. The Consumer Act of the Philippines [Consumer Act of the Philippines], Republic Act No. 7394, art. 4 (ab) (1992).

127. *Id.* art. 4 (ab).

128. *Id.* art. 4 (ad).

129. *Id.* art. 7.

130. *Id.* art. 8.

131. *Id.* art. 10.

132. An Act Strengthening and Rationalizing the Regulatory Capacity of the Bureau of Food and Drugs (BFAD) by Establishing Adequate Testing Laboratories and Field Offices, Upgrading its Equipment, Augmenting its Human Resource Complement, Giving Authority to Retain its Income, Renaming it the Food and Drug Administration (FDA), Amending Certain Sections of Republic Act No. 3720, as Amended, and Appropriating Funds thereof [Food and Drug Administration (FDA) Act of 2009], Republic Act No. 9711 (2009).

133. *Id.* § 9 (f).

any instrument, apparatus, implement, machine, appliance, implant, in-vitro reagent or calibrator, software, material, or other similar or related article intended by the manufacturer to be used alone, or in combination, for human beings for one or more of the specific purpose(s) of: diagnosis, prevention, monitoring, treatment or alleviation of disease; diagnosis, monitoring, treatment, alleviation of, or compensation for an injury; investigation, replacement, modification, or support of the anatomy or of a physiological process; supporting or sustaining life; preventing infection ... This device does not achieve its primary intended action in or on the human body by pharmacological, immunological, or metabolic means but which may be assisted in its intended function by such means.¹³⁴

3D printed fabrics or garments may also be “health-related devices” which pertain to “any device not used in healthcare but has been determined by the FDA to adversely affect the health of the people.”¹³⁵ The law obligates the FDA to develop and issue standards and appropriate authorizations that would cover health products, as well as their advertisements, and conduct, supervise, monitor, and audit research studies on health and safety issues of these products, undertaken by entities duly approved by the FDA.¹³⁶ It is also authorized, “[a]fter due process, to order the ban, recall, and/or withdrawal of any health product found to have caused the death, serious illness[,] or serious injury to a consumer or patient, or is found to be imminently injurious, unsafe, dangerous, or grossly deceptive[.]”¹³⁷ The FDA has not come up with any statement or regulatory standard concerning the sale and distribution of 3D printed products in the Philippines that may fall within its jurisdiction.

Clearly, these are areas that must be scrutinized with utmost care and deliberation by health experts, fashion, law, and IT professionals, and legislators, not only in the Philippines, but all over the world where 3D printed fashion products are sold and traded.

V. CONCLUSION

The demand and necessity for 3D printing will only continue to grow in the Philippines, as it is already doing worldwide. The fashion industry, those in the legal profession, and everyone affected by the technology must work together to understand and meet the challenges that 3D printing will wreak on the social, economic, political, and legal fibers of our society. This Article was meant to assist and start this crucial process.

134. *Id.* § 9 (g) (1).

135. *Id.* § 9 (g) (3).

136. *Id.* § 5.

137. *Id.*

The Author trusts that the essential issues identified will be pursued, debated, fine-tuned, clarified, and if possible, resolved by a generation of lawyers, designers, artists, scientists, IT specialists, legislators, and fashionists all raised on technological awareness, resistant to discriminatory stereotypes, appreciative of new ideas (no matter how lateral or even obtuse they may appear to be at first), and imbued with the passion to make a difference by translating those ideas into action.