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Replicant: 3D Printing and the Need for a Digital Millennium Patent Act

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Repli*cant*: 3D Printing and the Need for a Digital Millennium Patent Act

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I. INTRODUCTION

An aspiration of scientists and inventors, a darling of 'Trekkies,' Star Trek's replicator is one of television's great fictional ideas. First appearing in the late 1980s on *Star Trek: The Next Generation*, the replicator was a fictional device that could reproduce any food, liquid, or object its user wanted.[1] Twenty years ago, the technology to create a tool out of thin air to fix a space station seemed like a possibility only on the silver screen. Today, the possibility of Star Trek's replicator doesn't seem so distant. In fact, NASA plans to roll out the first attempt at approaching the wonders of that technology for use on the final frontier in the near future.[2] Once thought to be a science fiction fantasy, the ability to replicate models, prototypes, and ideas with a press of a button is now a reality.

Three-dimensional ("3D") printing has the potential to revolutionize the modern industry. This type of technology has advanced to the point where consumers, through 3D printing websites, can create 3D objects at a relatively cheap price. Seemingly, the only potential limitation to this new technology is a person's imagination. However, the availability of 3D printing at a consumer level poses potential disruptive effects in the form of patent infringement. This comment argues that in order to foster the progress of 3D printing, Congress should adopt some form of safe harbor protections specifically tailored to 3D printing online service providers ("OSPs").

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[1] *See generally*, *Replicator*, THE STAR TREK WIKI, http://en.memory-alpha.org/wiki/Replicator (last visited October 17, 2013).

[2] *See NASA Plans First 3D Printer Space Launch In 2014,* BBC NEWS (Sept. 20, 2013), http://www.bbc.co.uk/news/technology-24329296.

Part II of this comment will briefly summarize the growing phenomenon of 3D printing on the Internet. Part II-A specifically examines how 3D printing technology works while Part II-B will briefly compare the different business models for 3D printing OSPs. Part III will analyze its potential for patent infringement. Part III-A will specifically look at the direct infringement implications of online 3D printing; Part III-B will consider its potential for indirect infringement. Part IV will explore the Digital Millennium Copyright Act ("DMCA"), which provide OSPs certain protections from secondary liability for copyright infringement, and consider its current applicability to online 3D printing. Part V analyzes the feasibility of the adoption of a Digital Millennium Patent Act, finding that if Congress wants to promote the useful art of 3D printing, it will have to adopt an analogous statute to the DMCA's safe harbor and notice-and-takedown provisions that are specifically tailored to OSPs that provide 3D printing content. Finally, Part VI concludes.

II. 3D PRINTING TECHNOLOGY AT THE CONSUMER LEVEL

Patent law is a complex and varied area of law. The issue of patent liability becomes even more complex in the context of the Internet where individuals can share and download 3D designs instantaneously. In order to recognize the patent liability that 3D printing OSPs face, it is important to first understand: (1) how 3D printing works; and (2) the different types of business models employed by 3D printing OSPs.

A. How 3D Printing Works

3D printing is a method of manufacturing in which a computer-controlled printer builds a three-dimensional object through a successive layering technique, known as

additive manufacturing.[3] Unlike subtractive manufacturing, which relies on the removal of material through machining or drilling, additive manufacturing continues to add layers to a solidified base until the object is complete.[4] Based on a technique known as stereolithography, the technology to print three-dimensional objects has been available since the 1980s.[5] Since 3D printing's early incarnation 30 years ago, several different methods of printing 3D objects are now available to consumers.[6]

Regardless of the technique used, all 3D printing methods begin with a blueprint, usually one created with a computer aided design (CAD) program.[7] Widely used by designers, engineers, and architects, these CAD programs allow users to digitally develop objects before they are physically created.[8] Similar to working in "digital clay," designers are able to create complex and highly detailed organic shapes.[9] Alternatively, scanning an already existing object with a 3D scanner can also create a CAD file.[10] Once the model is created, it is then saved as a file that can be widely distributed via any digital storage medium like any other file.[11]

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[3] *See generally* Sebastian Anthony, *What is 3D Printing?*, EXTREMETECH, http://www.extremetech.com/extreme/115503-what-is-3d-printing (last visited Oct. 15, 2013); Christopher Barnatt, *3D Printing*, EXPLAININGTHEFUTURE.COM, http://www.explainingthefuture.com/3dprinting.html (last visited Oct. 15, 2013).

[4] *Id*.

[5] *See* Barnatt, *supra* note 3 (invented and patented by Charles Hull in 1984).

[6] *See* Anthony, *supra* note 3 (depending on the materials used, the amount of colors needed, and the price, there are at least four popular 3D printing methods to choose from: (1) Fused deposition modeling; (2) Inkjet printing; (3) Selective laser sintering; and (4) Digital light processing).

[7] *See* Michael Weinberg, *It Will Be Awesome If They Don't Screw It Up*, PUBLIC KNOWLEDGE 1, 2-3, (Nov. 2010), http://www.publicknowledge.org/files/docs/3DPrintingPaperPublicKnowledge.pdf.

[8] *Id*. at 3.

[9] *See* Elizabeth Royte, *What Lies Ahead for 3-D Printing?*, SMITHSONIAN.COM, 1, 2 (May 2013), http://www.smithsonianmag.com/science-nature/What-Lies-Ahead-for-3-D-Printing-204136931.html?c=y&page=1.

[10] *See* Weinberg, *supra* note 7 at 3 ("Just as a flatbed scanner can create a digital file of a drawing on a piece of paper, a 3D scanner can create a digital file of a physical object.").

[11] *Id*. at 3

After solely being used in the industrial setting for nearly 30 years,[12] 3D printing is now on the cusp of reaching a consumer level.[13] The 3D printing process could not have developed to this point without major advances in CAD programs.[14] A decade ago, it could take weeks to generate a 3D design, now it may take only a few hours.[15] Design software is now more accessible to consumers while scanners and 3D printers have become more powerful and easier to use.[16] The recent accessibility of design software, coupled with the relatively low prices for 3D printers and scanners, has given rise to 3D printing websites that look to bring 3D printing to the masses.[17]

B. 3D Printing, an Online Business

The number of business models used by websites that provide 3D printing services for consumers is as varied as the amount of different 3D printing methods. The services offered by these OSPs could range from directly manufacturing 3D designs to merely providing CAD files to consumers that can be downloaded and shared. Ultimately, these different business models can be broken down into two types, each having potentially unique direct or indirect patent infringement implications.

The most common business strategy used by 3D printing OSPs is offering a service that directly manufactures and delivers a final three-dimensional product to the website's user; this has become known as the "commercial model." One OSP that follows

[12] *See* Anthony, *supra* note 3.
[13] Currently, the most popular consumer level 3D printer, 3D System's The Cube, has a price tag of $1,299. For consumers that want to print objects in more than one color, The CubeX Duo costs roughly twice as much as The Cube. *See* Royte, *supra* note 9 at 1.
[14] *See* Royte, *supra* note 9 at 3.
[15] *Id*.
[16] *Id*. (Microsoft recently announced a software release that will provide its Kinect for Windows computer sensor with the ability to quickly create detailed 3D models).
[17] *See generally* Duncan Graham-Rowe, *3-D Printing for the Masses*, MIT TECHNOLOGY REVIEW (July 31, 2008), http://www.technologyreview.com/Infotech/21152/?a=f.

the commercial model is Shapeways, the leading 3D printing service provider in 2012.[18] Launched in July 2008, Shapeways provides 3D printing services to product designers, architects, and hobbyists who can submit their CAD files to Shapeways's website, which then manufactures and delivers the tangible object in about a week from when the order was placed.[19] Shapeways also allows users to submit their creation to the website's catalogue where other users may browse and buy a 3D version of the design.[20]

One of Shapeways's major competitors, MakerBot Industries and its website Thingiverse, launched in November 2008,[21] follows a different business model–known as the "open model." Instead of directly manufacturing and delivering 3D printed objects to users, Thingiverse takes a more passive approach, merely providing CAD files to users who can print the designs on their personal 3D printer.[22] Like Shapeways, Thingiverse also allows users to share their designs and expand upon other designs in the website's catalogue.[23]

As the accessibility of 3D printing rises, so too does the potential for liability, specifically patent infringement. As more consumers begin to tangibly create and use their 3D printed ideas, the possibility of one of these ideas infringing on a claimed patent becomes more likely. This possible rise in patent infringement could potentially leave 3D printing OSPs at the mercy of patent law and, at the same time, patent owners at the mercy of 3D printers.

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[18] *Funding the Rise of Creative Commerce*, SHAPEWAYS (June 19, 2012), http://www.shapeways.com/blog/archives/1442-Funding-the-Rise-of-Creative-Commerce.html.
[19] *See* Graham-Rowe, *supra* note 17.
[20] *See* Kevin Smith, *Now Anyone Can Use 3D Printing to Make Money*, BUSINESS INSIDER (Dec. 19, 2012), http://www.businessinsider.com/shapeways-3d-printing-2012-12.
[21] *See* John Baichtal, *Thingiverse.com Launches A Library of Printable Objects*, WIRED (Nov. 20, 2008), http://www.wired.com/geekdad/2008/11/thingiversecom/.
[22] THINGIVERSE, http://www.thingiverse.com (last visited Oct. 16, 2013).
[23] *Id*.

III. 3D PRINTING AND THE POTENTIAL FOR PATENT INFRINGEMENT

The causes of action for patent infringement can be divided into two categories: (1) direct infringement; and (2) indirect infringement. Direct infringement, under §271(a), occurs when there is a literal infringement of the claimed invention or its equivalent. In addition to direct infringement, the Patent Act, under §§ 271(b) and 271(c), imposes liability for indirect infringement. It is under these three sections that infringement may arise in an online 3D printing context.

A. Direct Infringement

The most likely form of patent liability that 3D printing OSPs and their consumers are likely to face is in the form of direct infringement. A patent grant gives a patentee several basic rights. Under §271(a) of the Patent Act, a patentee has the right to exclude others from making, using, selling, offering for sale, or importing their claimed invention throughout the United States.[24] Thus, in order to directly infringe on a patented claim, one must make, use, sell, offer for sale, or import the invention defined by a patent's claim, or its equivalent,[25] without the patent owner's authority.[26] The exclusive rights of a patent are disjunctive: performance of only one of the enumerated activities under §271(a), by someone other than the patent holder or a licensee, will be a direct infringement.[27] Put simply, if an OSP or an individual is using a 3D printer to reproduce a patented object, that person is directly infringing on the patent.

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[24] Patent Act, 35 U.S.C. § 271(a)(2006).

[25] *See* Warner-Jenkinson Co. v. Hilton Davis Chem. Co, 520 U.S. 17, 40 (U.S. 1997) (holding that under the Doctrine of Equivalents, an alleged infringer does not have to literally infringe any single element of a patent for there to be infringement. Instead, if elements of the infringing device or process are substantially the same as each element of the claimed invention, then there is infringement).

[26] *Id*.

[27] Roche Products, Inc. v. Bolar Pharmaceutical Co., Inc., 733 F.2d 858, 861 (Fed. Cir. 1984), cert. denied, 469 U.S. 856 (1984) ("It is beyond argument that performance of only *one* of the three enumerated activities is patent infringement.").

Online service providers that manufacture 3D printed objects are most likely to run afoul of §271(a). Hosting websites that follow a commercial model take in a considerable portion of their revenue by manufacturing the design submitted on the site by their users. As design models become more intricate, it becomes more likely that the CAD file the OSP is producing is a patented device, which would be an infringement under the "make" provision of §271(a). Even if the product manufactured by the OSP is not functional, there is still the possibility that the object infringes on a patentee's design patent, which are ornamental designs for an article of manufacture.[28] Additionally, 3D printing OSPs are selling or offering for sale the manufactured version of the design within the CAD file. Even if the OSP acts as the middleman, by outsourcing the manufacture of the CAD file to an industrial printing company, the fact that the OSP is offering for sale the finished 3D product to its user will be sufficient enough for liability under a direct infringement theory.

Although OSPs that follow a commercial model may not be aware that their services are directly infringing on a patent, it will have no bearing in a direct infringement action. The intent of the alleged infringer is irrelevant for the purposes of direct infringement, whether it is by literal infringement or equivalents.[29] Direct patent infringement is considered a strict liability offense and "accidental or 'innocent' infringement is still an infringement."[30] Thus, the potential for direct patent infringement is broad given the fact that 3D printing OSPs and consumers are considered direct

[28] 35 U.S.C. § 171 (2006)("Whoever invents any new, original and ornamental design for an article of manufacture may obtain a patent therefor, subject to the conditions and requirements of this title.").
[29] Hilton Davis Chemical Co. v. Warner-Jenkinson Co., Inc., 62 F.3d 1512 (Fed. Cir. 1995) (en banc), rev'd & remanded for further proceedings consistent with this opinion, 520 U.S. 17 (1997), remanded, 114 F.3d 1161(Fed. Cir. 1997).
[30] *Id*. at 1523.

infringers the moment that a patented invention is reproduced, whether it was intentional or not.

Finally, although 3D printing OSPs that follow the commercial model are likely to directly infringe on a patent, OSPs that merely provide CAD files for distribution under an open model are not. Inventions that are patented must be novel [31] and nonobvious.[32] Presumably, the CAD files themselves are made using existing technology. Although a product made from the CAD file may be patentable, the CAD files itself, and the method by which the file is used to instruct 3D printers, is likely in the public domain as prior art.[33] Similarly, CAD files merely act as the blueprint for the final printed design. Section 101 of the Patent Act sets forth four broad categories of patent-eligible subject matter: processes, machines, manufactures, and compositions of matter.[34] Although the categories of patent-eligible subject matter under §101 are fairly broad, their scope is limited by three judicially created exceptions: laws of nature, natural phenomena, and abstract ideas.[35] Abstractness has been a prevalent issue in patent law.[36] In 2010, in *Bilski v. Kappos*, the Supreme Court reaffirmed that claims to abstract ideas do not describe patentable subject matter under §101.[37] However, in the wake of *Biliski*, the Federal Circuit has struggled to distinguish unpatentable software claims that describe abstract

[31] 35 U.S.C. §102 (2006) ("A person shall be entitled to a patent unless… the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.").
[32] 35 U.S.C. §103 (2006) ("A patent for a claimed invention may not be obtained… if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.").
[33] See 35 U.S.C. § 102 (2006)(describing the various categories of publications and activities that constitute prior art to a new patent application filing).
[34] 35 U.S.C. §101 (2006)
[35] CLS Bank Int'l v. Alice Corp., 717 F.3d 1269, 1276-77 (Fed. Cir. 2013) ("Laws of nature, natural phenomena, and abstract ideas" are excluded from patent eligibility.").
[36] *See id*. at 1277-80 (discussing Supreme Court case law on the scope of abstractness).
[37] 130 S. Ct. 3218 (2010).

ideas from patentable software claims that do not.[38] Even assuming that CAD files are patent-eligible under §101, absent a new CAD file format or 3D printing method, a direct infringement claim is not likely.

It is evident that direct infringement under patent law is very broad in scope. One can be directly liable to a patentee for making, using, or selling a patented invention or its equivalent, regardless of the infringer's intention. Therefore, any person that prints a functional product runs the risk of directly infringing a patent. Because of this, 3D printing OSPs that follow a commercial model are most likely to be open to direct infringement since the website manufactures and sells the final 3D printed product. However, 3D printing OSPs that follow an open model are unlikely to be direct infringers since providing CAD files alone would not be sufficient for a direct infringement action. Service providers that follow an open model may still face liability, though, as CAD files play an integral role in the indirect infringement context.

B. Indirect Infringement

Even if a 3D printing OSP is not a direct infringer, it may still face patent liability as patent law also imposes liability for indirect infringement. Under the Patent Act, a third party could potentially be held liable for the infringing acts of another person. For example, the design of an infringing device or system for use by another may constitute indirect infringement.[39] In *Baut v. Pethcik Construction Co.*, it was held that the general contractor, subcontractor, and architect, who actively participated in the decisions as to the design of a window for a church, indirectly infringed on a patent for a stained glass

[38] Most recently, in *CLS Bank Int'l v. Alice Corp.,* the Federal Circuit issued a highly splintered en banc opinion regarding the patentability of an Internet business method. *See generally* 717 F.3d 1269 (Fed. Cir. 2013).
[39] 5-17 Chisum on Patents § 17.04

window.[40] This is important given the fact that most 3D printing OSPs have catalogues of CAD files for sale on their site. These CAD files are essentially the blueprints for the final 3D printed product. As discussed above, although the CAD files could not be considered a direct infringement of a patent, if a CAD file discloses how to create a patented claim, it could potentially be considered the instructions for the manufacture of the patented apparatus under an indirect infringement theory.

There are two provisions in the Patent Act that deal with indirect infringement. Subsection (b) creates a type of indirect infringement described as "active inducement,"[41] while subsection (c) creates liability for those who have contributed to the infringement of a patent.[42] It is under these two provisions that 3D printing OSPs that provide CAD files to its users may be held liable for indirect infringement.

1. Active Inducement Under § 271(b)

Pursuant to §271(b), a third party may be liable for "actively inducing" a patent infringement.[43] Active inducement generally occurs when a party encourages or aids another to directly infringe a patent, for example, by providing instructions on how to practice a patented invention. Courts have consistently held that a party must harbor some level of intent to induce direct infringement in order for liability to arise. Thus, two elements must be established to prove active inducement of an infringement: (1) there was a direct infringement of a patented claim; and (2) the third party had the intent to cause the acts that constituted the infringement.[44]

[40] 262 F. Supp. 350, 352 (M.D. Pa. 1966).
[41] 5-17 Chisum on Patents § 17.04.
[42] 5-17 Chisum on Patents § 17.03.
[43] Section 271(b) provides that "whoever actively induces infringement of a patent shall be liable as an infringer." 35 U.S.C. § 271(b)(2006).
[44] Water Tech. Corp. v. Calco, Ltd. 850 F.2d 660, 668 (Fed. Cir. 1988).

The intent requirement under the active inducement standard used by courts is a high bar to overcome for patentees. Although §271(b) does not explicitly have a knowledge requirement, courts have read an intent component into the provision.[45] Originally, under *Manville Sales v. Paramount Systems, Inc.*, the Federal Circuit stated that in order to prove active inducement the patentee must establish that the third party's "actions induced infringing acts and that he knew or should have known his actions would induce actual infringement."[46] However, the Supreme Court, in *Global-Tech Appliances v. SEB S.A.*, recently rejected this standard and raised the bar even higher.[47] In *Global-Tech*, the Supreme Court addressed the exact state of mind requirement that applies to patent infringement liability predicated on a theory of active inducement. Rejecting the standard used by the Federal Circuit that the knowledge requirement under §271(b) was "deliberate indifference to a known risk" to patent infringement, the Supreme Court adopted a willful blindness standard.[48] Under this standard, "(1) the defendant must subjectively believe that there is a high probability that a fact exists and (2) the defendant must take deliberate actions to avoid learning of that fact."[49] The Supreme Court clarified that under this standard, "a willfully blind defendant is one who takes deliberate actions to avoid confirming a high probability of wrongdoing and who can almost be said to have actually known the critical facts."[50] The Court made clear that these requirements give the standard for willful blindness a scope that surpasses mere recklessness or negligence on the part of the alleged infringer.[51] Under the standard set

[45] *See* 5-17 Chisum on Patents § 17.04
[46] 917 F.2d 544, 552 (Fed. Cir. 1990).
[47] 131 S. Ct. 2060 (U.S. 2011).
[48] *Id*. at 2068.
[49] *Id*. at 2070.
[50] *Id* at 2070-71.
[51] *Id*. at 2070.

forth in *Global-Tech*, it is evident that a patent infringement claim of active inducement will only succeed against the most egregious infringers.

Although the knowledge requirement in an induced infringement context is a high bar to meet, it is not impossible. In deciding an active inducement standard in *Global-Tech*, the Supreme Court considered the standard for contributory infringement of copyrighted works, specifically discussing its opinion in *Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd*., in which the Supreme Court held that active steps in encouraging infringement were required to prove inducement.[52] In *Grokster*, the court held that software distributors could be held liable of contributory infringement since the companies had extensive knowledge that its software was being used for copyright infringement, they expressly promoted the ability to copy works, and they made no attempt to implement filtering tools to diminish the infringing activity.[53] Similarly, like the companies in *Grokster*, a 3D printing OSP may be held liable for active inducement if it develops knowledge of patent infringing activity and fails to implement reasonable measures in filtering that infringing activity.

Service providers that provide CAD files to users may face indirect infringement claims under §271(b) going forward. Under the standard set forth in *Global-Tech*, in order to be liable under a theory of active inducement, a 3D printing OSP would either have to be actually aware of infringing CAD files on their website or take active steps to avoid learning a probable infringement. Although this is a high standard to prove, as evidenced by *Grokster*, which applied the same high standard in a copyright infringement

[52] *Grokster*, 545 U.S. at 934-36.
[53] *Id*. at 939.

context, it is not impossible. The *Global-Tech* standard is also significant given that the same knowledge standard applies in contributory infringement cases under §271(c).

2. Contributory Infringement under § 271(c)

3D printing OSPs that provide CAD files to users may also be considered indirect infringers under a theory of contributory infringement. Under §271(c) of the Patent Act, a person commits contributory infringement when they sell, or offer to sell, a component especially designed for use in a patented device or process.[54] Under a contributory infringement theory, a patentee would be required to show that the CAD file is a "component" of the patented product, "constituting a material part of the invention."[55]

Whether a 3D printing OSP can be held liable for contributory infringement will likely depend on whether CAD files are considered "components" under §271(c). In *Microsoft Corp. v. AT&T Corp.*, the Supreme Court reviewed the meaning of "component" under §271(f), which makes the export of unassembled components an infringement.[56] The case arose when AT&T alleged that Microsoft infringed on AT&T's patent for an apparatus for encoding and compressing recorded speech.[57] Microsoft's Windows operating system included software code that, when installed in a computer, enabled the computer to record speech within the scope of AT&T's claimed patent.[58] The Court posited that software abstracted from a tangible copy is similar to a blueprint, it can provide precise instructions for construction of components of a patented product, but it is not a "component" itself.[59] This very narrow view taken by the Supreme Court

[54] 35 U.S.C. § 271(c)(2006)
[55] *Id.*
[56] 550 U.S. 437 (2007).
[57] *Id.* at 441.
[58] *Id.* at 441-442.
[59] *Id.* at 449–50. ("A blueprint may contain precise instructions for the construction and combination of the components of a patented device, but it is not itself a combinable component of that device.").

excluded mere abstract instructions from being considered "components" under §271(f).

Although the Court in *Microsoft* addressed the meaning of the word "component" in the context of § 71(f), the same meaning can be read into the same term as it appears in §271(c), since both sections use the term in a similar fashion.[60] Under such a reading, it is unlikely that CAD files would be considered a "component" that would give way to contributory infringement under §271(c). Like the software code in *Microsoft*, CAD files are abstract instructions. Although the CAD files may contain instructions for the production of a patented device, the files are not combinable itself into a device, which would be required in order to be considered a "component" under the Court's holding in *Microsoft*.

Assuming that CAD files could be considered a "component" within in the meaning of §271(c), like its subsection (b) counterpart, subsection (c) requires that there must be a showing of actual direct infringement in order for a theory of contributory infringement to be available.[61] When the replacement of a component constitutes a permissible repair there is no direct infringement, and the seller of the repair component is not liable for contributory infringement.[62] In *Wilson v. Simpson*, the Supreme Court held that, although there is no right to "rebuild" a patented combination, the replacement of a worn-out essential part is permissible restoration of the machine to the original use

[60] *Compare* 35 U.S.C. § 271(c) ("Whoever offers to sell or sells within the United States or imports into the United States a component of a patented machine, manufacture, combination, or composition…knowing the same to be especially made or especially adapted for use in an infringement of such patent…shall be liable as a contributory infringer.") *with* 35 U.S.C. § 271(f) ("Whoever without authority supplies or causes to be supplied in or from the United States any component of a patented invention…where such component is uncombined in whole or in part, knowing that such component is so made or adapted and intending that such component will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States, shall be liable as an infringer.").
[61] Aro Mfg. Co. v. Convertible Top Replacement Co., 365 U.S. 336, 341-42 (1961).
[62] *Id.*

for which it was bought.[63] Thus, a key determination under §271(c) will be whether the design in the CAD file constitutes a reconstruction of the patented apparatus or if the design is merely a repair of a spent part of the apparatus. If the design is a refurbishment in which the patented invention is essentially made anew, then the provider of the CAD file could potentially be held liable.[64]

Finally, the knowledge component under subsection (c) is similar to the knowledge requirement to show active inducement, and is a high hurdle to overcome. Contributory infringement under §271(c) requires that an alleged infringer have knowledge "that the combination for which [the] component was especially designed was both patented and infringing."[65] In *Global-Tech*, the Supreme Court reviewed their decision in *Aro II* and stated that subsection (c) "requires knowledge of the existence of the patent that is infringed.[66] As mentioned previously, the Court also held that a willful blindness standard applied to the determination of knowledge under §271(b). Based on the Supreme Court's holding in *Global-Tech*, the doctrine of willful blindness ostensibly extends to the determination of knowledge under §271(c) as well.[67] Under the *Global-Tech* standard, 3D printing OSPs may be held liable for indirect infringement under §271(c) if the provided CAD file contains a design that constitutes a refurbishment of the patented apparatus and if the OSP has knowledge of the infringement.

It is apparent that 3D printing OSPs, whether the OSP manufactures 3D printed products, provides CAD files for users, or both, face various forms of patent liability.

[63] 50 U.S. 109, 123 (U.S. 1850).
[64] Husky Injection Molding Sys. Ltd. v. R&D Tool & Eng. Co., 291 F.3D 780, 785 (Fed.Cir. 2002) (stating that where a patented item is refurbished in order to make it useable after the item, considered as a whole, has become spent, refurbishment of the spent item constitutes impermissible reconstruction).
[65] Aro Mfg. Co. v. Convertible Top Replacement Co., 377 U.S. 476, 488 (1964).
[66] *Global-Tech*, 131 S. Ct. at 2068.
[67] 5-17 Chisum on Patents § 17.03

While consumer level 3D printing is still in its embryotic stage, some of the legal issues it creates are not necessarily new. The current unknown that 3D printing OSPs face on the patent law front is not so different from the environment websites faced in the late 1990s in relation to copyright law. It was during this time of uncertainty that Congress passed the Digital Millennium Copyright Act, which paved the way for the digital age.

IV. THE DIGITAL MILLENNIUM COPYRIGHT ACT

In 1996, the World Intellectual Property Organization ("WIPO"), held a diplomatic conference in Geneva that led to the WIPO Copyright Treaty and, subsequently, Congress's adoption of the Digital Millennium Copyright Act ("DMCA").[68] The legislature's intent in adopting the DMCA was to bring U.S. copyright law into the "digital age."[69] Through the DMCA, Congress hoped to create a "legal platform for launching the global digital online marketplace for copyrighted works" with the expectation to make "works that are the fruit of American genius" available via the Internet.[70] Probably the most essential components of the DMCA that have enabled the launch of a digital marketplace over the years have been the Act's notice-and-takedown provision and the safe harbor provision for content providers. It is these two provisions that could potentially facilitate the rise of 3D printing technology on the Internet.

Under one of the safe harbor provisions, §512(c) of the DMCA, an online service provider will not be held liable for copyright infringement on their site if the provider: (1) does not have actual knowledge that the material is infringing; (2) in the absence of actual knowledge, the OSP is not aware of facts or circumstances from which infringing activity is evident; or (3) upon obtaining knowledge or awareness, the OSP acts

[68] *See generally*, Universal City Studios v. Reimerdes, 111 F. Supp. 2d 294, 316 (S.D.N.Y. 2000).
[69] Report of the Senate Comm. on the Judiciary, S. Rep. No. 105-190, at 2 (1998).
[70] *Id*. at 8, 2.

expeditiously to remove the material.[71] Section 512(c) also sets forth a detailed notification scheme that requires OSPs to designate an agent that will receive notifications of any claimed copyright infringement.[72] Section 512(c)(2) further specifies the components of a proper "takedown notice" to be sent to the agent.[73] Thus, under the safe harbor provision, "actual knowledge of infringing material, awareness of facts or circumstances that make infringing activity apparent, or receipt of a takedown notice will each trigger an obligation to expeditiously remove the infringing material."[74]

The safe harbor provision for OSPs has often been coupled with §512(g), known as the "notice-and-takedown" provision.[75] Under the notice-and-takedown provision, OSPs are exempt from liability for the good faith removal of allegedly infringing material. However, this immunity is subject to the OSP's compliance with a notification and counter-notification procedure. Once the OSP receives notice from the copyright holder and takes down the allegedly infringing material, the OSP must then notify the user, who originally posted the material, that the material was removed or disabled. The user actually then has the ability to send a counter-notice to the OSP, claiming that the removed material was not an infringement. The OSP must then inform the copyright holder about receipt of the counter-notice and re-enable the removed material within 10 to 14 days after receipt of the counter-notice.[76]

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[71] Copyright Act, 17 U.S.C. § 512(c)(1)(A) (2006)
[72] 17 U.S.C. § 512(c)(2) (2006) ("The limitations on liability established in this subsection apply to a service provider only if the service provider has designated an agent to receive notifications of claimed infringement…").
[73] 17 U.S.C. § 512(c)(3) (2006) (setting out six different requirements, including identification of copyrighted work, identification of allegedly infringing material, statement that the information is accurate and a statement of a good faith belief that the material is not authorized).
[74] Viacom Int'l, Inc. v. YouTube, Inc., 676 F.3d 19, 27-28 (2d Cir. 2012).
[75] 17 U.S.C. § 512(g) (setting out the steps an OSP must follow to maintain immunity from liability after the receipt of a takedown notice).
[76] *Id.*

One of the most significant features of the DMCA is that it serves several interests.[77] When Congress adopted the DMCA, it was concerned with balancing the interests of copyright owners, on one side, against the interests of the community of users and OSPs, on the other.[78] During the deliberations regarding the bill for the DMCA, Congress progressed from constructing a statute that was "designed solely to protect copyright interests into a more broad-base redress of various aspects relating to digital commerce."[79] The DMCA achieves this balance by providing copyright holders a procedure to quickly remove works they believe are infringing while at the same time allowing users to contest the infringement, and an automatic restoration of the work, in the same procedure. Additionally, OSPs receive a tangential benefit, as they are able to continue to provide their services to users without fear of secondary infringement liability.[80]

Currently, 3D printing OSPs enjoy the benefit of the DMCA's safe harbor and notice-and-takedown provisions for infringing copyrighted works posted on their website. It is likely that most 3D printing OSPs have a designated agent to receive copyright infringement notices and counter-notices. In fact, in February 2011, Thingiverse received the first reported DMCA notice over 3D printer plans.[81] The notice involved a copyright

[77] David Nimmer, *A Riff on Fair Use in the Digital Millennium Copyright Act*, 148 U. Pa. L. Rev. 673, 681 (2000)("One of the most salient features of the Digital Millennium Copyright Act is that it serves several masters.").
[78] *Id*. at 682 ("In order to understand the thrust of the law, it is essential to appreciate Congress's concern with balancing the interests of copyright proprietors, on the one hand, against the interests of the community of users, scholars, equipment manufacturers, and on-line service providers, on the other.").
[79] *Id*. at 681-82.
[80] David Kravets, *10 Years Later, Misunderstood DMCA is the Law that Saved the Web*, WIRED, http://www.wired.com/threatlevel/2008/10/ten-years-later/ (last visited Oct. 12, 2008) (stating that intermediary websites, such as YouTube, could not exist without the DMCA's safe harbor provision).
[81] *See, IP, 3D Printing & DMCA*, SHAPEWAYS, (Feb. 20, 2011), http://www.shapeways.com/blog/archives/747-ip,-3d-printing-dmca.html, (detailing the Penrose triangle takedown incident).

claim over a 3D printed "Penrose Triangle"[82] and CAD files disclosing a similar creation on Thingiverse's website.[83] Thingiverse quickly responded to the DMCA takedown notice, removing the allegedly infringing files.[84] Eventually, the apparent copyright holder dropped his DMCA notice and released his model to the public, averting any potential litigation.[85] Although this is only a single instance, it illustrates that 3D printing OSPs are cognizant and prepared to follow the requirements of the DMCA's notice-and-takedown provision, which would allow for a smooth transition in codifying a Digital Millennium Patent Act.

V. THE VIABILITY OF A DIGITAL MILLENIUM PATENT ACT

Although it is only applicable to copyrights, Congress's legislative intent for adopting the DMCA is not so different from the budding potential of 3D printing on the Internet.[86] A competing interest in patent law, and in intellectual property in general, is the free flow of ideas and information.[87] Hosting websites like Shapeways and Thingiverse have the potential to be a digital online marketplace for a multitude of works. These websites enable a free flow of information, as users are able to embody their ideas into CAD files that are uploaded to the websites' catalogue, which can be shared around

[82] The Penrose triangle is considered to be an "impossible object." *See Impossible Penrose Triangle Now Possible*, FASTCODESIGN, http://www.fastcodesign.com/1663226/impossible-penrose-triangle-now-possible-with-3-d-printing-updated (last visited Oct. 21, 2013).
[83] *See IP, 3D Printing & DMCA*, *supra* note 81.
[84] *Id.*
[85] *Id.*
[86] *Compare* Nimmer, *supra* note 77 (stating that "by creating 'the legal platform for launching the global digital on-line marketplace for copyrighted works,' [the DMCA's] goal is to 'make available via the Internet the movies, music, software, and literary works that are the fruit of American creative genius.'") *with* Jeanne C. Fromer, *Patent Disclosure*, 94 Iowa L. Rev. 539, 547-48 (2009) ("It is well-accepted that the principal goal of the American patent system is to stimulate innovation. This goal is manifested in the U.S. Constitution's articulation of Congress's power '[t]o promote the Progress of Science and useful Arts…'").
[87] Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417, 429 (1984) (stating that patent and copyright statutes have been amended repeatedly to balance "the interests of authors and inventors in the control and exploitation of their writings and discoveries on the one hand, and society's competing interest in the free flow of ideas, information, and commerce on the other hand…").

the world with a click of a button. Not only are users able to share their designs with each other on hosting websites for 3D printing, but other users can also modify and improve upon existing design files, leading to innovative products and devices. This rapid sharing of ideas and information is exactly what the Founding Fathers hoped to facilitate with the adoption of United States Constitution's Patent Clause.[88] However, in order to continue this online utopian world of communal creativity in the immediate future, it is imperative that Congress takes action analogous to their adoption of the DMCA in the late 1990s. The notice-and-takedown and safe harbor provisions of the DMCA blaze a trail toward a basic legal framework that can help patentees easily assert their rights while shielding 3D printing OSPs from liability.

A patent safe harbor provision as a form of protection for 3D printing OSPs, similar to the one codified in §512(c) of the DMCA,[89] is the most practical option for lawmakers. As previously mentioned, the DMCA safe harbor provision shields OSPs from secondary liability as long as the OSP is not aware of the copyright infringement on its website, and acts expeditiously to remove the infringing material when it is made aware of the infringement.[90] A similar safe harbor provision can be adopted for OSPs in the patent infringement context. A safe harbor provision for online patent infringement would allow 3D printing OSPs to develop without being bogged down by infringement litigation, similar to the way sites like YouTube and Facebook took off on the heels of the DMCA.[91] In adopting a DMPA for 3D printing OSPs, there are three key issues to

[88] Fromer, *supra* note 86 (stating that the primary goal of the American patent system is to stimulate innovation).
[89] *See supra* Part IV (describing the requirements to obtain safe harbor from secondary liability of copyright infringement under the DMCA).
[90] *Id*.
[91] Kravets, *supra* note 80 (stating that sites like YouTube are dependent on the DMCA's safe harbor provisions).

consider: (1) the liability of direct infringers under a DMPA; (2) the rights of patent holders under a DMPA; and (3) whether there is an actual need for a DMPA.

A. An "Innocent Manufacturer" Exception

One key distinction between the DMCA and a proposed "Digital Millennium Patent Act (DMPA)" is that the DMCA does not grant safe harbor immunity to OSPs that are directly infringing. Under a DMPA, it would be essential to carve in a safe harbor provision for a limited "innocent manufacturer" defense. Most 3D printing OSPs are unique from the traditional OSP in that users are not only able to post their designs on the website, but the OSP also manufactures the design for the user.[92] This structure would move the 3D printing OSP from the realm of secondary liability to direct liability in a patent infringement context.[93] An innocent manufacturer defense would be restricted to only hosting websites and users downloading designs from the site. In order to qualify for the safe harbor, the infringer must not have actual knowledge or be "willfully blind"[94] of the infringement.

Criticism for modeling a patent statute after a copyright statute and creating a limited exception to patent liability may arise due to the distinct differences between copyrights and patents. Unlike the "bundle of rights"[95] in a copyright, which last for an extended period of time,[96] the exclusive rights in a patent are much more finite. The

[92] *See supra* Part II-B (describing the different business models for 3D printing hosting websites).
[93] *See supra* Part III-A (detailing the infringement implications websites like Shapeways face).
[94] This knowledge requirement would be the same as the showing required for liability for active inducement under *Global-Tech*. *See* Global-Tech, 131 S. Ct. at 2070-71 ("[A] willfully blind defendant is one who takes deliberate actions to avoid confirming a high probability of wrongdoing and who can almost be said to have actually known the critical facts.").
[95] 17 U.S.C. § 106 (2002) (conferring the right to reproduce, distribute, publicly perform, publicly display, and prepare derivatives of the copyrighted work).
[96] 17 U.S.C. § 302 (1998) (copyrights generally last for the life of the author and 70 years after the author's death).

patent term is for 20 years from the earliest filing date;[97] for design patents, the patent term is 14 years from the date of issuance.[98] Once the term of the patent expires, the patentee no longer maintains his or her exclusive rights and the invention claimed in the patent enters into the public domain.[99] In order to balance this limited duration of rights, a patent grants exclusive rights that are not subject to exceptions comparable to the fair use exceptions under copyright law. Since patents do not share the durational scope of copyrights, carving out exceptions to patent law can cause an imbalance between the access to information and incentive to create.

A limited extension of patent protection may be warranted, however, because of the current pitfalls of online printing. Other additive manufacturing companies, like a brick and mortar company, do not approach the sheer number of customers that 3D printing OSPs deal with on a daily basis and thus must be distinguished in terms of extending patent liability protection. Websites like Shapeways are currently printing 3D models at an astronomical rate;[100] it would be a practical impossibility to require such sites to scour the United States Patent and Trademark Office for patented inventions. The business model of OSPs that manufacture 3D printed products is also novel in the sense that there is no tangible inventory.[101] Hosting sites that follow the 3D printing

[97] Pub. L. 103-465, 108 Stat. 4809 (Dec. 8, 1994); Prior to June 8, 1995, the term for a United States patent was 17 years from the date the patent issued. In April 1994, the United States and several other countries entered an "Agreement on Trade-Related Aspects of Intellectual Property" (TRIPs), which provided for a 20-year term from the date of filing for patents. The TRIPS legislation also affects patent applications filed before June 8, 1995. The patent term for applications filed before June 8,1995 is either 17 years from the date of issuance or 20 years from the filing date of the earliest referenced application, whichever is greater. *See generally*, 5 Donald S. Chisum, 5-16 Chisum on Patents § 16.04.

[98] 35 U.S.C. §173 (2006).

[99] Kearns v. Chrysler Corp., 32 F.3d 1541, 1550 (Fed. Cir. 1994)("An invention claimed in a patent passes into the public domain upon termination of the patent's…statutory term.").

[100] Halfway through 2012, Shapeways has printed over 1 million 3D products. *See Funding the Rise of Creative Commerce*, *supra* note 18.

[101] *See* Brian Fung, *What Happens When You Mash Up 3D Printing and Amazon's Same-Day Delivery?*, THE WASHINGTON POST (Aug. 29 2013), http://www.washingtonpost.com/blogs/the-

commercial model are not reliant on the market's demand for a specific item because the printing is done on the spot.[102] Since products can essentially be created in an instant, from a seemingly limitless online cache of designs, 3D printing OSPs, and businesses using the hosting site's services, are not required to spend valuable time and money for market research and for approval of designs from investors.[103] Without an "innocent manufacturer" exception, OSPs would be required to research existing patents before printing an item or risk a direct infringement claim. An OSP's "instant inventory" model would be effectively ruined as OSPs would be required to spend time and resources researching patents, and businesses would be less likely to use a 3D printing OSP's services if a quick product return is no longer available.

The "innocent manufacturer" exception for safe harbor immunity under a DMPA should extend to 3D printing website users as well. The online 3D printing community is a community that never stops innovating. Users are constantly tweaking and building upon other people's designs, sharing the final product with the rest of community's members.[104] If the base design that is being built upon contains an infringing apparatus, it would be very easy for the several dozen members that made effortless alterations to that design to be liable for patent infringement.[105] If a potential patent infringement claim were available against a community member every time that member made a simple modification to a preexisting design, members would likely stop contributing CAD files

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switch/wp/2013/08/29/what-happens-when-you-mash-up-3d-printing-and-amazons-same-day-delivery/ (stating that 3D printing could "upend the retail sector" since inventory is small or non-existent).

[102] *Id*. ("A small or non-existent inventory gives a business much more freedom to test new products.").

[103] *Id*. (stating that a non-existent inventory allows businesses to save money on shelving, and reduces waste).

[104] *See* Kate Hannum, *3D Printing Atoms*, THINGIVERSE (Jul. 23, 2013), http://www.makerbot.com/blog/2013/07/23/thingiverse-3d-printing-atoms/ (describing how five different users built upon each other's designs to create a customizable atom design).

[105] *Id.* (detailing how a the customizable atom design allows users to create and print a model of every element in the periodic table).

altogether. An "innocent manufacturer" exception would insulate those users who innocently download and print a CAD file, unaware of the patented invention, from patent liability.

B. Rights of Patent Holders Under a DMPA

Although a DMPA would create a limited knowledge requirement to direct infringement actions, Congress's adoption of a DMPA will still be beneficial to patent holders. An analogous provision to the DMCA's notice-and-takedown provision would allow patent holders to quickly take down 3D printed models that are infringing. A patentee can impute actual knowledge, or at the very least, an awareness of "a high probability of wrongdoing"[106] on a 3D printing OSP by sending a takedown notice to the hosting website displaying the infringing CAD file.[107] For a lawful takedown notice, the patent holder would be required to simply supply the OSP with the number of the allegedly infringed patent, the claims that were allegedly infringed, and an explanation as to why the patent holder believes that their patent was infringed. Once the notice is received by the OSP, the OSP would be required to follow a takedown procedure comparable to the procedure described in the DMCA in order to retain its safe harbor immunity. By including the patent number and the claims allegedly infringed, an OSP could quickly research the patent before taking down the infringing file, ensuring a "good faith" removal.

The DMCA has often been criticized, however, and may not be a perfect model to follow for instances of patent infringement. Although the DMCA contains a penalty

[106] *Global-Tech*, 131 S. Ct. at 2070-71 (for a preliminary showing of willful blindness, "the defendant must subjectively believe that there is a high probability that a fact exists.").
[107] *See* Wolk v. Kodak Imaging Network, Inc., 840 F. Supp. 2d 724, 747 (S.D.N.Y. 2011) (stating that a DMCA takedown notice is sufficient to ascribe knowledge of a single infringing activity).

provision for individuals that abuse the notice or counter notice procedures,[108] they are rarely enforced. Since repercussions for abuse of the DMCA notice procedures rarely occur, companies often misuse DMCA notices to remove embarrassing or critical content.[109] It is likely that a rampant misuse of the notice-and-takedown procedure could only continue in the patent realm. A recent trend in patent law has been the rise of PAEs.[110] Frequently referred to as "patent trolls,"[111] these PAEs "focus[] on purchasing and asserting patents against manufacturers already using the technology (after infringement and lock-in have occurred), rather than developing and transferring technology."[112] PAEs often assert their rights against small companies, which cannot afford the cost of lengthy litigation or discovery, forcing them to settle or risk millions in litigation costs.[113] A DMPA, with a streamlined notice-and-takedown procedure, would only make it easier for PAEs to assert their (sometimes dubious) rights against 3D printing OSPs and users, creating expensive, time-consuming obstacles for individuals to release new, innovative products.[114]

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[108] 17 U.S.C. § 512(f) (2010) (providing for damages and attorney's fees for material misrepresentations in a notice or counter-notice).

[109] Jennifer M. Urban & Laura Quilter, *Symposium Review: Efficient Process or "Chilling Effects"? Takedown Notices Under Section 512 of the Digital Millennium Copyright Act*, 22 SANTA CLARA COMPUTER & HIGH TECH. L.J. 621, 667 (2006) (stating that 31% of DMCA takedown notices were flawed due to uncertain rights, either because the copyright owner was entitled to "thin" or no protection, or because the alleged infringer's work was a fair use); *See also* Nate Anderson, *Victims Fight Back against DMCA Abuse*, ARSTECHNICA (Mar. 16, 2007), http://arstechnica.com/tech-policy/2007/03/victims-fight-back-against-dmca-abuse/ (detailing instances of companies misusing DMCA's notice-and-takedown provision).

[110] *See* Federal Trade Commission, *The Evolving IP Marketplace* (Mar. 2011), available at http://www.ftc.gov/os/2011/03/110307patentreport.pdf (devising the phrase "Patent Assertion Entities").

[111] *See generally*, Brian W. Hannon & Margaret M. Welsh, *Challenges of Defining a Patent Troll*, BLOOMBERG LAW, http://about.bloomberglaw.com/practitioner-contributions/challenges-of-defining-a-patent-troll/ (last visited Oct. 21, 2013) (describing the common practices of "patent trolls").

[112] *See* Federal Trade Commission, *supra* note 110 at 8.

[113] *See* Hannon & Welsh, *supra* note 111 (stating that small companies often settle patent infringement claims brought by patent trolls to avoid an "estimated $2-8 million in litigation costs.").

[114] *See* Thomas A. Hemphill, *The Paradox of Patent Assertion Entities*, THE AMERICAN (Aug. 12, 2013) http://www.american.com/archive/2013/august/the-paradox-of-patent-assertion-entities (stating that PAEs

While patent holders will be able to take down infringing materials quickly and efficiently under a DMPA, an equivalent provision to §512(f) of the DMCA, if enforced, could prevent abuse of the notice-and-takedown system. Section 512(f) of the DMCA provides for damages, and attorney's fees, against anyone who "knowingly materially misrepresents" that a material is infringing.[115] The term "knowingly" under §512(f) has been interpreted to mean that a party actually knew or should have known that it was making misrepresentations.[116] Further, a misrepresentation is material if it would affect an OSP's response to a DMCA letter.[117] Courts have also read a good faith requirement into the provision.[118] A corresponding provision in a DMPA will require patent holders to act in good faith when sending a takedown notice. The fact that damages and attorney's fees may be awarded for any material misrepresentations will likely deter a Patent Assertion Entity (PAE), or "patent troll,"[119] from asserting dubious rights against users with the hope of obtaining a quick settlement.[120] Furthermore, this issue may eventually become moot as recent legislation was introduced to Congress, which would require PAEs to post a bond to cover the expenses of attorney's fees prior to litigation, thus deterring the assertion of ambiguous patent claims.[121]

C. The Need for a DMPA

"create costly, time-consuming barriers for U.S. businesses (especially small, entrepreneurial businesses) to release new, innovative products to the American consumer.").

[115] 17 U.S.C. § 512(f)

[116] *See* Online Policy Group v. Diebold, Inc., 337 F. Supp. 2d 1195, 1204 (N.D. Cal. 2004) ("'Knowingly' means that a party actually knew, should have known if it acted with reasonable care or diligence, or would have had no substantial doubt had it been acting in good faith, that it was making misrepresentations.").

[117] *Id.* ("'Material' means that the misrepresentation affected the ISP's response to a DMCA letter.").

[118] *Id*.

[119] *See* Hemphill, *supra* note 114 (stating that "PAE" describes a business model that focuses on purchasing patent rights, not for the development of the technology, but to assert patents against current users of the work).

[120] *See* Hannon & Welsh, *supra* note 111 (stating that "patent trolls" often assert sometimes questionable patents against small businesses to obtain at least a settlement).

[121] Patent Litigation Integrity Act, S. 1612, 113th Cong., 1st Session (2013).

At first glance, it may seem that the need for a DMPA is moot since 3D printing websites likely already implement their own private notice-and-takedown provisions, similar to the ones in the DMCA. Since 3D printing OSPs already have a DMCA agent to receive notifications of copyright infringement, it is probable that the sites implement a similar procedure for instances of patent infringement. A patentee who believes that an infringing design is being disseminated on an OSP's site can send a cease-and-desist letter to the hosting site. A hosting site that is directly infringing, like Shapeways, will likely remove the infringing material immediately instead of risking litigation. Additionally once the cease-and-desist letter is received, a site like Thingiverse, which may not be liable for direct infringement or indirect infringement prior to the notice, will have the requisite knowledge for secondary infringement under an active inducement theory, a strong incentive to comply with the letter.[122] Finally, although hosting sites that follow a commercial model may be subject to direct infringement, since the site manufactures and sells the infringing product, these sites generally have a Terms of Service, which will indemnify the website from an infringement claim.[123]

Although a private notice-and-takedown seems to be sufficient to protect every party's interests in theory, when applied in actual practice it would not be as comprehensive as a DMPA. A private cease-and-desist letter would prevent users from being able to contest the patent infringement claim. Under a DMPA, in order to retain safe harbor immunity, 3D printing OSPs would be required to reinstate the supposedly

[122] Fujitsu Ltd. v. Netgear Inc., 620 F.3d 1321, 1332 (Fed. Cir. 2010) (holding that letters from the patent-holder raised questions of material fact as to alleged infringer's knowledge and intent for the purposes of induced infringement).

[123] *See Shapeways Terms and Conditions*, SHAPEWAYS (March 2013), http://www.shapeways.com/terms_and_conditions ("You agree to indemnify and hold Shapeways and its affiliates, distributors, dealers, agents and its and their employees harmless from and against all liabilities, costs, damages and expenses (including reasonable attorneys fees) arising from or relating to any claims that result from your breach of these Terms and Conditions.").

infringing design if the user were to contest the infringement. In a private cease-and-desist letter situation, without a guaranteed safe harbor, it would be unlikely for a 3D printing OSP to restore the contested design and risk litigation from the patent holder. Without a DMPA notice-and-takedown procedure, PAEs will be able to assert dubious claims of infringement and successfully remove non-infringing materials without any repercussions under §512(f).

The fact that most 3D printing OSPs already have the required notice-and-takedown structure in place for DMCA purposes also makes codifying a DMPA a practical reality. As evidenced by Thingiverse's handling of the takedown notice for the "Penrose triangle," 3D printing OSPs are already aware of the DMCA takedown process.[124] It is likely that most hosting websites already have a designated agent to receive takedown notifications for copyright infringement. These websites could easily assign another agent, or maintain their current DMCA agent, to receive takedown notices regarding patent infringement, without a disruption in business.

Implementing a DMPA may also be considered redundant since the knowledge requirement for active inducement under *Global-Tech* will insulate most 3D printing OSPs from liability.[125] In theory, a 3D printing OSP could be held liable for secondary patent infringement by posting CAD files containing infringing designs. However, in order to be held liable for active inducement, and likely contributory infringement as well, there must be a showing of actual knowledge or willful blindness.[126] Pursuant to the standard set forth in *Global-Tech*, willful blindness would require a showing that the OSP

[124] *See IP, 3D Printing & DMCA, supra* note 81.
[125] *See supra* Part III-B (stating that active inducement requires a showing of actual knowledge or willful blindness).
[126] *Id.* (describing the knowledge requirement for indirect liability of a patent).

has a subjective belief that an infringement is occurring and the OSP must take deliberate actions to avoid learning that infringement.[127] Under this standard, only the most obvious infringers will be held liable. Websites that host 3D printing services often service a large market of consumers and any infringement is incidental to business. Absent a cease-and-desist letter detailing an infringement, patentees would be hard pressed to prove that a website that follows an open model, like Thingiverse, has the requisite knowledge to be held liable for secondary infringement.

Such a criticism overlooks the fact that most 3D printing OSPs follow a commercial model and that the *Global-Tech* standard only applies to indirect infringers. Direct patent infringement, on the other hand, is a strict liability action. If an individual makes or sells an infringing apparatus, that individual is directly liable to the patent holder, regardless of the individual's intent. Without a DMPA and an "innocent manufacturer" exception, commercial model 3D printing OSPs, and its users, are left open to patent liability.

Adopting a DMPA and a limited "innocent manufacturer" exception may be the most practical way to facilitate the growth of 3D printing. An innocent manufacturer exception will protect 3D printing OSPs and users that innocently manufacture a product that infringes upon a patent, which would enable such individuals to continue to create complex and functional designs without fear of patent liability. The notice-and-takedown provision of a DMPA would also allow patent holders to assert their rights by providing a procedure that quickly and efficiently removes infringing materials. Finally, without a DMPA in place, PAEs would be able to assert dubious patent infringement claims with a

[127] 131 S. Ct. at 2070 (stating that there are two basic requirements for willful blindness: "(1) the defendant must subjectively believe that there is a high probability that a fact exists and (2) the defendant must take deliberate actions to avoid learning of that fact.").

private cease-and-desist letter and remove non-infringing works, blocking potentially innovative creations from reaching the public.

VI. CONCLUSION

Almost anything a person can imagine can be created with 3D printing technology. With companies developing cheaper and more efficient consumer models, 3D printing may be on the verge of an industrial breakthrough. As revolutionary as 3D printing has the potential to be, it is a disruptive technology. Currently, patent law is ill prepared to handle the effects that 3D printing will have on the marketplace. This legal apprehension over a digital technology is a mirror image of the trepidation between copyright law and file sharing websites in the late 1990s. From that trepidation spawned the DMCA, which paved the way for sites like YouTube, Facebook, and Twitter. In order to bring patent law into the digital age, Congress will need to adopt legislation comparable to the DMCA's safe harbor and notice-and-takedown provisions. The most critical component of a DMPA will be a limited "innocent manufacturer" exception to direct infringement. One must be cognizant that patent law is a constant balancing act between promoting innovation, by allowing inventors to exploit their exclusive rights for a limited time, and the free flow of ideas, information, and commerce. However, rewarding the owner of the patent has always been a secondary consideration.[128] Consumer level 3D printing has the potential to transform everyday life as we know it. In a few more years, 3D printing technology may be no more difficult to use than a camera phone. Congress needs to act soon to ensure the growth of this budding technology.

[128] Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417, 429 (1984) (quoting United States v. Paramount Pictures, 334 U.S. 131, 158 (1948) ("The copyright law, like the patent statutes, makes reward to the owner a secondary consideration.").