

PATENT ENFORCEMENT IN CYBERTERRITORIES

Daniel Harris Brean[†]

3D printing technology has exposed a gap in patent protection. Thanks to 3D printers, physical products can be created and sold digitally in the form of CAD files, and consumers printing the products are effectively manufacturers. But current law would treat a product patent as being directly infringed only when the physical product is made, used, offered for sale, or sold, making it difficult to target the digital source of the infringement. While past scholarship has fashioned new legal constructs to close this gap (e.g., expanding patent eligibility or extending infringement case law) this Article considers whether a proper, analogous framework already exists—the law of extraterritorial patent enforcement.

National borders have long been thinning as a result of globalization, with manufacturing, sales, and operations increasingly being conducted, at least in part, abroad. When certain entities operated beyond the border to avoid infringement liability, Congress and the courts have occasionally responded to expand the reach of U.S. law to deem such conduct infringing, provided that there was a sufficient nexus to the United States and harm to the patent owner.

Now 3D printing has thinned the border between the digital and the physical such that the difference can be little more than the click of a button. As with national borders, businesses now have more choices as to which side of the digital-physical border to conduct their business activities. Just as the law bridged certain gaps in the national borders context, a similar reach into digital spaces may be appropriate.

[†] Assistant Professor of Law, University of Akron School of Law; Of Counsel, The Webb Law Firm. Thanks to Tim Holbrook, Camilla Hrdy, Sapna Kumar, and Lucas Osborn for helpful discussions and comments. Thanks also to the participants at the 2018 Three Rivers Colloquium at Pitt Law School and the 2018 Works-in-Progress IP Colloquium at Case Western Law School for their constructive feedback. The views expressed in this Article, as well as any errors, are my own. Questions and comments are welcome to dbrean@uakron.edu.

Beyond this analogy are similar analytical challenges. Both situations require some balancing of recognized jurisdiction with the reality that conduct outside the border often has substantial effects on the interests of U.S. patent owners. And in both situations, imposing liability for some conduct can over-protect patent owners' legitimate interests. There is even a statutory textual link, in that infringement is defined as certain acts "within the United States," although that geographic scope has not yet been interpreted to encompass three-dimensional spaces that exist only as non-physical, conceptual constructs within digital storage devices.

Applying patent extraterritoriality principles to such digital spaces, or cyberterritories, as if they were in fact outside "the United States," closes the gap in patent protection in certain desirable respects but leaves the gap open in other desirable respects. Further, although cyberterritories are not sovereign, and thus no traditional conflict-of-law analysis can be done, future evidence of norms concerning the development and use of CAD files may suggest that the results of this analytical approach are consistent with comity-like considerations.

TABLE OF CONTENTS

INTRODUCTION	2551
I. THE THINNING BORDERS OF PATENT LAW	2557
A. <i>Geographical Borders</i>	2561
B. <i>Digital-Physical Borders</i>	2572
II. PATENT INFRINGEMENT IN CYBERTERRITORIES	2575
A. <i>"Making" the Invention</i>	2577
B. <i>"Using" the Invention</i>	2583
C. <i>"Selling" or "Offering to Sell" the Invention</i>	2587
III. THE POTENTIAL ROLE OF DESIGN AND CAD NORMS.....	2588
CONCLUSION.....	2595

INTRODUCTION

Additive manufacturing, or 3D printing, is revolutionizing how products can be designed, made, sold, and distributed.¹ Products in many industries are now routinely designed digitally by computer-aided drafting (CAD) programs and, with little more than the click of a button, can be “printed” into physical, three-dimensional objects on demand.² 3D printers can make objects in metals, ceramics, plastics—even living tissue.³ Industrial applications have enabled, for example, the creation of impressively light, strong, and durable airplane engine parts,⁴ and consumer applications are already bringing much of the promise of science fiction “replicators” into our homes today.⁵

¹ See, e.g., JOHN HORNICK, 3D PRINTING WILL ROCK THE WORLD (2015); HOD LIPSON & MELBA KURMAN, FABRICATED: THE NEW WORLD OF 3D PRINTING (2013).

² Daniel Harris Brean, *Asserting Patents to Combat Infringement via 3D Printing: It's No "Use"*, 23 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 771, 774 (2013) (“A 3D printer essentially takes a CAD file and turns it into a physical object—‘feed it a design for a wrench, and it produces a physical, working wrench.’ Rather than starting with a block of raw material and removing, for example, all that is not a wrench, 3D printers build objects by adding small amounts of liquid or powdered material such as plastic layer by layer, from the bottom up. During the layering process, heat, light, or chemicals are precisely applied to bond and strengthen the structure. This layering approach enables 3D printers to construct highly intricate forms that would not be possible by simply using cutting or shaping tools on solid blocks of material. Three-dimensional printers can even be used to make devices having internal moving parts, such as a functional clock or gun.”); Daniel Harris Brean, *Patenting Physibles: A Fresh Perspective for Claiming 3D-Printable Products*, 55 SANTA CLARA L. REV. 837, 847 (2015) (describing how CAD files are “sliced” into layers before they are printed layer by layer).

³ See Brean, *Asserting Patents*, *supra* note 2, at 779; Arielle Duhaime-Ross, *This 3D Bioprinter Can Make Human-Sized Ear, Muscle, and Bone Tissues*, VERGE (Feb. 15, 2016, 11:00 AM), <https://www.theverge.com/2016/2/15/10995730/3d-print-human-tissue-ear-muscles-bone> [https://perma.cc/K7EP-BGB6].

⁴ Tomas Kellner, *An Epiphany of Disruption: GE Additive Chief Explains How 3D Printing Will Upend Manufacturing*, GE REPORTS (Nov. 13, 2017), <https://www.ge.com/reports/epiphany-disruption-ge-additive-chief-explains-3d-printing-will-upend-manufacturing> [https://perma.cc/SWE7-DCKT] (explaining that GE took a 20-component fuel nozzle and re-engineered it to be 3D-printed, where the result was that “not only combined all 20 parts into a single unit, but it also weighed 25 percent less than an ordinary nozzle and was more than five times as durable.”).

⁵ See generally *Star Trek: The Next Generation* (Paramount Domestic Television, 1987–1994); see also *Replicator (Star Trek)*, WIKIPEDIA, [https://en.wikipedia.org/wiki/Replicator_\(Star_Trek\)](https://en.wikipedia.org/wiki/Replicator_(Star_Trek)) [https://perma.cc/WZQ9-5ZHC] (last updated Mar. 28, 2019) (“In *Star Trek* a

3D printing technology also permits traditional supply and distribution channels to fundamentally shift such that the consumer becomes the manufacturer and the commercial “product” being sold is a mere digital file.⁶ As I have written elsewhere, this shift exposed a gap in patent protection where the making, use, sale, offer for sale, or importation of such files is not, under current law, an act of direct infringement—only those acts with respect to the physical objects would infringe.⁷

To address this gap, some have suggested that the infringement law should be interpreted to cover such digital activities, at least where there is a clear appropriation of the economic value of the invention by a sale or offer to sell such files.⁸ I have approached the issue from the patentability side and advocated that patents should be able to distinctly claim the digital representation of the physical invention, and thus

replicator is a machine capable of creating (and recycling) objects. Replicators were originally seen used to synthesize meals on demand, but in later series they took on many other uses.”).

⁶ See generally Brean, *Asserting Patents*, *supra* note 2; Tabrez Y. Ebrahim, *3D Printing: Digital Infringement & Digital Regulation*, 14 NW. J. TECH. & INTELL. PROP. 37, 39 (2016) (“[T]he consumer availability of 3D printing has enabled a DIY consumer to create a design in the form of a digital file that can be easily transmitted and made available to others. The digital file is called a Computer Aided Design (‘CAD’) file, which is a virtual blueprint model that is used to produce 3D printed objects. . . . [P]hysical products are already being designed, sold, and distributed on the computer and over the Internet, with end consumers only printing the physical manifestation of the product.”).

⁷ Brean, *Asserting Patents*, *supra* note 2, at 804 (summarizing that the “state of the law leaves patentees virtually helpless to combat a large class of infringement of their product claims”); *id.* (observing that some potential liability for *indirect* infringement—namely, active inducement under § 271(b)—might exist, but that the burden of proof for such claims is quite high); see also Ebrahim, *supra* note 6, at 66 (“Patent law in its current form is geared towards physical objects and is not prepared for the shift being created by 3D printing. Since 3D printing involves creation of CAD files that can print the physical object in an instant press of a button, there are blurry lines as to whether the creation of a CAD file should be viewed as making the object itself. Since the line between the digital and physical world is being blurred by 3D printing on a mass scale, it makes sense to develop new regulations and reform existing ones.”).

⁸ See generally Timothy R. Holbrook & Lucas S. Osborn, *Digital Patent Infringement in an Era of 3D Printing*, 48 U.C. DAVIS L. REV. 1319, 1327–28 (2015) (suggesting that a “sale” or “offer[] to sell” a CAD file should be actionable because, unlike a mere “use” or “making,” such acts appropriate the “economic value” of the patented invention).

patent the files per se (much like software has been patented on digital storage media in the form of *Beauregard* claims).⁹

Both infringement-focused and patentability-focused approaches to closing the gap are supported in large part by favoring substance over form. These approaches recognize that the differences between the digital files and the physical objects has become less significant as 3D printing makes it fast and easy to both print a digital object and digitally scan a physical one.¹⁰ But both approaches also have purported to expand or extend the law in different ways to cover so-called “digital infringement.”¹¹

⁹ See Brean, *Patenting Physibles*, *supra* note 2, at 852–60 (demonstrating how a CAD file directed to a printable object could satisfy § 101 and the “printed matter” doctrine, while still avoiding the *Alice* “abstract idea” exception, because the file is a sufficiently specific and concrete form of data that is only readable by computers or 3D printers); *id.* at 843–46 (discussing the analogous history of *Beauregard* claims, which originated as a test case filed by IBM because software was distributed on disks but patented as method claims, causing a gap in enforceability such that those trading in disks were not direct infringers).

¹⁰ See *id.* at 838 (“Today consumers, hobbyists, and technophiles can download a computer-aided design or CAD file (a digital representation of a physical product) and additively ‘print’ a three-dimensional product or component as simply as one can print words to a page.”); *id.* at 852 (“A CAD file is intended to be precise, detailed, and suitable for use in tooling and manufacturing—it is not an abstraction of an object but an accurate representation of it.”); Holbrook & Osborn, *supra* note 8, at 1362 (“CAD files are easily transferable and are one click away from producing a tangible object. A transfer of a CAD file is likely to take place immediately and makes future, tangible infringement all too easy.”); *id.* (“3D printing and other DMT are bridging the digital and physical worlds, rendering many of the distinctions between ‘tangible’ and ‘intangible’ anachronistic.”); Lucas S. Osborn, *Regulating Three-Dimensional Printing: The Converging Worlds of Bits and Atoms*, 51 SAN DIEGO L. REV. 553, 620 (2014) (“3D printing causes the worlds of bits and atoms to overlap further. As the technology proliferates and improves, CAD files for many products will become equivalent to their physical counterparts. Regulating these files will be the chief challenge for the legal system as it seeks to adapt to a world with 3D printing.”); Brean, *Asserting Patents*, *supra* note 2, at 773 (“While designs can certainly be created and manipulated in CAD programs from scratch, 3D scanning technology can also be used to make a CAD file that digitally captures and represents an existing object.”).

¹¹ E.g., Brean, *Patenting Physibles*, *supra* note 2, at 863–64 (ultimately advocating for a “test case” to determine if new claiming strategies to encompass CAD files will succeed); Holbrook & Osborn, *supra* note 8, at 1360 (“We are not simply asking whether the law at present *will* allow such liability. We are asking whether the law *should* do so. Our contention is that it should, as a normative matter, regardless of whether current case law permits it.”); *id.* at 1362 (“*Transocean* of course does not definitively answer the question of CAD files because the court was not considering digital infringement.”); *id.* at 1384 (“Whether to extend patent law in the ways we have explored is clearly a complex question. Even though digital infringement, particularly

This Article considers whether an appropriate framework already exists in the extraterritorial application of patent law. I examine whether infringement liability would attach if the accused actions occurred in digital spaces (i.e., non-physical, conceptual spaces on computers) that, though arguably within the United States, are treated as extraterritorial.¹² I call such digital spaces “cyberterritories.”

For example, creating a CAD file makes a digital representation of a product in a cyberterritory. If that file is printed on a 3D printer in the United States, it crosses the digital-physical boundary and becomes a physical object that is clearly within the reach of U.S. patent law. But many actions involving CAD files in cyberterritories will stop short of that ultimate step of making a physical object and occur partly, if not entirely, on the digital side of the border—e.g., copying the digital file, electronically transmitting the digital file, modifying the digital file, and offering to sell or selling a copy of the digital file. In those instances, the reach of U.S. patent law into the digital-only conduct is less clear—are those actions “mak[ing],” “us[ing],” or “sell[ing]” the “invention[] within the United States,” as the infringement statute requires?¹³ The statute and common law surrounding it was mostly developed long before the internet, let alone 3D printing, existed. Thus, answering that

direct infringement, is justifiable on technical terms, such an expansion may work considerable costs on other parties.”). Professors Holbrook and Osborn further contended that the law, as is, would extend to CAD file sales and offers for sale as actions of infringement despite involving intangible files, *id.* at 1359–63, though I have taken the contrary position based on a different reading of the case law. See Brean, *Asserting Patents*, *supra* note 2, at 790–93. A third, related approach is that taken by the International Trade Commission (ITC) in *ClearCorrect Operating, LLC v. ITC*, 810 F.3d 1283, 1287 (Fed. Cir. 2015), discussed *infra* Section I.B, where the ITC attempted to expand the scope of its unfair trade jurisdiction by blocking the importation of digital CAD files over the Internet via the ITC’s powers under 19 U.S.C. § 1337. The Federal Circuit rejected the ITC’s effort to so expand the meaning of infringing “articles” that may be blocked from importation under § 337. *Id.* Although related to the issues of infringement under 35 U.S.C. § 271, which are the focus of this Article, *ClearCorrect* represents the first major attempt for U.S. patent protection to extend to such digital activities, as discussed *infra* Section I.B.

¹² For an excellent discussion of how digital infringement activities should be addressed when those activities are *actually* outside the United States, see Timothy R. Holbrook, *Extraterritoriality and Digital Patent Infringement*, in RESEARCH HANDBOOK ON INTELLECTUAL PROPERTY AND DIGITAL TECHNOLOGIES (forthcoming), <https://ssrn.com/abstract=3088027> [<https://perma.cc/4F9W-CKD3>].

¹³ 35 U.S.C. § 271(a) (2018).

question implicates other questions similar to those that arise when the accused infringement occurs at least partially in other countries where U.S. courts' right to exercise jurisdiction is not a given. For example: (1) did Congress expressly give the courts jurisdiction over such conduct?; (2) is there a legitimate harm to the patent owner that will go unremedied if the conduct is not actionable?; and (3) would applying the law to reach this conduct be considered offensive or overreaching to other stakeholders? This Article will demonstrate how those questions are similarly implicated (and answered) when some or all of the accused conduct occurs within a digital cyberterritory.

Importantly, when discussing cyberterritories I am not referring per se to the internet and similar networks that are more commonly called "cyberspace." Cyberterritories are the constructs of three-dimensional objects that are represented by digital data, where that digital data will often be stored on devices entirely within one country's national borders. Put another way, the cyberterritory is the conceptual three-dimensional space occupied by the digital object and associated with the digital storage device on which the data representing the object is stored. Though such data may be transferred over networks across national borders, in which case the digital object might ultimately occupy multiple cyberterritories, as a first analytical step this Article assumes that the digital object and any networked computers involved are entirely within U.S. national borders.¹⁴ As many others have written

¹⁴ Similar location-based analytical challenges have arisen in the context of using trademarks in virtual spaces, such as online interactive games, even if all the relevant users and computers are assumed to be in the United States. See, e.g., Candidus Dougherty & Greg Lastowka, *Virtual Trademarks*, 24 SANTA CLARA COMPUTER & HIGH TECH. L.J. 749, 782–83 (2008) ("Since Second Life is a software platform that resides on 2,000 servers located in San Francisco and Dallas, it probably would not be found to exist outside of the jurisdiction of the United States."); *id.* at 783 ("Since Second Life is Internet-based, it would seem that [a virtual trademark user's] . . . rights would also extend nationally across the Web. Maybe limiting the protection of a virtual trademark to its virtual 'territory'—Second Life—would chart a better policy course, but trademark law does not seem to recognize 'virtual' geographic limitations. So to the extent such a notion would be accepted as a limitation on virtual trademark rights, it would probably have to be under the rubric that Second Life constitutes a separate market, not a separate place."). With federal trademark law stemming from the commerce clause of the Constitution, rather than the intellectual property clause, authors like Daugherty and Lastowka may well be justified in their more expansive assumptions about the reach of virtual trademark rights. See, e.g., Sapna Kumar, *Patent Damages Without Borders*, 25 TEX. INTELL. PROP. L.J. 73, 96–97 (2017) (discussing *Steele v. Bulova Watch Co.*, 344 U.S. 280 (1952), where the Supreme

at length, cyberspace holistically defies (and arguably should defy) efforts to be located within any one country or controlled by any one set of laws.¹⁵ Future work will address the complication of multinational and transnational cyberterritories throughout cyberspace.

With those caveats, the following discussion shows that many of the legal expectations and policy goals of the United States patent system would be well served by treating cyberterritories as being outside the United States for purposes of infringement. This framework also goes a long way to closing to above-mentioned gap in patent protection to advance patent policy goals, while stopping short of some potential undesirable consequences.

Part I juxtaposes the challenges and analytical frameworks surrounding extraterritoriality and digital patent infringement. Part II examines, through a trans-national or multi-national lens, how and when conduct within cyberterritories should infringe U.S. patent rights. Part III considers what role normative evidence may play in this debate. A brief conclusion follows.

Court “carved out a notable exception to the presumption [against extraterritoriality] in trademark law” to extend to conduct occurring entirely in Mexico, and explaining that the decision was rooted in the broad power to regulate commerce that stems from the commerce clause and flows through the Lanham Act); Timothy R. Holbrook, *Extraterritoriality in U.S. Patent Law*, 49 WM. & MARY L. REV. 2119, 2124 (2008) (“In contrast to copyright and trademark law, many commentators viewed patent law as the most territorially based form of intellectual property because most inventions were tangible in nature and because patents are subject to extensive review by a national government prior to the patent rights being granted.”).

¹⁵ See, e.g., David R. Johnson & David G. Post, *Law and Borders: The Rise of Law in Cyberspace*, 48 STAN. L. REV. 1367, 1371–72 (1996) (“The power to control activity in Cyberspace has only the most tenuous connections to physical location. Nonetheless, many governments’ first response to electronic communications crossing their territorial borders is to try to stop or regulate that flow of information. . . . But efforts to control the flow of electronic information across physical borders—to map local regulation and physical boundaries onto Cyberspace—are likely to prove futile, at least in countries that hope to participate in global commerce.”); see also Timothy S. Wu, *Cyberspace Sovereignty? The Internet and the International System*, 10 HARV. J.L. & TECH. 647 (1997); I. Trotter Hardy, *The Proper Legal Regime for “Cyberspace”*, 55 U. PITT. L. REV. 993 (1994).

I. THE THINNING BORDERS OF PATENT LAW

U.S. patent law is presumed to have no effect outside this country unless there is an express congressional enactment to the contrary.¹⁶ Even if Congress provides that a patent statute should have extraterritorial effect, the presumption still provides guidance as to the extent of the extraterritorial reach.¹⁷ The presumption applies essentially because giving U.S. patents legal effect beyond U.S. borders risks offending the legitimate sovereign interests of other nations, the laws of which may reflect different policy judgments about patents and how best to promote technological progress.¹⁸ Thus, the conventional

¹⁶ *Deepsouth Packing Co. v. Laitram Corp.*, 406 U.S. 518, 531 (1972) (“[W]e should not expand patent rights by overruling or modifying our prior cases construing the patent statutes, unless the argument for expansion of privilege is based on more than mere inference from ambiguous statutory language. We would require a clear and certain signal from Congress. . . . Our patent system [as then enacted] makes no claim to extraterritorial effect. . . .”); *Microsoft Corp. v. AT&T Corp.*, 550 U.S. 437, 454–55 (2007) (“The presumption that United States law governs domestically but does not rule the world applies with particular force in patent law. The traditional understanding that our patent law ‘operate[s]’ only domestically and d[oes] not extend to foreign activities,’ is embedded in the Patent Act itself, which provides that a patent confers exclusive rights in an invention within the United States.”); *see generally* *RJR Nabisco, Inc. v. European Cmty.*, 136 S. Ct. 2090, 2100 (2016) (“It is a basic premise of our legal system that, in general, ‘United States law governs domestically but does not rule the world.’ This principle finds expression in a canon of statutory construction known as the presumption against extraterritoriality: Absent clearly expressed congressional intent to the contrary, federal laws will be construed to have only domestic application.”) (internal citations omitted) (quoting *Microsoft Corp. v. AT&T Corp.*, 550 U.S. 437, 454 (2007)) (citing *Morrison v. Nat’l Austl. Bank Ltd.*, 561 U.S. 247, 255 (2010)).

¹⁷ *Microsoft*, 550 U.S. at 455–56 (“AT&T argues that the presumption is inapplicable because Congress enacted § 271(f) specifically to extend the reach of United States patent law to cover certain activity abroad. But as this Court has explained, ‘the presumption is not defeated. . . . because [a statute] specifically addresses [an] issue of extraterritorial application,’; it remains instructive in determining the *extent* of the statutory exception. . . .”) (internal citations omitted).

¹⁸ *Id.* at 455 (“[C]ourts should assume that legislators take account of the legitimate sovereign interests of other nations when they write American laws.”) (internal citations and quotation marks omitted). There are other ways to justify the presumption, but the subjectivity of such considerations has led to inconsistent applications of the presumption, as well as criticisms of judicial policymaking. *See, e.g.*, Timothy R. Holbrook, *Boundaries, Extraterritoriality, and Patent Infringement Damages*, 92 NOTRE DAME L. REV. 1745, 1752 (2017) (“Courts and commentators have offered a variety of justifications for the presumption. The courts have suggested that using domestic laws extraterritorially could violate international law. Comity and the potential for creating conflicts with the laws of foreign countries both

thinking goes that foreign law, and foreign patents, would and should typically govern disputes over alleged infringing conduct that occurs outside the United States.¹⁹

The Supreme Court has further decided, however, that barring an express, affirmative indication from Congress that a statute should have an extraterritorial effect, a statute might still be applied to at least some foreign conduct *in addition to* some domestic conduct, depending on the statute's "focus":

If the conduct relevant to the statute's focus occurred in the United States, then the case involves a permissible domestic application even if other conduct occurred abroad; but if the conduct relevant to the focus occurred in a foreign country, then the case involves an impermissible extraterritorial application regardless of any other conduct that occurred in U.S. territory.²⁰

Thus, if the domestic conduct is the focus of the statute, the statute might apply to the related foreign conduct even absent an express statement from Congress to that effect. Between 2010 and the 2016 *RJR*

loom large in this calculus. Courts have identified concerns with separation of powers—the usurpation of the executive by acts of Congress—as also supporting the presumption. The reality is that no single theory justifies the presumption. Needless to say, the presumption has also been criticized, particularly for its inconsistent application.”); Kumar, *supra* note 14, at 82 (“Although the presumption was originally about discerning Congress’s intent, it has strayed from these roots. Scholars have observed how the Supreme Court uses it to discount Congress’s objectives and engage in judicial policymaking. Several policy justifications underlie the modern presumption. Some relate to international concerns, such as respecting the laws of foreign countries and avoiding conflicts with them. Others are more domestic in nature, such as maintaining separation of powers.”). Indeed, the Supreme Court’s recent “focus” framework in the *Morrison* and *RJR Nabisco* cases, discussed below, has been sharply criticized for enabling judicial policymaking. See, e.g., Lea Brilmayer, *The New Extraterritoriality: Morrison v. National Australia Bank, Legislative Supremacy, and the Presumption Against Extraterritorial Application of American Law*, 40 SW. L. REV. 655, 664 (2011) (contending that “*Morrison* makes it more difficult than before to base the result on what Congress wanted and easier than before to base the decision on undeniably judge-made concepts[]” and that the new approach has thus “increased the opportunity for judicial policy making and diminished the importance of congressional preferences.”).

¹⁹ *Microsoft*, 550 U.S. at 456 (“[F]oreign law alone, not United States law, currently governs the manufacture and sale of components of patented inventions in foreign countries. If AT&T desires to prevent copying in foreign countries, its remedy today lies in obtaining and enforcing foreign patents.”).

²⁰ *RJR Nabisco, Inc. v. European Cmty.*, 136 S. Ct. 2090, 2101 (2016).

Nabisco decision, the Court has applied this “focus” analysis after concluding that a statute was not clearly intended to have extraterritorial effect, but the Court has never found a basis for extraterritorial application on those grounds.²¹ First, in *Morrison v. National Australia Bank*, the Court held that the Securities Exchange Act does not apply to fraudulent conduct occurring in the United States relating to the purchase of foreign securities, explaining that “the focus of the Exchange Act is not upon the place where the deception originated, but upon purchases and sales of securities in the United States.”²² Second, in *Kiobel v. Royal Dutch Petroleum Co.*, the Court concluded that the Alien Tort Statute could not be read to apply to alleged international law violations where “all the relevant conduct” occurred overseas.²³

Against this backdrop, the Patent Act provides that “whoever without authority makes, uses, offers to sell, or sells any patented invention, *within the United States* . . . infringes the patent.”²⁴ The Patent Act separately defines “United States” as “the United States of America, its territories and possessions.”²⁵ Although disputes over the scope of this definition have been rare, it has been essentially limited to geographic areas of land that the United States owns or controls, with very narrow exceptions (e.g., aboard U.S.-flagged ships on the high seas).²⁶ Congress expanded the physical reach of this provision

²¹ The Court suggested that the “focus” analysis should only proceed if there is no textual basis in the statute to give the statute extraterritorial effect. *RJR Nabisco*, 136 S. Ct. at 2102 n.5 (“Because a finding of extraterritoriality at step one will obviate step two’s ‘focus’ inquiry, it will usually be preferable for courts to proceed in the sequence that we have set forth.”). As such, in *RJR Nabisco*, where the Court considered the Racketeer Influenced and Corrupt Organizations Act and found that certain predicate actions expressly contemplated foreign conduct and thus had extraterritorial effect, it did not reach any consideration of the statute’s “focus.” *Id.* at 2103–04.

²² *Morrison v. Nat’l Australia Bank, Ltd.*, 561 U.S. 247 (2010).

²³ *Kiobel v. Royal Dutch Petroleum Co.*, 569 U.S. 108 (2013).

²⁴ 35 U.S.C. § 271(a) (2018) (emphasis added).

²⁵ 35 U.S.C. § 100(c) (2018).

²⁶ *See, e.g.*, *Hughes Aircraft Co. v. United States*, 29 Fed. Cl. 197, 230–31 (1993) (“The Supreme Court’s holding in *Deepsouth* that our patent laws have no extraterritorial effect bolsters our view that [28 U.S.C.] § 1498 in its entirety should be construed consistently with title 35 as limited in application to United States territory and thus as not applying in outer space (absent a specific enactment extending the reach of patent laws to uses in space).”) (internal citations omitted); *M-I Drilling Fluids UK Ltd. v. Dynamic Air Inc.*, 99 F. Supp. 3d

elsewhere, in the Inventions in Outer Space Act, which provides that if an invention is made, used, or sold on a U.S. spacecraft, it is treated as if it occurred “within the United States.”²⁷ But, to date, “within the United States” has always meant some three-dimensional physical space, and has never been construed to mean any non-physical or conceptual location.²⁸

Nonetheless, section 271(a)’s explicit limit of “within the United States” would all but preclude any argument that the statute includes a “clearly expressed congressional intent” of extraterritorial application.²⁹

969, 974 (D. Minn. 2015) (“In the Patent Act of 1952, Congress expressly stated the geographic limits of patent rights and defined the ‘United States’ as ‘the United States of America, its territories and possessions.’ At least one commentary on patent law notes the ‘broad’ definition of ‘United States’ in the 1952 Act, which is understood to include ‘land areas under U.S. Control, U.S. registered vessels at high sea, and space vehicles under U.S. jurisdiction or control.’”) (internal citations omitted); *WesternGeco LLC v. ION Geophysical Corp.*, No. 4:09-cv-1827, 2011 WL 3608382, at *11 (S.D. Tex. Aug. 16, 2011) (“In sum, we have carefully reviewed the statutory construction to be provided to the term ‘possessions’ in 35 U.S.C. § 100(c). Though the ordinary meaning of ‘possessions’ would include areas within United States’ control, we believe that the United States’ circumscribed level of control over the EEZ is insufficient to characterize it as a ‘possession’ of the United States. In addition, we do not believe that the Congressional intent evinced in the legislative history of the Patent Act of 1952 indicates that Congress believed the term ‘possessions’ to include areas of sea rather than areas of land. We also find persuasive the distinction between the purpose and effect of patent law to create monopolies, on one hand, and the purpose of FLSA to offer a remedy to employees. Finally, we are unconvinced that the United States possesses the sole power to regulate patents in the area of the EEZ. We hold that the EEZ is not a ‘possession’ of the United States within the meaning of U.S. patent law.”).

²⁷ 35 U.S.C. § 105 (1990) (“Any invention made, used or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for the purposes of this title . . .”).

²⁸ Nonetheless, in an exceptional work detailing the many nuances of the seemingly straightforward territorial definition in 35 U.S.C. § 100(c), Professor Elizabeth Winston argued that the meaning of “the United States, its territories and possessions” has enough ambiguity even when only referring to geographic locations and should be clarified by Congress to maximize judicial efficiency when faced with difficult interpretive questions. Elizabeth I. Winston, *Patent Boundaries*, 87 *TEMPLE L. REV.* 501, 546 (2015) (“Technology has spread to every corner of the earth, bringing once hostile territory under the spell of deepwater oil drilling, satellite communication systems, and mobile phone technology. These technologies present challenges to our current understanding of patent law. The patent boundaries of the United States extend from the International Space Station to the Outer Continental Shelf.”).

²⁹ *RJR Nabisco, Inc. v. European Cmty.*, 136 S. Ct. 2090, 2100 (2016); see Holbrook, *supra* note 18, at 1779 (“Section 271(a) has very explicit territorial restrictions. . . . It is hard to

Congress did, however, enact some other provisions outside of § 271(a) that expressly purport to have extraterritorial effect, as discussed below in the next subpart. Likewise, the “focus” of § 271(a) would seem to be exclusively on the actions listed as defining infringement, each of which is modified by “within the United States,” leaving little room to interpret the focus as being on any foreign conduct.³⁰ Thus any “focus”-based liability involving foreign conduct would appear to arise only in instances of trans-border or multinational conduct, as certain court decisions discussed in the following sub-part would support.

A. *Geographical Borders*

Although presumptively disfavored, both Congress and the courts have extended the geographic reach of U.S. patent law in the past few decades. Professor Tim Holbrook identified two reasons for why the United States is, overall, expanding the reach of its patent laws. First, he pointed to globalization, observing that while intellectual property (IP) rights are national in scope, “[m]arkets are increasingly global in nature, with goods and services crossing borders routinely.”³¹ Businesses looking to minimize transaction costs are increasingly frustrated by having to navigate, rely on, and utilize IP laws on a country-by-country basis.³² Indeed, the Supreme Court’s recent *Lexmark* decision on patent exhaustion indicates just how much the pressures of globalization has diminished the importance of patent territoriality.³³ There, the Court held that a sale of a patented product anywhere in the world that is

imagine a starker expression of territorial limits . . .”). *But see infra* Section II.A (discussing Federal Circuit cases such as *NTP* that apply § 271(a) to at least some extraterritorial conduct).

³⁰ Holbrook, *supra* note 18, at 1780 (“The ‘focus’ of § 271(a) is on acts of using, making, or selling the invention within the United States.”).

³¹ Holbrook, *supra* note 14, at 2123.

³² *Id.* (“This divergence between markets and property rights can create difficulties for companies seeking to protect such intangible assets. Differing national intellectual property laws raise transaction costs in navigating international business transactions because the rights afforded may differ from country to country. Businesses must anticipate the varying levels of protection and attempt to maximize their opportunities on a country-by-country basis.”).

³³ *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1536 (2017).

authorized by the U.S. patent owner exhausts all patent rights to that product in the United States.³⁴

Second, Professor Holbrook pointed to the rise of patents on intangible inventions such as interactive software and business methods (e.g., e-commerce), which are not by their nature constrained to single physical locations and can defy efforts to identify where the accused infringing conduct occurred.³⁵ 3D-printable products and their digital CAD files present yet another frontier where physical location becomes murky and will be addressed in Section I.B.

The remainder of this Section I.A presents several examples of how U.S. patent law has been extending into foreign territories. These instances largely involve the exposure of perceived “loopholes” or undesirable gaps in patent protection and the responses thereto. Sometimes the legal evolution has been a congressional response to a strict judicial construction of the statute that led to an unjust result; other times, courts have expansively interpreted the meaning of acts of infringement to encompass activities taking place at least partially abroad. As many other commentators have observed, there are systemic benefits and drawbacks to either avenue of legal change.³⁶

³⁴ *Id.* at 1535 (“An authorized sale outside the United States, just as one within the United States, exhausts all rights under the Patent Act.”). Although not an expansion of patent enforceability abroad, but a limit on domestic patent enforceability, *Lexmark* nonetheless reflects the concern about the complexity of tracing patent rights through increasingly complicated and more global streams of commerce and supply chains. *See id.* at 1532 (“[E]xtending the patent rights beyond the first sale would clog the channels of commerce, with little benefit from the extra control that the patentees retain. And advances in technology, along with increasingly complex supply chains, magnify the problem.”).

³⁵ Holbrook, *supra* note 14, at 2124 (“The expansion of subject matter to cover intangible inventions, such as business methods and software, has begun to place pressure on these historical territorial limits in patent law. Recent cases confirm that patent law is now beginning to buckle under the pressure.”); *see also* Dan L. Burk, *Patents in Cyberspace: Territoriality and Infringement on Global Computer Networks*, 68 TUL. L. REV. 1, 5–6 (1993) (“The patent statutes are territorial in nature; the computer network is not. On-line databases and other information services are routinely accessed from abroad through transnational linkages. . . . Where the users and providers of software-based services inhabit an electronic realm with virtual machines that transcend national boundaries, application of a territorial intellectual property scheme may be difficult and may lead to unintended results.”). As Professor Holbrook observed, Professor Burk’s 1993 prediction was remarkably “prescient” of subsequent developments like the *NTP* case, which is discussed *infra*. Holbrook, *supra* note 14, at 2124 n.7.

³⁶ Having Congress address matters of territorial scope has the benefits of preserving the separation of powers, encouraging clearer and more predictable territorial rules for courts to

follow, and leveraging Congress's superior access to political, trade, and foreign policy information. However, a major drawback is that Congress tends to be more reactive than proactive and can take a long time to amend statutes. See Holbrook, *supra* note 14, at 2142 (explaining that strict statutory construction against extraterritoriality would retain "[t]he primacy of Congress in establishing the scope of patent rights" but noting that it took twelve years before Congress overruled the *Deepsouth* decision discussed below); *id.* at 2142 ("[C]ongressional action will always be piecemeal and reactive; it is unlikely that Congress would be able to anticipate various ways that companies would arbitrage the system to take advantage of the rules of territoriality."); Curtis A. Bradley, *Territorial Intellectual Property Rights in an Age of Globalism*, 37 VA. J. INT'L L. 505, 585 (1997) ("There are better ways to cope with global interdependence than judicial abandonment of territoriality. Where necessary, the political branches can protect U.S. interests by entering into international agreements, adjusting legislation and trade policy, and pursuing international dispute resolution."); *id.* at 550 ("Unlike the political branches of the government, the judicial branch does not have access to information relating, for example, to the views of foreign governments and the U.S. strategic and economic interests around the world."); Mark P. Gibney, *The Extraterritorial Application of U.S. Law: The Perversion of Democratic Governance, the Reversal of Institutional Roles, and the Imperative of Establishing Normative Principles*, 19 B.C. INT'L & COMP. L. REV. 297, 310 (1996) (arguing that political branches of government should be "taking on the lion's share in determining when, and explaining why, U.S. law should or should not be applied extraterritorially."). Entrusting courts to address territoriality issues has the benefit of offering speedy solutions that may prevent injustice, as courts are often at the front lines of such new questions—but the result may be rather "tortured statutory constructions to combat the situation." Holbrook, *supra* note 14, at 2143 (citing the Federal Circuit's expansive interpretation in *Microsoft*, discussed below) (quoting *AT&T Corp. v. Microsoft Corp.*, 414 F.3d 1366, 1371 (Fed. Cir. 2005) (holding that a master disk not combined into computers abroad was nonetheless a "component" of the foreign computers because "[i]t would be unsound to construe a statutory provision that was originally enacted to encourage advances in technology by closing a loophole, in a manner that allows the very advances in technology thus encouraged to subvert that intent.")). Further, the nature of the judicial process constrains a court's ability to anticipate and respond to issues beyond the case before it, and the decision-making lacks transparency that may offend foreign governments that are affected by the decision. Bradley, *supra*, at 550 ("Certain characteristics of judicial decisionmaking, such as the case and controversy requirement, the rule of stare decisis, and the need to issue reasoned opinions, undermine the ability of the judicial branch to anticipate and respond to changing foreign political situations."); Holbrook, *supra* note 14, at 2161–62 (discussing the Canadian government's decrying of the Federal Circuit's failure to consider Canada's views in how the *NTP* case, discussed *infra*, should have been resolved). But see Maggie Gardner, *RJR Nabisco and the Runaway Canon*, 102 VA. L. REV. ONLINE 134, 141–42 (2016) (criticizing *RJR Nabisco* as making it "harder for Congress to efficiently rebut the presumption against extraterritoriality" and arguing that too much insistence on clear congressional statutory language turns into "not a search for congressional intent, but an effort to put the brakes on what Congress can do."). This Article's focus is on identifying workable legal principles in the cyberterritory context and does not intend to weigh in much on the debate of which *kind* of legal reform may be warranted. In the short term, courts have the advantage of speed in resolving current, actual conflicts that might avoid injustice, while in the long run these issues

First, in 1984, Congress enacted § 271(f) to make it an act of infringement to supply components of a patented invention in or from the United States, uncombined, to be assembled abroad.³⁷ This was done to abrogate a Supreme Court ruling that strictly construed § 271(a) to conclude that there could be no liability for “making” a patented product under such circumstances.³⁸ Although the Supreme Court has since twice had the occasion to interpret § 271(f), and in both instances limited the extent of the extraterritorial application,³⁹ the law remains a substantial extension of U.S. patent rights and is considered to have fixed what was a significant “gap in our patent law.”⁴⁰

are complex enough that a full policy analysis from the political branches may strike a better, or at least more predictable, overall balance.

³⁷ See 35 U.S.C. § 271(f)(1) (2018) (“Whoever without authority supplies or causes to be supplied in or from the United States all or a substantial portion of the components of a patented invention, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components 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.”).

³⁸ *Deepsouth Packing Co. v. Laitram Corp.*, 406 U.S. 518, 526, 530–31 (1972) (emphasizing the presumption against extraterritoriality and “this Nation’s historical antipathy to monopoly” to strictly construe the statute against extraterritorial application absent a “clear and certain signal from Congress . . .”). For more discussion of the history of § 271(f), see Holbrook, *Territoriality Waning? Patent Infringement for Offering in the United States to Sell an Invention Abroad*, 37 U.C. DAVIS L. REV. 701, 720–22 (2004) (explaining that “Congress . . . made it an act of infringement to export either the complete but disassembled invention, or even a component of an invention for which there is no noninfringing use, effectively overruling *Deepsouth* and significantly expanding the patentee’s exclusive rights.”).

³⁹ See *Microsoft Corp. v. AT&T Corp.*, 550 U.S. 437, 449–56 (2007) (holding that a master disk of software was not a “component” of computers onto which the software was copied abroad under § 271(f) because software per se is not physical, but is more akin to a set of instructions or “blueprint,” and because the master disk was not itself combined with the computers but was used to make copies of the software onto other disks that were combined with the computers); *Life Techs. Corp. v. Promega Corp.*, 137 S. Ct. 734, 743 (2017) (holding that supplying a single component of a multicomponent invention cannot be a “substantial portion” of the components of the invention for purposes of § 271(f)(1)). The Court also recently revisited § 271(f) in *WesternGeco LLC v. ION Geophysical Corp.*, 138 S. Ct. 2129 (2018), see discussion *infra* notes 61–62, 64–68 and accompanying text, though in the context of damages and not liability.

⁴⁰ *Microsoft*, 550 U.S. at 457; see also *Life Techs.*, 137 S. Ct. at 743 (“The effect of this provision was to fill a gap in the enforceability of patent rights by reaching components that are manufactured in the United States but assembled overseas and that were beyond the reach of the statute in its prior formulation.”).

Second, in 1988, Congress closed another gap by adding § 271(g),⁴¹ which makes it an act of infringement to import into the United States a product made by a patented process, even if the process is performed entirely abroad.⁴² Before the enactment of § 271(g), one could only infringe such process patents by performing the process in the United States.⁴³ The Federal Circuit later limited the extent of this statute's reach when it held that if the result of a process is intangible information (in that case, revealing properties of a drug), bringing that information into the United States is not importing a "product" for purposes of § 271(g), which the court held contemplates a physical product resulting from a manufacturing process.⁴⁴

⁴¹ Pub. L. No. 100-418, § 9003, 102 Stat. 1563-67 (1988). In addition to bridging another gap in the scope of U.S. patent protection, this particular protection became mandatory for the United States to include once it became a member of the Trade-Related Aspects of Intellectual Property Rights Treaty (TRIPS). *See* TRIPS art. 28(b) ("A patent shall confer on its owner the following exclusive rights: . . . (b) where the subject matter of a patent is a process, to prevent third parties not having the owner's consent from the act of using the process, and from the acts of: using, offering for sale, selling, or importing for these purposes at least the product obtained directly by that process.").

⁴² 35 U.S.C. § 271(g) (2018) ("Whoever without authority imports into the United States or offers to sell, sells, or uses within the United States a product which is made by a process patented in the United States shall be liable as an infringer, if the importation, offer to sell, sale, or use of the product occurs during the term of such process patent."). Section 271(g) precludes liability if the product "is materially changed by subsequent processes" or "becomes a trivial and nonessential component of another product." *Id.* § 271(g)(1)-(2).

⁴³ As Professor Holbrook explained,

Prior to the adoption of section 271(g), a competitor could circumvent a U.S. patent that covered only the process of making a product, but not the product itself. For example, a chemical company may have discovered a more cost-effective process to make an already known chemical. The process could be patented, but the chemical compound itself may not be. Technically, to infringe the patent under section 271(a), a competitor would have to perform the process within the United States. If the process was used overseas, there would be no infringement. A competitor could avoid infringement, therefore, by manufacturing the chemical by the patented process outside of the United States and then importing the unpatented product. Section 271(g) is Congress' response to this problem and an attempt to reach some extraterritorial conduct—the use of the infringing process—through the nexus of a domestic act—the importation, sale, or use of the invention.

Holbrook, *supra* note 38, at 721-22.

⁴⁴ *Bayer AG v. Housey Pharms., Inc.*, 340 F.3d 1367, 1377 (Fed. Cir. 2003) ("[I]n order for a product to have been 'made by a process patented in the United States' it must have been a physical article that was 'manufactured' and that the production of information is not

Third, in *NTP, Inc. v. Research in Motion, Ltd.*, the Federal Circuit held that while a patented method must be performed entirely in the United States to be an infringing use, the use of a system comprised of multiple components could be used “within the United States” even if one such component was outside the United States.⁴⁵ The court reasoned that components of systems are used “collectively,” not individually, and so “[t]he use of a claimed system under section 271(a) is the place at which the system as a whole is put into service, i.e., the place where control of the system is exercised and beneficial use of the system obtained.”⁴⁶ In *NTP*, the extraterritorial component of the system was a communication “relay” in Canada used for transmitting electronic messages as part of a cellular phone email network, and the court concluded that the customers who used their cell phones for email service controlled the transmission of information and derived the

covered.”). *Bayer* involved mere information about a drug—what the court described as “knowledge that a substance possesses a particular quality.” *Id.* at 1376. As discussed below, some district courts have more liberally construed § 271(g) and distinguished *Bayer*, at least when the patent expressly claims the digital material as the product that results from the process. See *CNET Networks, Inc. v. Etilize, Inc.*, 528 F. Supp. 2d 985, 994 (N.D. Cal. 2007); *Ormco Corp. v. Align Tech., Inc.*, 609 F. Supp. 2d 1057, 1076 (C.D. Cal. 2009); see discussion *infra* Section II.A.

⁴⁵ *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1318 (Fed. Cir. 2005) (“Because a process is nothing more than the sequence of actions of which it is comprised, the use of a process necessarily involves doing or performing each of the steps recited. This is unlike use of a system as a whole, in which the components are used collectively, not individually. We therefore hold that a process cannot be used ‘within’ the United States as required by section 271(a) unless each of the steps is performed within this country.”). This particular distinction between system and method claims, resulting in liability and non-liability, respectively, on the same facts, has been criticized for being grounded in very little law or policy. See, e.g., Timothy R. Holbrook, *Method Patent Exceptionalism*, 102 IOWA L. REV. 1001, 1044 (2017) (“The reasoning also does not seem terribly persuasive. Why is the use of the system in the United States based on the user, but not the *method*, when it is the user who puts the method into operation? There is no apparent reason why the ‘control and beneficial use’ test could not also apply to method claims. A consistent rule could also be one of strict territoriality: if any part of the system or any step of the method is performed outside of the United States, then there would be no infringement. Regardless of which approach a court were to take—using the beneficial use and control test, or using a strict territorial approach—it is clear that the Federal Circuit created a rule that treats method claims exceptionally with little textual or policy justification.”).

⁴⁶ *NTP*, 418 F.3d at 1317–18.

benefits of the system as a whole, and thus “used” the patented system.⁴⁷ Because the bulk of the accused system was in the United States and was being used by customers in the United States, those facts would presumably⁴⁸ satisfy the *RJR Nabisco* “focus” test to justify some extraterritorial effect as to the relay component in Canada.⁴⁹

Fourth, in *Litecubes, LLC v. Northern Light Products, Inc.*, the Federal Circuit held that a sale made and shipped to U.S. customers who contracted for the sale in the United States took place “within the United States,” even though the products were shipped free on board (f.o.b.) from Canada.⁵⁰ The seller argued that the f.o.b. shipment placed the legal title with the customer in Canada, such that the “sale” happened in Canada and the customer then imported the products into the United States.⁵¹ The Federal Circuit rejected this formalistic argument in favor of a flexible standard where the situs of a sale can be conceptualized to occur at the place of performance, the place of contracting, or the place of delivery.⁵² Again, this would appear to

⁴⁷ *Id.* at 1317 (“[I]t was proper for the jury to have found that use of NTP’s asserted system claims occurred within the United States. RIM’s customers located within the United States controlled the transmission of the originated information and also benefited from such an exchange of information. Thus, the location of the Relay in Canada did not, as a matter of law, preclude infringement of the asserted system claims in this case.”).

⁴⁸ The Federal Circuit has not yet applied the *RJR Nabisco* “focus” test to § 271(a), and *NTP* predated *RJR Nabisco*. See Holbrook, *supra* note 18, at 1780 (“Although the Federal Circuit has not yet had occasion to apply the *RJR framework* to its analysis of extraterritoriality for patent infringement liability, one could rationalize their holdings on this basis.”) (emphasis added).

⁴⁹ See *id.* (“The ‘focus’ of § 271(a) is on acts of using, making, or selling the invention within the United States. In *NTP*, the court effectively determined that the ‘use’ of the patented system fell within the United States, notwithstanding that part of the system was in Canada. As such, the facts in *NTP* would satisfy step two of *RJR*.”).

⁵⁰ *Litecubes, LLC v. N. Lights Prods., Inc.*, 523 F.3d 1353, 1371 (Fed. Cir. 2008) (“[H]ere it is undisputed that GlowProducts sold the products directly to customers in the United States. Since the American customers were in the United States when they contracted for the accused cubes, and the products were delivered directly to the United States, under *North American Philips* and *MEMC* there is substantial evidence to support the jury’s conclusion that GlowProducts sold the accused cubes within the United States.”).

⁵¹ *Id.* at 1359 (“GlowProducts’ theory was that because its sales to United States’ customers were shipped f.o.b., the sales took place in Canada and that it was the customer who imported the goods into the United States.”).

⁵² *Id.* at 1369–72. This flexible approach has been criticized, in favor of a bright-line rule to treat a “sale” as occurring at the place of delivery and performance. See Bernard Chao, *Patent Law’s Domestic Sales Trap*, 93 DENV. L. REV. ONLINE 87, 92 (2016) (“Patent law should adopt a

satisfy the *RJR Nabisco* “focus” test because acts of purchasing and receiving the accused item in the United States are what had the effect of appropriating the economic value of the patent.⁵³

Fifth, in *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling U.S., Inc.*, the Federal Circuit held that an offer to sell a patented oil rig made outside the United States could be an actionably “offer[] to sell . . . within the United States” as long as the contemplated sale would be in the United States, separate and apart from the consummation of the sale itself.⁵⁴ The court explained that “[t]he underlying purpose of holding someone who offers to sell liable for infringement is to prevent ‘generating interest in a potential infringing product to the commercial detriment of the rightful patentee.’”⁵⁵ While acknowledging the presumption against extraterritoriality, the court believed that reading “offers to sell . . . within the United States” to require that the offer itself be in the United States was unwarranted by the plain text.⁵⁶ But the court also expressed concern that a contrary reading would “exalt form

bright line rule that is both easy to apply and consistent with common sense notions of where a sale takes place. The Federal Circuit has already said that ‘a contract between two U.S. companies for the sale of the patented invention with delivery and performance in the U.S. constitutes a sale under § 271(a) as a matter of law.’ That rule should also apply to foreign companies. But that’s as far as U.S. patent law should extend. It should not allow some unknown sales-related activities to expand the contours of what we consider a domestic sale. That injects undesirable uncertainty into the law.”).

⁵³ *Cf.* *Holbrook*, *supra* note 18, at 1780 (explaining that under *Transocean*, discussed *infra*, the “location of the contemplated sale of the invention determines the locus of infringement, even if all negotiations take place outside of the United States and the sale is never consummated. The act of economic appropriation—the focus of the statute—is within the United States, satisfying step two.”).

⁵⁴ *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling U.S., Inc.*, 617 F.3d 1296, 1309 (2010) (“This case presents the question whether an offer which is made in Norway by a U.S. company to a U.S. company to sell a product within the U.S., for delivery and use within the U.S. constitutes an offer to sell within the U.S. under § 271(a). We conclude that it does. Section 271(a) states that ‘whoever . . . offers to sell . . . within the United States any patented invention . . . infringes.’ In order for an offer to sell to constitute infringement, the offer must be to sell a patented invention within the United States. The focus should not be on the location of the offer, but rather the location of the future sale that would occur pursuant to the offer.”).

⁵⁵ *Id.* (quoting *3D Sys., Inc. v. Aarotech Labs., Inc.*, 160 F.3d 1373, 1379 (Fed. Cir. 1998)).

⁵⁶ *Id.* (“The statute precludes ‘offers to sell . . . within the United States.’ To adopt Maersk USA’s position would have us read the statute as ‘offers made within the United States to sell’ or ‘offers made within the United States to sell within the United States.’ . . . [T]his is not the statutory language.”) (quoting *3D Sys.*, 160 F.3d at 1379).

over substance by allowing a U.S. company to travel abroad to make offers to sell back into the U.S. without any liability for infringement.”⁵⁷ Once again, this would seem to satisfy the *RJR Nabisco* “focus” test, as the contemplated sale was clearly in the United States.⁵⁸

Finally, beyond infringement liability, the law has expanded the geographic reach of patent infringement remedies to some extent.⁵⁹ For example, the Federal Circuit has allowed injunctions to reach products abroad that are “destined for delivery” in the United States.⁶⁰ The Federal Circuit had been reluctant to allow recovery of damages for extraterritorial conduct,⁶¹ however, but was recently reversed by the Supreme Court on that issue.

⁵⁷ *Id.* (“[T]his interpretation would exalt form over substance by allowing a U.S. company to travel abroad to make offers to sell back into the U.S. without any liability for infringement. This company would generate interest in its product in the U.S. to the detriment of the U.S. patent owner, the type of harm that offer to sell within the U.S. liability is meant to remedy. These acts create a real harm in the U.S. to a U.S. patentee.”) (internal citations omitted).

⁵⁸ Holbrook, *supra* note 18, at 1780 (“The same can be said of *Transocean*’s ruling that the location of the contemplated sale of the invention determines the locus of infringement, even if all negotiations take place outside of the United States and the sale is never consummated. The act of economic appropriation—the focus of the statute—is within the United States, satisfying step two.”). Notably, again, the sale need only be contemplated and does not ever need to occur in the United States for “offer” liability to attach. See Timothy R. Holbrook, *Territoriality and Tangibility After Transocean*, 61 EMORY L.J. 1087, 1112 (2012) (“[U]nder the *Transocean* rule, two parties negotiating, but not reaching an agreement, to potentially sell something in the United States could be liable for infringement of a U.S. patent notwithstanding that no actual commercial activity would take place within the United States.”).

⁵⁹ See generally Holbrook, *supra* note 18; Kumar, *supra* note 14.

⁶⁰ *Spindelfabrik Suessen-Schurr v. Schubert & Salzer Maschinenfabrik Aktiengesellschaft*, 903 F.2d 1568, 1577–78 (Fed. Cir. 1990).

⁶¹ *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 711 F.3d 1348, 1371–72 (Fed. Cir. 2013) (“Power Integrations is incorrect that, having established one or more acts of direct infringement in the United States, it may recover damages for Fairchild’s worldwide sales of the patented invention because those foreign sales were the direct, foreseeable result of Fairchild’s domestic infringement. Power Integrations has not cited any case law that supports an award of damages for sales consummated in foreign markets, regardless of any connection to infringing activity in the United States. To the contrary, the entirely extraterritorial production, use, or sale of an invention patented in the United States is an independent, intervening act that, under almost all circumstances, cuts off the chain of causation initiated by an act of domestic infringement.”); *Carnegie Mellon Univ. v. Marvell Tech. Grp., Ltd.*, 807 F.3d 1283, 1307 (Fed. Cir. 2015) (“Although all of Marvell’s [chip] sales are strongly enough tied to its domestic infringement [i.e., ‘use’ of the patented methods] as a causation matter to have been part of the hypothetical-negotiation agreement, that conclusion is not enough to use the sales as a direct measure of the royalty except as to sales that are domestic (where there is no

In *WesternGeco LLC v. ION Geophysical Corp.*,⁶² the Supreme Court held that infringement under § 271(f)(2), which prohibits supplying a material component of a patented device in or from the United States for assembly of the device abroad,⁶³ entitles the patentee to recover damages for foreign lost profits that result from the infringement.⁶⁴ The Court reasoned that the damages provision in § 284, which permitted damages for “infringement” as defined in § 271,⁶⁵ made the focus of the remedy for infringement under

domestic making or using and no importing.”). Notably, *Carnegie Mellon* would allow some damages for any of the accused chips that ultimately made it back into the United States. *Id.* at 1305 (“Marvell makes no meaningful extraterritoriality argument against—and we see no problem with—applying the royalty rate to chips that do enter the United States.”). At least one Federal Circuit judge would have liked the court to reconsider when foreign sales activity has a sufficient nexus to § 271(f) infringement to justify lost profit damages. *See WesternGeco LLC v. ION Geophysical Corp.*, 837 F.3d 1358, 1365–66 (Fed. Cir. 2016) (Wallach, J., dissenting in part) (“When a patent holder successfully demonstrates both patent infringement under United States law and foreign lost profits, what degree of connection must exist between the two before the foreign activity may be used to measure the plaintiff’s damages? Put another way, left unanswered is the question of where we must draw the line as to when patented products or services made, used, or sold abroad (or some combination of these) may be considered in calculating damages flowing from infringement under Title 35 of the United States Code. The issue is not one of infringement, where foreign use generally does not count, but one of damages, where it may.”); *id.* at 1369 (“An unduly rigid rule barring the district court from considering foreign lost profits even when those lost profits bear a sufficient relationship to domestic infringement improperly cabins this discretion, encourages market inefficiency, and threatens to deprive plaintiffs of deserved compensation in appropriate cases.”).

⁶² 138 S. Ct. 2129 (2018).

⁶³ 35 U.S.C. § 271(f)(2) (2018) (“Whoever without authority supplies or causes to be supplied in or from the United States any component of a patented invention that is especially made or especially adapted for use in the invention and not a staple article or commodity of commerce suitable for substantial noninfringing use, 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.”).

⁶⁴ 138 S. Ct. at 2138 (“The conduct in this case that is relevant to that focus clearly occurred in the United States, as it was ION’s domestic act of supplying the components that infringed WesternGeco’s patents. Thus, the lost-profits damages that were awarded to WesternGeco were a domestic application of § 284.”).

⁶⁵ *Id.* at 2137 (“[T]he conduct relevant to the statutory focus in this case is domestic. We begin with § 284. It provides a general damages remedy for the various types of patent infringement identified in the Patent Act. The portion of § 284 at issue here states that ‘the court shall award the claimant damages adequate to compensate for the infringement.’ We conclude that ‘the infringement’ is the focus of this statute.”).

§ 271(f)(2) on the domestic act of “supply[ing]” the component in or from the United States.⁶⁶ Thus, awarding damages for foreign lost profits to WesternGeco was considered a “domestic application” of § 284 under *RJR Nabisco*.⁶⁷ The Court did, however, suggest that the damages award might be limited by other principles such as proximate causation.⁶⁸

At least one district court has since concluded that that § 271(a), which applies to infringement activities entirely “within the United States,” permits recovery of damages suffered abroad under *WesternGeco*.⁶⁹ This is a generous reading of *WesternGeco*, which interpreted § 271(f)(2)—a statute that expressly targets conduct leading

⁶⁶ *Id.* at 2137–38 (“Section 271(f)(2) focuses on domestic conduct. It provides that a company ‘shall be liable as an infringer’ if it ‘supplies’ certain components of a patented invention ‘in or from the United States’ with the intent that they ‘will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States.’ The conduct that § 271(f)(2) regulates—i.e., its focus—is the domestic act of ‘suppl[y]ing in or from the United States.’”) (emphasis omitted).

⁶⁷ *Id.* at 2138 (“The conduct in this case that is relevant to that focus clearly occurred in the United States, as it was ION’s domestic act of supplying the components that infringed WesternGeco’s patents. Thus, the lost-profits damages that were awarded to WesternGeco were a domestic application of § 284.”).

⁶⁸ In a footnote, the seven-Justice majority explained that “[i]n reaching this holding, we do not address the extent to which other doctrines, such as proximate cause, could limit or preclude damages in particular cases.” *Id.* at 2139 n.3. This comment appears to have been at least partly in response to criticism made in dissent by Justice Gorsuch, who suggested that the majority’s decision would allow any single domestic act of infringement (i.e., exporting a material component for assembly of a device abroad) to open the floodgates to recover profits derived from all uses of that device worldwide. *Id.* at 2142 (Gorsuch, J., dissenting) (“Any suggestion that § 271(f)(2) provides protection against foreign uses . . . would threaten to ‘conver[t] a single act of supply from the United States into a springboard for liability.’ Here, for example, supplying a single infringing product from the United States would make ION responsible for any foreseeable harm its customers cause by using the product to compete against WesternGeco worldwide, even though WesternGeco’s U.S. patent doesn’t protect it from such competition. It’s some springboard, too. The harm flowing from foreign uses in this case appears to outstrip wildly the harm inflicted by ION’s domestic production: the jury awarded \$93.4 million in lost profits from uses in 10 foreign surveys but only \$12.5 million in royalties for 2,500 U.S.-made products.”) (internal citations omitted).

⁶⁹ *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, No. 04-1371-LPS, 2018 WL 4804685, at *1 (D. Del. Oct. 4, 2018) (“Fairchild has identified no persuasive reason to conclude that the interpretation of § 284 should differ here from what was available in *WesternGeco II* just because the type of infringing conduct alleged is different. . . . ‘Section 271(a) ‘vindicates domestic interests’ no less than Section 271(f).’”).

to extraterritorial infringement.⁷⁰ Given the far-reaching implications of its decision, that district court went the extra step of certifying the issue for immediate interlocutory appeal to the Federal Circuit.⁷¹ That appeal is currently pending.⁷²

B. *Digital-Physical Borders*

Much like globalization has thinned geographic borders, the internet, 3D printing, and 3D scanning are thinning technological borders between the digital and the physical. The difference between digital and physical is becoming decreasingly important as the translation from one form to the other gets faster, easier, and more reliable.⁷³ Goods can now be designed, copied, sold, and distributed—in that order—via purely digital streams of commerce.

⁷⁰ Tim Holbrook criticized the decision as being based on reasoning that was “relatively thin, with no robust consideration of the focus of § 271(a)” and its clear domestic focus. Timothy R. Holbrook, *Extraterritoriality and Proximate Cause After WesternGeco*, YALE J.L. & TECH. (forthcoming), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3259667 [https://perma.cc/8CD2-YEHR].

⁷¹ *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, No. 04-1371-LPS (D. Del. Oct. 4, 2018).

⁷² *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, No. 19-1246 (Fed. Cir. 2018).

⁷³ See Brean, *Patenting Physibles*, *supra* note 2, at 838 (“Today consumers, hobbyists, and technophiles can download a computer-aided design or CAD file (a digital representation of a physical product) and additively ‘print’ a three-dimensional product or component as simply as one can print words to a page.”); *id.* at 852 (“A CAD file is intended to be precise, detailed, and suitable for use in tooling and manufacturing—it is not an abstraction of an object but an accurate representation of it.”); Holbrook & Osborn, *supra* note 8, at 1362 (“CAD files are easily transferable and are one click away from producing a tangible object. A transfer of a CAD file is likely to take place immediately and makes future, tangible infringement all too easy.”); *id.* (“3D printing and other DMT are bridging the digital and physical worlds, rendering many of the distinctions between ‘tangible’ and ‘intangible’ anachronistic.”); Lucas S. Osborn, *Regulating Three-Dimensional Printing: The Converging Worlds of Bits and Atoms*, 51 SAN DIEGO L. REV. 553, 620 (2014) (“3D printing causes the worlds of bits and atoms to overlap further. As the technology proliferates and improves, CAD files for many products will become equivalent to their physical counterparts. Regulating these files will be the chief challenge for the legal system as it seeks to adapt to a world with 3D printing.”); Brean, *Asserting Patents*, *supra* note 2, at 773 (“While designs can certainly be created and manipulated in CAD programs from scratch, 3D scanning technology can also be used to make a CAD file that digitally captures and represents an existing object.”).

These technological advancements will increasingly apply similar pressures to expand the reach of the patent system as globalization did. The first major case in this progression was *ClearCorrect Operating, LLC v. ITC*, a case involving CAD files that could be 3D printed into tooth-correcting “aligners.”⁷⁴ The CAD files were designed for and modeled after a specific patient’s teeth, to be worn in lieu of traditional orthodontic braces.⁷⁵ The ITC concluded that such CAD files were infringing “articles” under § 337, such that the ITC had the authority to prevent the files’ electronic transmission into the United States, where the CAD files would then be 3D printed into the physical aligners.⁷⁶ The Federal Circuit reversed, holding that “it is clear that ‘articles’ means ‘material things,’ whether when looking to the literal text or when read in context ‘with a view to [the term’s] place in the overall statutory scheme.’”⁷⁷ Although conceding that the electronic transmissions possess some physical properties, the Federal Circuit concluded that “commonsense dictates that there is a fundamental difference between electronic transmissions and ‘material things.’”⁷⁸

While some have characterized *ClearCorrect* as the Federal Circuit rightfully reining in the ITC’s overreaching interpretation of its historically limited jurisdiction,⁷⁹ others would take the position that the

⁷⁴ 810 F.3d 1283, 1287 (Fed. Cir. 2015) (“The technology at issue in this case relates to the production of orthodontic appliances, also known as aligners. The aligners in question ‘are configured to be placed successively on the patient’s teeth and to incrementally reposition the teeth from an initial tooth arrangement, through a plurality of intermediate tooth arrangements, and to a final tooth arrangement.’ ClearCorrect is a producer of these aligners.”) (quoting another source).

⁷⁵ *Id.*

⁷⁶ *Id.* at 1286.

⁷⁷ *Id.* at 1287. For a detailed discussion of the ITC’s authority as it relates to digital trade, see Sapna Kumar, *Regulating Digital Trade*, 67 FLA. L. REV. 1909 (2015).

⁷⁸ *Clearcorrect*, 810 F.3d at 1287. Subsequent *en banc* petitions were unsuccessful, with a lone dissent from the denial of rehearing *en banc* by Judge Newman (who also dissented in the original panel decision). *ClearCorrect Operating, LLC v. Int’l Trade Comm’n*, 819 F.3d 1334 (Fed. Cir. 2016).

⁷⁹ See, e.g., Kumar, *supra* note 77, at 1958–59 (“The ITC’s jurisdiction does not appear to extend to digital information. The defining characteristic of property subject to in rem jurisdiction is that one person or entity can control it. A court or agency can seize control over tangible property, such as land, and even some intangible property, such as domain names. But nobody can seize pure information. This limitation of the ITC’s jurisdiction makes sense, given that Customs can only seize physical goods at the border under the Tariff Act. Because the

digital imports can and should be policed by the ITC to better protect patent rights (amending Section 337, if necessary).⁸⁰ What seems less divisive is that the general gap in patent protection in the 3D-printing space, as reflected in *ClearCorrect*, is largely a consequence of the fact that U.S. patent law has developed for centuries under the assumption that physical goods would be made, used, offered for sale, sold, and imported in physical form.⁸¹ That assumption has been entirely reasonable until recently, but now if certain digital activities that look and feel like infringement are not actionable, it may create the same kinds of gaps in protection that justified the law's expansion in the national territoriality context.

But, as Professor Mark Lemley cautions, the response to such gaps should not be a knee-jerk effort to fill the gaps with IP protection wholesale.⁸² Over-protecting IP relative to new technological platforms (e.g., the internet) can cause a net reduction in creativity and innovation⁸³ and can lead to undesirable targeting of ignorant intermediaries.⁸⁴ Others considering how to handle patent rights in the

ITC's in personam jurisdiction is secondary, it is not clear that the ITC has jurisdiction to investigate cases involving digital trade.”).

⁸⁰ See, e.g., Ebrahim, *supra* note 6, at 73–74 (explaining that the dispute in *ClearCorrect* “demonstrates the rapid progress of 3D printers and serves as a preview of potential patent infringement by individuals who will generate CAD files for use in printing physical products on their 3D printers.”); *id.* (discussing the Online Protection and Enforcement of Digital Trade Act, which would have amended Section 337 to explicitly allow the ITC to block digital imports, and arguing that such an amendment would allow the ITC to better police “the blur in digital and physical” and provide more balance between policies that support patent rights and those that support imports).

⁸¹ Brean, *Patenting Physibles*, *supra* note 2, at 838 (“Centuries of traditional manufacturing processes and commercial infrastructure have shaped patent law under the assumption that physical goods are traded in physical form.”); Ebrahim, *supra* note 6, at 66 (“Patent law in its current form is geared towards physical objects and is not prepared for the shift being created by 3D printing.”); see generally *ClearCorrect*, 810 F.3d at 1289–1302.

⁸² Mark A. Lemley, *IP in a World Without Scarcity*, 90 N.Y.U. L. REV. 460, 462–65 (2015).

⁸³ *Id.* at 463 (“The Internet may have spawned unprecedented piracy, but it has also given rise to the creation of more works of all types than ever before in history, often by several orders of magnitude.”); *id.* at 464 (“If people are intrinsically motivated to create (as they seem to be), then the easier it is to create and distribute content, the more content is likely to be available even in the absence of IP.”).

⁸⁴ *Id.* at 462 (IP owners “might have more success targeting the intermediaries rather than the individuals consuming content, but because those intermediaries distribute content without

wake of 3D printing have likewise been sensitive to the double-edged nature of such gap filling.⁸⁵

With the technological reality and these caveats in mind, the following Part explores whether and when various acts within cyberterritories should infringe patents. To do so, the law and policy of applying patent law extraterritorially is applied to actions in cyberterritories as if they are not “within the United States.”

II. PATENT INFRINGEMENT IN CYBERTERRITORIES

Imagine a CAD file for a patented hand tool is being sold by the patentee’s competitor, and that the purchasers of the file can 3D print the tool at home. Although the patented “invention” is claimed as the actual physical tool (e.g., “A wrench comprising . . .”), not the file,⁸⁶ and the purchasers are the ones “making” the tool,⁸⁷ the transaction looks and feels, in substance, much like a sale of the tangible invention. Allowing the seller of the file to categorically avoid infringement liability seems unfair.⁸⁸

regard to what it is, IP law can block piracy there only at the cost of killing off what is good about the Internet.”).

⁸⁵ See, e.g., Brean, *Patenting Physibles*, *supra* note 2, at 860–63 (advocating for a safe harbor for incidental infringers); Holbrook & Osborn, *supra* note 8, at 1383–84 (advocating for limits on patent rights against digital activities that are desirable, such as design around innovation).

⁸⁶ The textual, sentence-form claims define the scope of the patented invention. See 35 U.S.C. § 112(b) (2018) (“The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.”). Claiming inventions in physical form is typical given the only recent advent of consumer-level 3D printing, and such claiming causes most of the above-discussed gaps in direct infringement. See generally Brean, *Asserting Patents*, *supra* note 2. Doctrinally, at least some 3D-printable objects may be eligible for patenting when claimed as digital files, but a test case has yet to challenge the limits of the doctrine. Brean, *Patenting Physibles*, *supra* note 2, at 848–54.

⁸⁷ Brean, *Asserting Patents*, *supra* note 2, at 804 (summarizing that the “state of the law leaves patentees virtually helpless to combat a large class of infringement of their product claims.”); *id.* (observing that some potential liability for *indirect* infringement—namely, active inducement under § 271(b)—might exist, but that the burden of proof for such claims is quite high).

⁸⁸ As noted above, ideas for closing such gaps have been proposed, i.e., allowing the CAD files per se to be patented or generously interpreting what a “sale” or “offer for sale” of the “invention” is. See Brean, *Patenting Physibles*, *supra* note 2 (demonstrating how a CAD file

Under current law, the difference between infringement and noninfringement is essentially the difference between a digital act and an act involving a three-dimensional physical embodiment of the patented product.⁸⁹ The digital acts *relate* to the invention but do not occur in three-dimensional space that the actual claimed invention would occupy. Thus, such digital acts are also, in a sense, not “within the United States” as that term has been understood.⁹⁰

This Part explores whether such acts in cyberterritories would or should result in infringement liability by treating the cyberterritories as extraterritorial locations. For each potential infringing act, the relevant doctrinal and statutory patent law discussed above is applied.

Additional extraterritoriality theory or doctrine is also considered, as appropriate. For example, some have advocated for “effects-based” approaches, such that extraterritorial conduct significantly affecting the market for patented invention in the United States would justify infringement liability.⁹¹ As Professor Holbrook explained,

Suggestions along these lines in patent law have generally taken two forms. One is an economically based effects test: if the foreign activity affects the domestic market in some way, then U.S. law should apply. A second approach is more technologically based: if

directed to a printable object could satisfy § 101 and the “printed matter” doctrine, while still avoiding the *Alice* “abstract idea” exception, because the file is a sufficiently specific and concrete form of data that is only readable by computers or 3D printers); *id.* at 843–46 (discussing the analogous history of *Beauregard* claims, which originated as a test case filed by IBM because software was distributed on disks but patented as method claims, causing a gap in enforceability such that those trading in disks were not direct infringers); Holbrook & Osborn, *supra* note 8, at 1383–84 (suggesting that suggest that a “sale” or “offer[] to sell” a CAD file should be actionable because, unlike a mere “use” or “making,” such acts appropriate the “economic value” of the patented invention). These approaches have essentially expanded or extended existing law to create new analytical frameworks. Brean, *Patenting Physibles*, *supra* note 2, at 863–64; Holbrook & Osborn, *supra* note 8, at 1359–62.

⁸⁹ See generally Brean, *Asserting Patents*, *supra* note 2. Even for purposes of an offer for sale, the offer still must be to sell the physical embodiment of the patented product. *Id.* at 792–93.

⁹⁰ See *supra* Part I.

⁹¹ Holbrook, *supra* note 14, at 2154 (“Commentators . . . have offered a number of generalized approaches to determining the extraterritorial reach of a U.S. patent, offering some version of an ‘effects-based’ test. Under these approaches, there will be liability for infringement of the U.S. patent if there is some sort of ‘effect’ on the market for the patented good within the United States. This approach is similar to that used in trademark, antitrust, and securities law.”).

there is some aspect of the device or technology that is in the United States, without a focus on the economic impact, then U.S. law should apply.⁹²

Given the increasingly global economy, an economic effects test could give very broad extraterritorial scope to U.S. patent law.⁹³ The *NTP* case, discussed above, is an example of a technology-based effects test.⁹⁴ The challenge in applying such effects tests is in the triggering. For example: (1) should U.S. law apply when a certain non-trivial threshold of economic effect or technology is present and, if so, where should the threshold be set?; and (2) should U.S. law apply only when, on the balance, there is more economic interest or technical activity in the United States than the foreign territory and, if so, how can that balancing be reliably or predictably conducted?⁹⁵ The following subparts attempt to apply such effects tests via triggers that reflect sound patent policy. Further limiting principles based on normative evidence are discussed in Part III.

A. “Making” the Invention

The creation or copying of a CAD file would easily constitute a “making” in the cyberterritory. The Supreme Court has stated that “[t]he right to make can scarcely be made plainer by definition, and embraces the construction of the thing invented.”⁹⁶ Within the cyberterritory, the CAD file would constitute “the operable assembly of the whole,” not merely part of the invention.⁹⁷ Thus, the creation or

⁹² *Id.* at 2155.

⁹³ *Id.* (“In a global marketplace, relying only upon the economic impact of the foreign activities would provide considerable extraterritorial reach to U.S. patent law. Many U.S. patent holders operate on a transnational level, so seemingly any activity abroad could have implications for the U.S. market.”).

⁹⁴ *Id.*

⁹⁵ *Id.* at 2157–60.

⁹⁶ *Bauer & Cie v. O’Donnell*, 229 U.S. 1, 10 (1913). *Cf.* *FastShip, LLC v. United States*, 892 F.3d 1298, 1304 (Fed. Cir. 2018) (holding that under 28 U.S.C. § 1498, which renders the government liable for certain acts of infringement, “manufacture[.]” of a patented invention requires that “‘each limitation’ ‘of the thing invented’ be present, rendering the invention suitable for use . . .”).

⁹⁷ *Deepsouth Packing Co. v. Laitram Corp.*, 406 U.S. 518, 528 (1972).

copying of a CAD file in a cyberterritory is not “within the United States” pursuant to § 271(a). Whether that making could somehow be actionable would require that “all or a substantial portion of the components” of the CAD file, or at least one component that is “especially made or adapted for” the invention, were supplied from the United States, per § 271(f).

The problem with such a theory (aside from the general difficulty meeting the heightened scienter requirements of § 271(f))⁹⁸ is that the “components” of the CAD file are all digital information, not physical objects. However, that digital data might have originated and from wherever it might have been “supplied” (e.g., drawn into the file by the designer, copied from another CAD file, 3D-scanned from the physical object, etc.), the Supreme Court’s decision in *Microsoft* would preclude an argument that the digital information in the cyberterritory is a “component” under § 271(f). There, the Supreme Court held that unless and until software is expressed on a computer readable medium, it is not a “component” amenable to “combination.”⁹⁹ This was because the Court viewed software in the abstract as mere information and instructions that “might be compared to blueprint (or anything containing design information, e.g., a schematic, template, or prototype),” but which is not itself combinable into a device.¹⁰⁰ Looking

⁹⁸ Liability under 35 U.S.C. § 271(f)(1) requires that the accused infringer supplied such components “in such a manner as to actively induce the combination.” Active inducement has been interpreted to require at least the mindset of willful blindness. See *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 768 (2011) (“Given the long history of willful blindness and its wide acceptance in the Federal Judiciary, we can see no reason why the doctrine should not apply in civil lawsuits for induced patent infringement under 35 U.S.C. § 271(b).”). Liability under 35 U.S.C. § 271(f)(2) requires that the accused infringer supplied the component “knowing that such component is [especially] . . . made or adapted and intending that such component will be combined outside of the United States”

⁹⁹ *Microsoft Corp. v. AT&T Corp.*, 550 U.S. 437, 449 (2007) (“[A]ny software detached from an activating medium—remains uncombinable. It cannot be inserted into a CD-ROM drive or downloaded from the Internet; it cannot be installed or executed on a computer. Abstract software code is an idea without physical embodiment, and as such, it does not match § 271(f)’s categorization: ‘components’ amenable to ‘combination.’”).

¹⁰⁰ *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.”). For this proposition, the Supreme Court cited with approval *Pellegrini v. Analog Devices, Inc.*, 375 F.3d 1113, 1117–19 (Fed. Cir. 2004), which held that

at the statutory text, the Court noted that “Congress, of course, might have included within § 271(f)’s compass, for example, not only combinable ‘components’ of a patented invention, but also ‘information, instructions, or tools from which those components readily may be generated.’ It did not.”¹⁰¹ In the context of this Article, nothing physical is even capable of being supplied into the cyberterritory—only blueprint-like data about a product can be supplied into the cyberterritory and that activity is beyond the reach of § 271(f). At least one district court has adopted this view of CAD files not being “components” under § 271(f) or *Microsoft*.¹⁰²

Under an economic effects-based approach, the mere creation or copying of a CAD file is not likely to have a significant effect on the market for the patented invention in the United States. The file in no way enters the stream of commerce. Essentially, “making” in a cyberterritory amounts to no more than possession of the digitally-stored CAD file, and mere possession of patented item is not generally actionable absent at least some proof of “threatened or contemplated” use or sale.¹⁰³

This result also reflects sound policy. If a mere digital “making” were actionable, it would give rise to widespread intermediary liability such that any digital copies stored in a network or on a server as part of a file-sharing network, email transmission, email account, or cloud storage would be an independent “making.” This could ensnare many unknowing incidental infringers because § 271(a) neither excuses de

“transmission abroad of instructions for [the] production of patented computer chips” was not an infringement under § 271(f). *Id.* at 450.

¹⁰¹ *Microsoft*, 550 U.S. at 451–52.

¹⁰² See *Ormco Corp. v. Align Tech, Inc.*, 609 F. Supp. 2d 1057, 1071–72 (C.D. Cal. 2009) (“A data file like the ADF file does not merely instruct Align’s Costa Rican subsidiary how to act in a manner that infringes on its patented claims. Rather, it is information that is incorporated into other steps of the patented claims, without which the patented claim cannot fully be completed. It is the sole source of information about a patient’s teeth, not a generalized set of steps. Unlike a blueprint or ‘template,’ it is more like an ‘ingredient’ in a recipe than the recipe card itself. Under the plain meaning definition of the term ‘component’ adopted by the Court in *Microsoft*, the Court finds that the ADF file is a component of the patented claims at issue.”).

¹⁰³ 5 Donald S. Chisum, *Chisum on Patents* § 16.02[4][b] (2018) [hereinafter *Chisum on Patents*] (citing examples of stockpiling inventory, where possession of infringing guns in the United States “kept ready for use in case of war” constituted an infringing use, whereas goods being imported and stored in the United States prior to exportation to be sold abroad was not a use in the United States).

minimis infringement nor includes any scienter requirement.¹⁰⁴ Particularly if such CAD-file “makings” are only temporarily stored in such cyberterritories, there should be no liability. Under the judicially-created “temporary presence” doctrine,¹⁰⁵ there is no patent liability arising from merely occasional, temporary entry into the United States on ships or planes en route to other countries.¹⁰⁶ The doctrine applies by analogy here because, as Professor Dan Burk explained, it “represents judicial recognition that the balance struck in the quid pro quo patent

¹⁰⁴ See *Embrex, Inc. v. Serv. Eng'g Corp.*, 216 F.3d 1343, 1353 (Fed. Cir. 2000) (Rader, J., concurring) (“[T]he statute leaves no leeway to excuse infringement because the infringer only infringed a little. Rather, the statute accommodates concerns about *de minimis* infringement in damages calculations.”); Breaun, *Patenting Physibles*, *supra* note 2, at 859–63 (suggesting that this risk of intermediaries being targeted for infringement is mitigated by the likely *de minimis* damages of such infringement, but acknowledging that injunctive relief may be the most valuable to patentees as to some intermediaries, such as peer-to-peer networks). As the consumer 3D-printing field evolves and becomes more patent savvy, it may become more difficult to justify exempting such incidental “infringement” on policy grounds. See Ebrahim, *supra* note 6, at 59 (arguing in the context of indirect infringement liability, which does include scienter requirements, that “[i]t is not true that all or even the majority of actors that enable sharing of CAD files would not have knowledge of the patent that covers the eventually printed object. As CAD files for 3D printing become more accessible via online sharing networks, actors that create CAD files and promote CAD file creation will likely become more sophisticated. . . . Such companies would employ in-house patent counsel or hire sophisticated patent law firms as a risk mitigation strategy. Their legal counsels’ responsibilities would include monitoring patent related activities and sending notice letters. Such counsel would be tasked with forming opinions of the patent landscape and conducting freedom-to-operate clearances.”).

¹⁰⁵ The doctrine is now essentially codified. See 35 U.S.C. § 272 (2018) (“The use of any invention in any vessel, aircraft or vehicle of any country which affords similar privileges to vessels, aircraft or vehicles of the United States, entering the United States temporarily or accidentally, shall not constitute infringement of any patent, if the invention is used exclusively for the needs of the vessel, aircraft or vehicle and is not offered for sale or sold in or used for the manufacture of anything to be sold in or exported from the United States.”).

¹⁰⁶ See *Brown v. Duchesne*, 60 U.S. 183, 198–99 (1856) (“[T]he rights of property and exclusive use granted to a patentee does not extend to a foreign vessel lawfully entering one of our ports; and that the use of such improvement, in the construction, fitting out, or equipment of such vessel, while she is coming into or going out of a port of the United States, is not an infringement of the rights of an American patentee, provided it was placed upon her in a foreign port, and authorized by the laws of the country to which she belongs.”). For a helpful discussion of the history and boundaries of the temporary presence doctrine, see Ted L. Field, *The “Planes, Trains, and Automobiles” Defense to Patent Infringement for Today’s Global Economy: Section 272 of the Patent Act*, 12 B.U. J. SCI. & TECH. L. 26, 92 (2006) (concluding that “[a]lthough it may not be well-known, the temporary-presence provision of 35 U.S.C. § 272 offers a potentially powerful defense under proper circumstances.”).

bargain may be upset by international policy considerations, particularly when the harm to the patent holder is slight.”¹⁰⁷

At least two district courts, however, have treated the creation of certain digital content as sufficiently concrete to warrant its importation a potential infringement under § 271(g). First, in *CNET Networks, Inc. v. Etilize, Inc.*, the claimed invention was a process for making an electronic catalog.¹⁰⁸ The electronic catalog was viewed as physical and tangible, in part, because the digital catalog was represented in magnetic fields or etchings on the computer-readable media that stored the catalog.¹⁰⁹ Unlike the “abstract information” about a drug at issue in *Bayer*, the catalog was considered “a physical article no different from a product catalog manufactured and assembled on paper bound with stitching, glue or staples.”¹¹⁰ Second, in *Ormco Corp. v. Align Tech., Inc.*,¹¹¹ the court extended the reasoning *CNET* in the context of a patented method for constructing CAD models of orthodontic

¹⁰⁷ Burk, *supra* note 35, at 66 (explaining that in *Brown v. Duchesne*, “the Court carved out a public policy exception to the patent grant, finding that the prejudice to foreign relations that would result from enforcing the letter of the patent laws outweighed the slight damage that the patent holder would suffer from occasional and temporary entry into the United States of an infringing product.”).

¹⁰⁸ *CNET Networks, Inc. v. Etilize, Inc.*, 528 F. Supp. 2d 985, 993–94 (N.D. Cal. 2007).

¹⁰⁹ *Compare id.* at 994 (noting that “an electronic catalog, like computer software, is not simply an intangible collection of information, but can also be thought of as having a physical, tangible embodiment once it is expressed and stored on computer readable media in the form of magnetic fields on a hard drive or etchings on a CD-ROM. The catalog in this case, therefore, is distinguishable from the abstract information at issue in *Bayer*.”), *with* *Bayer AG v. Housey Pharms., Inc.* 340 F.3d 1367, 1376 (Fed. Cir. 2003) (“The importation of information in the abstract (here, the knowledge that a substance possesses a particular quality) cannot be easily controlled. As Bayer points out, a person possessing the allegedly infringing information could, under Housey’s interpretation, possibly infringe by merely entering the country.”).

¹¹⁰ *CNET*, 528 F. Supp. 2d at 994 (“The court holds that the catalog is a ‘product’ within the meaning of section 271(g) which is ‘made by’ CNET’s patented processes and is ‘imported’ and ‘used’ in the United States by Etilize and Etilize’s customers.”); *id.* (“The catalog in this case, therefore, is distinguishable from the abstract information at issue in *Bayer*. The claims in this case are directed toward *creation* of a product catalog *stored on computer readable media*, not the identification of whether a particular substance inhibits or does not inhibit a particular protein.”); *id.* at 988 (summarizing the category of method claims as methods “for creating a product catalog stored on computer readable media . . .”).

¹¹¹ *Ormco Corp. v. Align Tech., Inc.*, 609 F. Supp. 2d 1057 (C.D. Cal. 2009).

retainers.¹¹² The court held that “[l]ike the catalog in *CNET Networks*, the 3D digital model is not a mere package of information, but a ‘creation’ produced by ‘practicing each step’ of a patented process.”¹¹³

While these two decisions afforded meaningful protection against the unauthorized making (and importing) of those digital products at issue, they are distinguishable from the more likely or typical assertions of CAD-file making. In *CNET*, the patented method was expressly claimed as making a catalog “stored on computer readable media,”¹¹⁴ and in *Ormco*, the patented method was expressly claimed as one for producing “digital representations from the generated [tooth] data”¹¹⁵ But the vast majority of 3D-printable patented products are claimed as physical objects, while the CAD files are mere digital representations thereof—the claims are not directed to the digital versions.¹¹⁶ Further, the patentability of most 3D-printable inventions will be in the underlying invention, not the process of making the digital model, as in *Ormco*.¹¹⁷ Thus, these decisions do not support § 271(g) protection for CAD files in general—only for those that are created by independently patentable processes performed abroad.¹¹⁸

¹¹² *Id.* at 1075–76 (explaining that the patentee had sued “for the importation of the post-Treat 3D digital model sent from Costa Rica back to Align’s Santa Clara headquarters”).

¹¹³ *Id.* at 1076. It was immaterial that the digital model itself was not the final product intended to be bought and sold. *Id.* at 1076–77 (“Align attempts to distinguish *CNET Networks* by noting that, unlike the catalog there, the 3D digital model is not itself bought and sold as a final product. This argument appears to be irrelevant to the § 271(g) analysis, because the statute does not require a ‘product’ to be sold at all, as it explicitly provides for liability if the product at issue is sold or imported or used. Further, under Align’s proposed construction, any patented process that produced a product only used as a component in another product could never give rise to a § 271(g) claim.”).

¹¹⁴ *CNET*, 528 F. Supp. 2d at 988.

¹¹⁵ *Ormco*, 609 F. Supp. 2d at 1064–66.

¹¹⁶ *But see* Brean, *Patenting Physibles*, *supra* note 2, at 863 (advocating for 3D-printable CAD files to be patent-eligible).

¹¹⁷ *See* Brean, *Asserting Patents*, *supra* note 2, at 787 (“[I]nventors of products that are merely capable of being 3D-printed are unlikely to be in the business of 3D printing technology per se, and so are unlikely to have developed their own 3D printing systems or methods where the 3D printing technology and infrastructure already exists.”).

¹¹⁸ Oddly, the logic of *CNET* and *Ormco* seemingly provides protection for the “creation” of a CAD file abroad that would not constitute a “making” in the United States, if done domestically, per my analysis above. But this can be reconciled by recognizing that the scope of § 271(g) applies only where there has been a performance of an independently patentable process to make the file, not to the mere creation or importation of the file itself. 35 U.S.C.

B. “Using” the Invention

Almost any digital exploitation, testing, or programming application of a device in a CAD file would likely meet the definition of infringing “use” within a cyberterritory. The concept of “use” as an act of infringement has been construed broadly, such that even use for mere personal convenience is infringing.¹¹⁹ The Supreme Court has stated that “the right to use is a comprehensive term and embraces within its meaning the right to put into service any given invention.”¹²⁰ The Federal Circuit in *NTP* more recently confirmed that “[t]he ordinary meaning of ‘use’ is to ‘put into action or service.’”¹²¹

Although one can be said to “use” a patented invention in a variety of ways,¹²² “the word ‘use’ in section 271(a) has never been taken to its utmost possible scope,”¹²³ as there are limitations on what kinds of use can be deemed infringements.¹²⁴ While a person does not avoid liability by using the patented product for a purpose not specifically contemplated by the patentee, the use of the product “must incorporate in some fashion the principles of the claimed invention.”¹²⁵ Exploiting, testing, making minor modifications,¹²⁶ or otherwise operating a CAD

§ 271(g) (2018). The performance of the same patented process in the United States would constitute an infringing “use” of the process under § 271(a). 35 U.S.C. § 271(a).

¹¹⁹ *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1316 (Fed. Cir. 2005) (“In terms of the infringing act of ‘use,’ courts have interpreted the term ‘use’ broadly.”); 5 *Chisum on Patents*, *supra* note 103, § 16.03[1] (“Mere use of a patented product or process, even for purposes of personal convenience, ordinarily constitutes infringement.”).

¹²⁰ *Bauer & Cie v. O’Donnell*, 229 U.S. 1, 10–11 (1913).

¹²¹ *NTP*, 418 F.3d at 1317 (citing WEBSTER’S THIRD NEW INTERNATIONAL DICTIONARY 2523 (1993)).

¹²² *Medical Sols., Inc. v. C Change Surgical LLC*, 541 F.3d 1136, 1141 (Fed. Cir. 2008); *see also Hughes Aircraft Co. v. United States*, 29 Fed. Cl. 197, 226 (Ct. Cl. 1993) (“[T]he question of what constitutes ‘use’ is a mixed question of fact and law to be determined on a case-by-case basis. A device may be ‘used’ in many different ways, and all uses that rely on the teachings of a patent constitute infringement.”).

¹²³ *Roche Prods., Inc. v. Bolar Pharm. Co.*, 733 F.2d 858, 861 (Fed. Cir. 1984).

¹²⁴ *See id.*

¹²⁵ 5 *Chisum on Patents*, *supra* note 103, § 16.02[4][c] (contrasting the use of a clothing fastener as a fastener on a pocketbook—which was deemed an infringement—with the use of a wall safe as a ship anchor—which presumably would not be an infringement).

¹²⁶ I.e., modifications that do not alone place the digital object outside the scope of the patent claims.

file in a computer program all relate to the functional purpose of the article and would seem to fall within this broad scope of use.

From an economic effects standpoint, these digital uses would not appear to have a strong effect on the market for the patented invention in the United States, however. Such uses are not propagating or distributing the files to others. Nor are they interfering with any other uses that might be made of the patented invention. As with a mere making of the CAD file, such uses would seem to be a “no harm, no foul” situation.

Under an *NTP* analysis, the situs of such use can be conceptualized to occur in either the United States, the cyberterritory, or both.¹²⁷ The actual file being affected is and remains in the cyberterritory such that any “beneficial use” seemingly occurs there, if at all.¹²⁸ On the other hand, the digital use of the file is facilitated by a human controlling the computer from outside the cyberterritory, and the Federal Circuit post-*NTP* has suggested that such a person’s ability to control a computer system makes that person’s location a proper situs of the use of the system.¹²⁹ Still, the benefit of that control, even if occurring from the physical side, never manifests physically. Ultimately, *NTP* says that both the control *and* benefit are required at the situs of a “use,” and the lack of a physical benefit from the digital use suggests that the use would be largely confined to the cyberterritory and not infringing.¹³⁰ This appears to be consistent with the *RJR Nabisco* “focus” test as well, considering

¹²⁷ *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1317–18 (Fed. Cir. 2005).

¹²⁸ *Id.*

¹²⁹ See *Centillion Data Sys., LLC v. Qwest Commc’ns Int’l*, 631 F.3d 1279, 1284 (Fed. Cir. 2011) (“The ‘control’ contemplated in *NTP* is the ability to place the system as a whole into service. In other words, the customer in *NTP* remotely ‘controlled’ the system by simply transmitting a message. That customer clearly did not have possession of each of the relays in the system, nor did it exert the level of direct, physical ‘control’ that the district court requires.”) (internal citations omitted).

¹³⁰ See *NTP*, 418 F.3d at 1317 (“The use of a claimed system under section 271(a) is the place at which the system as a whole is put into service, *i.e.*, the place where control of the system is exercised *and* beneficial use of the system obtained.”); accord *Centillion*, 631 F.3d at 1285 (“By causing the system as a whole to perform this processing *and* obtaining the benefit of the result, the customer has ‘used’ the system under § 271(a).”); *id.* at 1285 (holding that a customer’s use of a back-end server, by requesting certain billing reports from the server, “is ‘use’ because, but for the customer’s actions, the entire system would never have been put into service. This is sufficient control over the system under *NTP*, and the customer clearly benefits from this function.”) (emphasis added).

that essentially none of the conduct that might result in an economic appropriation of the invention is caused by the physical activities incidental to the “use” in the cyberterritory.¹³¹ “Use” in a cyberterritory is essentially the converse of *NTP*, where most of the system was in the United States and interfered with the patent owner’s exclusive rights, with only the one relay portion of the system located abroad.¹³²

This result has beneficial consequences, the main one being that it permits “design-around” innovation where a CAD file might be used as a means to create technologically similar, but non-infringing, products.¹³³ As the Federal Circuit has observed, such conduct can result in “possibly better or cheaper functional equivalents,” and is among the many “fair fights” of competition that benefits consumers.¹³⁴

In the analogous copyrighted software context, courts have found that using (and even repeatedly copying) another’s computer program as a necessary means to create a functionally-equivalent program is a fair use, though the end product itself might be infringing even if none of the copied code appears in the end product.¹³⁵ Immunizing liability for such “intermediate copying” is necessary to obtain the pro-competitive benefits that flow from allowing one to understand another’s product and attempt to design around it.¹³⁶

¹³¹ See Holbrook, *supra* note 18, at 1780 (“The ‘focus’ of § 271(a) is on acts of using, making, or selling the invention within the United States. In *NTP*, the court effectively determined that the ‘use’ of the patented system fell within the United States, notwithstanding that part of the system was in Canada. As such, the facts in *NTP* would satisfy step two of *RJR*.”).

¹³² *Id.*

¹³³ See, e.g., *State Indus., Inc. v. A.O. Smith Corp.*, 751 F.2d 1226, 1236 (Fed. Cir. 1985) (“One of the benefits of a patent system is its so-called ‘negative incentive’ to ‘design around’ a competitor’s products, even when they are patented, thus bringing a steady flow of innovations to the marketplace.”); Holbrook & Osborn, *supra* note 8, at 1383–84 (“If we view creation of the CAD file as a form of ‘making’ the claimed invention, then even these digital efforts to design around would technically be a form of infringement. These concerns about downstream users counsel against extending the definition of ‘making’ to these activities.”).

¹³⁴ *State Indus., Inc.*, 751 F.2d at 1235–36.

¹³⁵ See, e.g., *Sony Comput. Entm’t, Inc. v. Connectix Corp.*, 203 F.3d 596 (9th Cir. 2000); *Sega Enters. v. Accolade, Inc.*, 977 F.2d 1510 (9th Cir. 1992).

¹³⁶ See *Sony*, 203 F.3d at 602–03; see also Pamela Samuelson, *Freedom to Tinker*, 17 THEORETICAL INQUIRIES IN LAW 563 (2016) (arguing that tinkering can be transformative, allow one to learn how a device works, permit repair or technical cooperability, and lead to follow-on and design-around innovation, noting that “[t]he maker movement and DIY communities indicate that the next generation of users will likely be more engaged than ever in

To be clear, copyrighted software does not protect the functional ideas or concepts embodied in the programs, only the particular expression of those ideas and concepts in the code.¹³⁷ Extending copyright protection to functional aspects of the code would tie up the use of such functions and undermine, not further, copyright goals of encouraging more and better software development.¹³⁸ Patent law, on the other hand, purports to protect inventions at the functional conceptual level, but only recognizes harm at the physical level.¹³⁹ But, like the copyrighted software setting, to expand patent protection into cyberterritories for mere “use” risks undermining technological progress by effectively prohibiting desirable design-around activities—especially because computer tools like 3D scanners and CAD programs are increasingly replacing more traditional engineering and design tools. Using such “artificial hurdle[s]” to push creators away from the most efficient tools available for creation tends only to hinder progress.¹⁴⁰

tinkering-type activities, particularly in the digital environment.”); Pamela Samuelson & Suzanne Scotchmer, *The Law and Economics of Reverse Engineering*, 111 YALE L.J. 1575, 1662 (2002) (“Reverse engineering is fundamentally directed to discovery and learning. Engineers learn the state of the art not just by reading printed publications, going to technical conferences, and working on projects for their firms, but also by reverse engineering the products of others. Learning what has been done before often leads to new products and advances in know-how.”).

¹³⁷ 17 U.S.C. § 102(b) (2018) (“In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.”).

¹³⁸ See *Sega Enters.*, 977 F.2d at 1527 (“[T]he fact that computer programs are distributed for public use in object code form often precludes public access to the ideas and functional concepts contained in those programs, and thus confers on the copyright owner a de facto monopoly over those ideas and functional concepts. That result defeats the fundamental purpose of the Copyright Act—to encourage the production of original works by protecting the expressive elements of those works while leaving the ideas, facts, and functional concepts in the public domain for others to build on.”).

¹³⁹ See 35 U.S.C. § 101 (2018) (“Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.”); 35 U.S.C. § 271(a) (“Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.”).

¹⁴⁰ See *Sony*, 203 F.3d at 605 (“[T]he rule urged by Sony [i.e., considering whether each copy of the program made is truly ‘necessary’ to reverse engineer the software functions] would

C. “Selling” or “Offering to Sell” the Invention

Perhaps the most doctrinally straightforward actions involving CAD files would be the sale or offer for sale thereof. A sale is essentially the transfer of property for a price, or an agreement to that effect.¹⁴¹ An offer for sale is any commercial offer, as evaluated under traditional contract principles, to those same ends.¹⁴² Because an offer need not be accepted to give rise to liability, the amount of damages might differ for a sale versus a mere offer.¹⁴³

In one sense, the sale and offer to sell a CAD file both occur exclusively in cyberterritories because the end result is that the digital data is transmitted from one cyberterritory to another cyberterritory to make a copy the file in the latter. On the other hand, the contracting-related actions surrounding the offer or sale, as well as the people involved in facilitating the transaction, are all outside the cyberterritory.¹⁴⁴ Plus, if the purpose of the sale is for the purchaser to print the product, the sale looks even more substantively like a sale of a physical object.¹⁴⁵ From an effects standpoint, the economic harm to the

require that a software engineer, faced with two engineering solutions that each require intermediate copying of protected and unprotected material, often follow the *least efficient solution*. (In cases in which the solution that required the fewest number of intermediate copies was also the most efficient, an engineer would pursue it, presumably, without our urging.) This is precisely the kind of ‘wasted effort that the proscription against the copyright of ideas and facts . . . [is] designed to prevent.’”) (citing *Feist Publ’ns, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 354 (1991)).

¹⁴¹ *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1319 (Fed. Cir. 2005) (“The definition of sale is: 1. The transfer of property or title for a price. 2. The agreement by which such a transfer takes place. The four elements are (1) parties competent to contract, (2) mutual assent, (3) a thing capable of being transferred, and (4) a price in money paid or promised.”) (quoting another source).

¹⁴² *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling U.S., Inc.*, 617 F.3d 1296, 1308 (2010).

¹⁴³ *Id.* (citing Timothy R. Holbrook, *Liability for the “Threat of Sale”: Assessing Patent Infringement for Offering to Sell an Invention and Implications for the On-Sale Patentability Bar and Other Forms of Infringement*, 43 SANTA CLARA L. REV. 751, 791–92 (2003) (noting that for mere offers, price erosion is a better proxy for infringement damages than lost profits or compensatory damages flowing from actual sales)).

¹⁴⁴ *See Litecubes, LLC v. N. Light Prods., Inc.*, 523 F.3d 1353, 1369 (Fed. Cir. 2008) (adopting a flexible standard for where a “sale” occurs).

¹⁴⁵ Holbrook & Osborn, *supra* note 8, at 1356 (“Given that the line between the intangible CAD file and the tangible item now is so thin, one could easily argue that the sale of the file

patent owner is far easier to identify resulting from sales and offers to sell than from mere makings and uses.¹⁴⁶ The commercial nature of such sales activities also overshadows the potential for pro-competitive design-around innovation and the risk of unintentional intermediary liability. And the sale or offer can easily be seen as relating to the patent owner's economic interests in the physical United States pursuant to an *RJR Nabisco* "focus" analysis.¹⁴⁷ For all these reasons, sales and offers to sell a CAD file would properly be viewed as occurring outside, or at least partially outside and actionable against conduct within, the cyberterritory.

III. THE POTENTIAL ROLE OF DESIGN AND CAD NORMS

A vital guidepost and limiting principle of applying law extraterritorially, and effects tests in particular, would be to consider the laws and policies of foreign territories—something that essentially none of the effects-based approaches do.¹⁴⁸ By considering any conflicts of laws, it might be revealed that the foreign law would either treat the act

should be effectively an infringing sale of the item itself. The interest in the purchaser is not the CAD file itself, but instead in the item to be produced by the CAD file. We think such sales and offers to sell are attempts to appropriate the economic value of the item, harming the patent owner pecuniarily.”).

¹⁴⁶ *Id.* at 1384 (“Sales activity necessarily means that a party is attempting to commercialize the invention, appropriating its economic value. There is less concern that the infringer is seeking to improve upon the invention in this context. Consideration of these downstream impacts supports a bifurcated approach: maintain a tangibility requirement for ‘making’ the patented invention, but permit intangible infringement by ‘selling’ or ‘offering to sell’ the claimed innovation.”).

¹⁴⁷ See Holbrook, *supra* note 18, at 1780 (“The same can be said of *Transocean*’s ruling that the location of the contemplated sale of the invention determines the locus of infringement, even if all negotiations take place outside of the United States and the sale is never consummated. The act of economic appropriation—the focus of the statute—is within the United States, satisfying step two.”).

¹⁴⁸ See Holbrook, *supra* note 14, at 2160–61 (“[N]early all of these effects-based tests focus exclusively on the impact on U.S. markets and ignore the intellectual property policies of the relevant foreign countries. . . . Allowing the mere effect on U.S. markets to generate liability for acts that would not infringe within that country would undermine those policies and that nation’s sovereignty. Accordingly, a truly economically driven effects test would extend the reach of a U.S. patent to the four corners of the globe, undermining the various policies in place in other countries and providing considerable-and inappropriate-reach to a U.S. patent.”).

as infringing, in which case applying U.S. law may not cause any offense to the other country's sovereignty, or would not treat the act as infringing, in which case not applying U.S. law better respects the other country's sovereignty.¹⁴⁹

Here, because cyberterritories are not sovereign and do not have their own patent laws,¹⁵⁰ there can be no traditional conflicts-of-law analysis. However, norms within the communities that create, use, modify, and commercialize CAD files can at least serve as a rough proxy for potential conflicts.¹⁵¹ The perspectives of those entities who use,

¹⁴⁹ *Id.* at 2165 (“This Article’s proposal would require U.S. courts to explicitly contemplate foreign patent law. The basic premise is that, for there to be infringement of a U.S. patent, the patent holder would also have to show that there would be infringement in the foreign jurisdiction. If that is the case, then the harm from extraterritorially enforcing the U.S. patent is mitigated significantly. On the other hand, if there is some reason that infringement would not be found in the foreign country, then infringement should not be found under U.S. law. By explicitly contemplating possible differences in the law, this comparative approach guards against creating such conflicts and preserving these distinctions.”).

¹⁵⁰ This is somewhat surprising, as the Skynet artificial intelligence systems became self-aware way back on August 29, 1997. See *TERMINATOR 2: JUDGMENT DAY* (TriStar Pictures 1991); see also MARK TWAIN, *A CONNECTICUT YANKEE IN KING ARTHUR’S COURT* 49 (1889) (Bantam Classic ed. 1981) (“[T]he very first official thing I did, in my administration—and it was on the very first day of it, too—was to start a patent office; for I knew that a country without a patent office and good patent laws was just a crab, and couldn’t travel any way but sideways or backwards.”).

¹⁵¹ See Osborn, *Bits and Atoms*, *supra* note 10, at 593–94 (explaining that norms play an important role in the regulation of new technologies by indicating users’ reasonable expectations, and that attempts to force new legal rules into such spaces can cause resistance rather than compliance); see also Carla L. Reyes, *Conceptualizing Cryptolaw*, 96 NEB. L. REV. 384, 415 (2017) (treating distributed ledger technology code “as a form of foreign law” into which U.S. substantive business and financial laws can be “transplanted” for consideration alongside functional comparisons of the home and receiving jurisdictions’ individual approaches to the societal problems). Professor Reyes further explains this transplant methodology as follows:

Legal transplantation is the process of taking a legal artifice from its home jurisdiction and implementing it in a foreign, receiving jurisdiction. Unless legal transplants are designed to deal effectively with the special characteristics of the recipient jurisdiction, in this case, DLT, the transplanted law can have unexpected effects. Even when a transplanted law has unexpected effects, it succeeds if it achieves its function in the receiving jurisdiction.

Id. (internal quotation marks omitted).

work with, and deal in CAD files can reveal how accepting those communities would be to new proposed forms of patent enforcement.¹⁵²

The major challenge in identifying such norms is the current, emerging state of the technology. While CAD programs and 3D printers have been around for a while, consumers are only beginning to be exposed to the technology and bring it into their homes. The relevant norms may not arise or be discernible for some time, especially as to end-users and consumers whose perspectives are historically underrepresented in the development of IP law.¹⁵³

CAD file consumers may turn out to have different norms than the law would encourage, as many consumers did with respect to the rampant copyright infringement in the wake of the internet, emphasizing a need for legal reform.¹⁵⁴ Or consumers in the near future

¹⁵² See Osborn, *Bits and Atoms*, *supra* note 10, at 593–94; see also Mark F. Schultz, *Copynorms: Copyright and Social Norms*, in *INTELLECTUAL PROPERTY AND INFORMATION WEALTH 1–2* (Peter Yu ed., 2006) (“Copynorms moderate, extend, and undermine the effect of copyright law. For better or worse, copynorms play an important role in shaping what copyright law does and does not accomplish.”).

¹⁵³ Too much emphasis on the IP creator or owner and not enough on the end user can cause undesirable laws that fail to optimally promote progress overall. See Julie E. Cohen, *The Place of the User in Copyright Law*, 74 *FORDHAM L. REV.* 347, 374 (2005) (“Copyright should recognize the situated, context-dependent character of both consumption and creativity, and the complex interrelationships between creative play, the play of culture, and progress, and should adjust its baseline rules—not simply its exceptions—accordingly. Scholars and policy makers should ask how much latitude the situated user needs to perform her functions most effectively, and how the entitlement structure of copyright law might change to accommodate that need. In particular, they should be prepared to ask whether the situated user is well served by the current copyright system of broad rights and narrow, limited exemptions, or whether she would be better served by a system that limits the rights of copyright owners more narrowly in the first instance.”). Cf. Michael Grynberg, *Trademark Litigation as Consumer Conflict*, 83 *N.Y.U. L. REV.* 60, 61–62 (2008) (“Trademark’s traditional seller-conflict account gives insufficient weight to the interests of nonconfused consumers and their potential losses if the defendant is enjoined. The resulting ‘two-against-one’ dynamic is more than a rhetorical imbalance. Trademark’s tilted storyline has doctrinal consequences because the disposition of trademark cases often rests on the factfinder’s intuitions. When the plaintiff’s and the defendant’s interests are balanced, any marginal amount of consumer confusion can too easily tip the scales in the plaintiff’s favor. The seller-conflict narrative thus skews analysis of trademark claims and abets the heavily criticized expansion of trademark’s scope beyond its traditional boundaries.”).

¹⁵⁴ See John Tehranian, *Infringement Nation: Copyright Reform and the Law/Norm Gap*, 2007 *UTAH L. REV.* 537, 539 (“At this juncture, three key trends bear close observation. First, copyright law is increasingly relevant to the daily life of the average American. Second, this

may approach printable utilitarian objects with an attitude quite different from that of early digital music and movies on the internet. Unlike during the early days of the World Wide Web and peer-to-peer file-sharing networks, there are now many legitimate, reliable vendors for digital consumer goods at competitive prices (e.g., iTunes, Amazon, and Google Play) such that many consumers prefer such “authorized” vendors over digital piracy.

As to CAD file creators and distributors (many of whom may also be consumers or users), some in patent-centric industries may work hard to shut down access to 3D printing technology, platforms, or distribution networks, much like the music industry fought to prevent digital music from taking off.¹⁵⁵ Alternatively, many creators of CAD files may wish to leverage the democratization of the new 3D-printing medium and will freely give away their creative work, obviating their need for IP protection.¹⁵⁶

growing pertinence has precipitated a heightened public consciousness over copyright issues. Finally, these two facts have magnified the vast disparity between copyright law and copyright norms and, as a result, have highlighted the need for reform.”); *id.* at 543 (“The dichotomy between copyright law and norms is profound yet underappreciated. On any given day, for example, even the most law-abiding American engages in thousands of actions that likely constitute copyright infringement. The widespread use of peer-to-peer (P2P) file-sharing technology, which has enabled ordinary Americans to become mass copyright infringers with spectacular ease, has brought the law/norm gap to light. However, the problem extends far beyond P2P activities. We are, technically speaking, a nation of constant infringers.”).

¹⁵⁵ See Lemley, *supra* note 82, at 497 (“The music industry spent years trying to shut down digital music before actually offering a realistic, legal, digital music service, and when they finally did agree to license a legal alternative—iTunes—they priced their songs to protect their offline music market rather than to make digital music attractive. Book publishers conspired to raise the price of eBooks so they wouldn’t cut into the sales of hardback books; it took a successful government antitrust case to force competition in eBook pricing.”); *id.* at 498 (“Professional industrial design firms will resist having their works ‘Napsterized’ because they fear losing control over who can use their design and not getting paid when people do. Indeed, some have already called for strengthening IP laws to try to block the distribution of designs for patented products to 3D printers.”).

¹⁵⁶ *Id.* at 487 (“[P]eople are creating an astonishing array of content specifically for the purpose of giving it away for free on the Internet. Early on, scholars worried that no one would create content for the Internet because they couldn’t see a way to get paid, but it is hard to think of a prediction in all of history that has been more dramatically wrong. People spend hundreds of millions—or even billions—of hours a year creating content online for no reason other than to share it with the world. They create and edit Wikipedia pages, post favorite recipes, create guides to TV shows and video games, review stores and restaurants, and post information on any subject you can imagine.”).

There are also ethical codes within the professional industrial design and engineering communities that demand honesty, integrity, attribution, and respect for others' proprietary rights,¹⁵⁷ which may result in a reluctance to use or modify others' CAD files without permission. Indeed, the market has even generated non-IP technological controls to help prevent unauthorized use of CAD files. In June 2017, the data security firm Vera announced partnerships with Autodesk and PTC, the global leaders of the CAD software market.¹⁵⁸ Under the partnerships, Vera would provide built-in security for CAD files "to control designs once shared with contractors, third parties, or foreign suppliers."¹⁵⁹ Tools such as dynamic digital access and permissions, encryption, and automatic security triggers promise to greatly reduce the possibility of "IP theft" via CAD file misappropriation.¹⁶⁰ This digital

¹⁵⁷ The Industrial Designers Society of America's code of ethics requires designers to be "honest and fair," to provide "original and innovative design service," to "compete fairly . . . primarily on the quality of our work," and to "properly credit[] work accomplished." *Code of Ethics*, INDUS. DESIGNERS SOC'Y AM., [http://www.idsa.org/code-ethics_\[https://perma.cc/GB2E-WBFG\]](http://www.idsa.org/code-ethics_[https://perma.cc/GB2E-WBFG]) (last visited Apr. 26, 2019). Similarly, the National Society of Professional Engineers' code of ethics requires engineers to "avoid deceptive acts," and provides that they "shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments." More specifically as to attribution and intellectual property, the code provides that "[e]ngineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others," specifically requiring that:

- a. Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.
- b. Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others without express permission.
- c. Engineers, before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.

NAT'L SOC'Y OF PROF. ENGINEERS, CODE OF ETHICS FOR ENGINEERS (July 2018), <https://www.nspe.org/sites/default/files/resources/pdfs/Ethics/CodeofEthics/Code-2007-July.pdf> [<https://perma.cc/KG3B-69PS>].

¹⁵⁸ Press Release, Vera, Vera Partners with Autodesk and PTC to Eliminate IP Theft and Protect Trade Secrets (June 14, 2017), <https://www.vera.com/press-release/vera-partners-with-autodesk-ptc> [<https://perma.cc/3A3E-T3X5>].

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

rights management approach is not entirely new,¹⁶¹ but will now be better streamlined into the major CAD platforms by Vera. Another method for preventing unauthorized CAD file use is to embed secret, intentional flaws into CAD files.¹⁶² Such CAD files would be printable, but would print in low-quality resolution or with serious physical defects unless the person using the CAD file also knew of specific parameters and printing conditions that would avoid or remedy the defects.¹⁶³ These non-IP control measures indicate the considerable commercial value of at least some CAD files per se.

On the other hand, at least some anecdotal evidence suggests that when the unauthorized use of a CAD file is noncommercial and only in digital format (i.e., not used to physically produce the product), such uses may be normatively acceptable. An article on the popular industrial design website Core77, for example, discussed the European company 3D Furniture, which provides digital models of both classic and modern furniture items (e.g., an Eames chaise longue) for architects and designers to use in digital drawings.¹⁶⁴ The author explained the ethical dilemma as follows:

From a moral standpoint, the company is seemingly providing a useful service to architects and designers trying to show their clients what a particular space could look like, and you could argue that

¹⁶¹ See Andre, *MarkAny Develops DRM and Piracy Protection for 3D Print Files*, 3DERS (Mar. 31, 2016), <http://www.3ders.org/articles/20160331-markany-develops-drm-and-piracy-protection-for-3d-print-files.html> [<https://perma.cc/PD3C-8EAS>].

¹⁶² Fei Chen et al., *Security Features Embedded in Computer Aided Design (CAD) Solid Models for Additive Manufacturing*, 128 MATERIALS & DESIGN 182 (2017); Benedict, *Intentional Defects Could Save Your 3D Printing Files from Cyber Threat*, NYU Researchers Say, 3DERS (May 24, 2017), <http://www.3ders.org/articles/20170524-intentional-defects-could-save-your-3d-printing-files-from-cyber-theft-nyu-researchers-say.html> [<https://perma.cc/VM82-47ZL>].

¹⁶³ Benedict, *supra* note 162 (“The secret is in developing a system, a precise set of parameters and printing conditions, that can automatically identify and reverse these defects. Those who own the IP would have access to this system of parameters, but any potential hackers would not. This means that, if a hacker attempted to 3D print the stolen file, their model would have serious physical flaws or an unnaturally low resolution.”).

¹⁶⁴ Rain Noe, *Selling Virtual Versions of Design Classics: Is this Even Legal?*, CORE77 (May 29, 2013), <http://www.core77.com/posts/24957/Selling-Virtual-Versions-of-Design-Classics-Is-This-Even-Legal> [<https://perma.cc/WLG6-LWB3>] (“You can find there models of famous timeless pieces, but also models of famous brands and manufacturers, currently in trend in field of interior design. Because of that, collection of 3d models is growing larger each day.”).

inclusion of a particular piece in a rendering could lead the client to purchase the real deal. But is it legal? They are, after all, profiting off of the designs of others, selling the models for roughly US \$8 to \$15 a pop.¹⁶⁵

Reader comments were illuminating. Many expressed firm beliefs that the non-physical nature of the transaction made it appropriate, if not also lawful.¹⁶⁶ But even if unlawful from an IP perspective,¹⁶⁷ some suggested there would be no economic harm to the IP owner flowing from such digital activities,¹⁶⁸ particularly as manufacturers sometimes provide free CAD files of such products.¹⁶⁹ Yet multiple commenters also expressed the belief that the for-profit aspect of the 3D Furniture transaction itself is what made 3D Furniture's conduct improper.¹⁷⁰

¹⁶⁵ *Id.*

¹⁶⁶ *See, e.g.*, db, Comment to *id.* ("Of course it is legal. They created a model of an object, not the object. It is exactly the same as a photographer. They created an image of an object, not the object."); AM, Comment to *id.* ("No one should ever be locked in a cage for purchasing or selling a copy of a digital file, regardless of what that file contains."); DJ, Comment to *id.* ("The actual chairs exist, and have protection for the form and function only. Duplication of the form (specific shape) and function (chair. for sitting on), in a specific combination—is illegal. The 3D model's form is a packet of data, and it's function is to make images. In the future, designers will protect their '3 dimensional copyrights', but currently the laws shouldn't stop the creation of something that otherwise would not exist.").

¹⁶⁷ Some comments suggested there were valid trademark and/or copyright complaints against 3D Furniture. *See, e.g.*, Rafael Morgan, Comment to *id.* ("In theory, copyright covers all aspects of a design project, including the object itself, its blueprints and images. Of course, you could take a picture of a classic chair or model it yourself, but profiting from it is technically illegal.").

¹⁶⁸ Rafael Morgan, Comment to *id.* ("[P]ersonally, I would not care if someone modeled my designs and sold the models online, for visualization purposes. I cannot see how it would interfere negatively in the commercialization of the real tangible thing. On the other hand, copycats could use such models to produce real life copies, but this is something they would do anyway, with or without 3D models to guide them.").

¹⁶⁹ Andrew, Comment to *id.* ("I know some manufacturers have lowish quality models available for speccing/arch purposes and may be used as a reference to model over."); craig, Comment to *id.* ("I have over 2000 models of just about every classic piece of furniture made, all were gotten free from the manufacturer of the piece.").

¹⁷⁰ Rafael Morgan, Comment to *id.* ("In theory, copyright covers all aspects of a design project, including the object itself, its blueprints and images. Of course, you could take a picture of a classic chair or model it yourself, but profiting from it is technically illegal."); Roly, Comment to *id.* ("Not 100% sure how it applies to copyright, but believe they'd be in breach due to the fact they're profiting from someone else's design."); IDiot, Comment to *id.* ("Offering high quality versions of these models for profit is an interesting IP question, obviously it takes

This limited data, though interesting, is not only sparse but also often conflicting. One cannot draw any reliable normative conclusions from the foregoing data points even though some data may hint, for example, at the perceived propriety of using CAD files for non-commercial or design-around activities in ways that accord with the results of the analysis above in Part II. However, once 3D printing technology and CAD file commerce become more commonplace, a comprehensive normative assessment should be conducted to determine whether and to what extent the norms have diverged from the law. Significant divergence may reveal a need for legal reform, reexamination of norms, or both.¹⁷¹

For now, in the absence of any clear normative conflict, this Article's approach to patent enforcement in cyberterritories is theoretically justified as a sensible means of allocating liability for conduct across the digital-physical border. The analysis is rooted in established patent doctrine and policy, without bending to the undue influence of customs that may be unwise or induced by circumstances outside of a desire to achieve the patent system's goal of promoting the progress of the useful arts.¹⁷²

CONCLUSION

3D printing is a remarkable emerging technology and its effects on U.S. patent law have yet to be fully realized. This Article has shown that a territoriality lens is a suitable perspective to help assess whether and

some time and work to create a high quality / detailed model, but the designs themselves are often the intellectual property of someone else.”).

¹⁷¹ See Tehranian, *supra* note 154, at 550 (“As surveillance technology grows more sophisticated, thereby allowing acts of infringement increasingly to come under the detection and enforcement power of copyright holders, we will be forced to confront the law/norm disparity. In response, we have already begun to reexamine our norms. It is also incumbent upon us to reexamine the vitality of our copyright regime.”).

¹⁷² See Jennifer E. Rothman, *The Questionable Use of Custom in Intellectual Property*, 93 VA. L. REV. 1899, 1981 (2007) (“The analysis of IP reinforces concerns that custom will develop in suboptimal ways, often driven by rent-seeking, powerful participants. Moreover, in areas of the law where it does not make sense to further expectation interests, or where expectations run against treating custom as legally binding, it generally does not make sense to incorporate custom. Additionally, when a body of law, such as IP, is directed toward an interaction with the public more broadly, a preference should be given to public rather than private ordering.”).

how conduct relating to digital representations of physical objects should be reachable by U.S. patent law. Applying the pertinent statutes and doctrines suggests that mere creations or uses of CAD files within digital environments should not be actionable infringements, while commercial activities that offer to sell or sell the files should be. The result is a limit on the enforcement of patent rights that allows patents to reach the activities that are likely to have an adverse effect on a patent owner's economic interests, while preserving the rights of users and those who would design-around such patents to do so using the most efficient tools available. In the absence of any clear normative conflicts (which may be revealed in the future as the technology becomes more widely adopted), the balance struck in this Article should effectively facilitate the policy goals of the patent system.