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The Right to Repair Doctrine and the Use of 3D Printing Technology in Canadian Patent Law

Tesh W. Dagne and Gosia Piasecka*

Abstract

3D printing technology is part of a new economic movement, termed the sharing economy, where consumers rely less on large corporations for supplying them with products. The technology allows consumers to bypass the traditional manufacturing process. Instead, consumers increasingly share and sell products to each other on online sharing platforms. Consumers can download digital copies of products and print them in the convenience of their homes. In addition, they can repair and modify these products to suit their needs. Canadian patent law permits the repair of a patent-protected item but prohibits its reconstruction. However, the line between repair and reconstruction is unclear, which can cause tensions between consumers and patent-holders. This article argues that consumers should be given an all-encompassing right to repair and modify legally purchased goods for private purposes using 3D printing technology if the repair or modification is not shared with others for a profit. This would give consumers the freedom to share their designs for free while still protecting patent-protected items from piracy. On a broader scale, the proposed legal right would encourage the sharing economy and build positive relationships between consumers and patent-holders.

INTRODUCTION

3D printing is a revolutionary technology bound to disrupt manufacturing processes. Its versatile applications and rapid expansion foreshadow it to become as indispensable as the internet. One of its many applications is its ability to print specific replacement parts for broken products. As such, it allows consumers to repair or modify products to suit their needs. There is an increasing trend to share the designs for these 3D printed creations online, as consumers progressively shift away from vertical economies towards horizontal market networks. This trend is commonly referred to as the sharing economy. It presents a wealth of opportunities but also bears challenges. As consumers want to have greater freedom and autonomy over the design and manufacture of goods, patent-holders will seek to minimize the unauthorized reconstruction of their inventions. Under Canadian patent law, consumers may repair items but are prevented from reconstructing them. The line between repair and reconstruction in the use of 3D printing is blurred because of the nature of the technology.

This article explores this blurry area of the law. It examines a consumer's right to repair patent-protected objects using 3D printing technology in

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Canadian patent law. It argues that a consumer should be granted an all-encompassing legal right to repair and modify patent-protected items given three conditions: (1) the consumer legally purchased the original good; (2) the consumer uses the repaired or modified item for private purposes; and (3) the consumer gains no financial benefit from posting the repair or modification online for others. Online sharing platforms should have the right to share these repairs and modifications without becoming liable for contributory infringement. As such, consumers could not sell their innovations for a profit but could share them for free with others. These conditions would give consumers freedom to repair and modify products while these products would still be protected from rampant piracy. On a broader scale, the proposed legal right would encourage the sharing economy and build positive relationships between consumers and patent-holders.

The article presents this proposal as follows: Part I surveys 3D printing technology and discusses its significance in the manufacturing economy; Part II delves into patent law and analyzes the current legal framework; and Part III applies this law to 3D printing technology and a consumer's right to repair patent-protected goods, where the challenges to the current regime are discussed and recommendations offered. The purpose of this article is to provide a comprehensive overview of the state of the law and to provide recommendations that support innovation and new economic trends while balancing these objectives with the interests of patent-holders.

I. THE CONSUMER AND 3D PRINTING TECHNOLOGY

Before examining a consumer's right to repair using 3D printing in patent law, it is necessary to provide a foundation for the ensuing discussion by exploring the technology itself. This section surveys how 3D printing works and how the technology is used today. It also discusses the significance of 3D printing and its role in the global economy.

(a) What is 3D Printing?

3D printers create objects by placing small drops of materials, such as metal, plastic, or food ingredients at predetermined locations.¹ They build layers of these drops until the product is finished. The process is also referred to as additive manufacturing. The predetermined locations are provided by digital files, called Computer Aided Design (CAD) files.² These are "virtual 3D models of an object,"³ and are easily accessed and downloaded from online-sharing

¹ The Economist. "A factory on your desk" (3 September 2009) *The Economist*, online: < <http://www.economist.com/node/14299512> > .

² Michael Weinberg, "It Will Be Awesome if They Don't Screw it Up: 3D Printing, Intellectual Property, and the Fight Over the Next Great Disruptive Technology" (November 2010), *Public Knowledge*, online: < <https://www.publicknowledge.org/files/docs/3DPrintingPaperPublicKnowledge.pdf> > at 2.

platforms. CAD files are commonly used by professionals, such as designers, engineers, and architects, to imagine physical objects before they are created in the real world.⁴ In fact, CAD files were used by professionals since the 1950s.⁵ Today these files, in combination with 3D printing, provide a range of opportunities. For example, an engineer working in a remote location does not have to order special tools she needs for her work but can rather download the item's CAD file or design it herself to print it.⁶ Alternatively, users can create CAD files by scanning existing objects through a 3D printing scanner.⁷ Another benefit of 3D printing is its ability to customize products. CAD files can be downloaded and tweaked with a few mouse clicks to fit one's personal needs and wants.⁸ The technology offers a plethora of possibilities for creating and reshaping objects. The convenience and ease of access makes the technology increasingly popular.

3D printers can print almost anything, ranging from simple household articles, such as mugs, to more complex items, such as prosthetic limbs.⁹ 3D printers can build objects with internal, movable parts, so they eliminate the assembly time of otherwise factory-manufactured items.¹⁰ Recently, the Massachusetts Institute of Technology printed a hydraulic robot that "can practically walk right out of the printer."¹¹ Fashion designers use 3D printers to create entire clothing collections.¹² 3D printing is also increasingly applied in the health and medical industry. Health experts can practice complex heart surgeries on 3D-printed hearts.¹³ Doctors and surgeons also rely on the technology to print body parts. In South Korea, a team of surgeons recreated and implanted

³ *Ibid.*

⁴ *Ibid.*

⁵ David Cohn, "Evolution of Computer-Aided Design" (1 December 2010) *Desktop Engineering*, online: < <http://www.deskeng.com/de/evolution-of-computer-aided-design/> > .

⁶ The Economist, "The third industrial revolution" (21 April 2012) *The Economist*, online: < <http://www.economist.com/node/21553017> > [The Economist, "Industrial Revolution"].

⁷ Weinberg, *supra* note 2 at 3.

⁸ The Economist, "Industrial Revolution", *supra* note 6.

⁹ Bridget Butler Millsaps, "Japanese Artists Show Anime & Subculture Influences in 3D Printed XSENSE Prosthetics" (1 July 2015) *3D Print*, online: < <https://3dprint.com/78024/japanese-art-3d-print-xsense/> > .

¹⁰ Weinberg, *supra* note 2 at 2.

¹¹ Adam Conner-Simons, "First-ever 3-D printed robots made of both solids and liquids" (6 April 2016) *MIT News*, online: < <http://news.mit.edu/2016/first-3d-printed-robots-made-of-both-solids-and-liquids-0406> > .

¹² DanitPeleg, "How I 3D-Printed a 5-Piece Fashion Collection at Home" (2015) *DanitPeleg*, online: < <http://danitpeleg.com/3d-printing-fashion-process/> > .

¹³ Kendra Mangione, "Cardiologists use 3D-printed hearts to practice surgery on infants" (8 January 2016) *CTV News*, online: < <http://toronto.ctvnews.ca/cardiologists-use-3d-printed-hearts-to-practice-surgery-on-infants-1.2729865> > .

part of a woman's skull made of titanium to save her life after she suffered from a rare condition that damaged her head.¹⁴ Furthermore, there is great research and development in printing human tissue and organs.¹⁵ 3D printers can also create large structures, such as houses.¹⁶ Another interesting application of 3D printing technology is the food industry. There are specific printers used to print various foods, which combine “technology, food, art and design.”¹⁷ The National Aeronautics and Space Administration (NASA) considered using a 3D printer so that astronauts could print their own food in space.¹⁸ 3D printers can even print themselves.¹⁹ The options for creating goods with 3D printing technology are, therefore, limitless.

This technological innovation expands exponentially and consumers are increasingly turning to 3D printing to create customized and innovative products.²⁰ Anybody with a computer and internet access can download a CAD file. Several online-sharing platforms, such as Thingiverse, provide easy access to files.²¹ One can readily print these files at home or alter them to suit one's needs. Thingiverse describes itself as “a thriving design community for discovering, making, and sharing 3D printable things.”²² It encourages an open sharing platform by asking all designers to license their creations with a Creative Commons license.²³ The technology is also becoming increasingly user-friendly

¹⁴ Clare Scott, “A 3D Printed Skull Saves the Life of South Korean Woman” (9 April 2016) *3D Print*, online: < <https://3dprint.com/128423/3d-printed-skull-surgery/> > .

¹⁵ Clare Scott, “Wake Forest Researchers Successfully Implant Living, Functional 3D Printed Human Tissue into Animals” (16 February 2016) *3D Print*, online: < <https://3dprint.com/119885/wake-forest-3d-printed-tissue/> > .

¹⁶ Ruby Lott-Lavigna, “Watch this giant 3D printer build a house” (21 September 2015) *Wired*, online: < <http://www.wired.co.uk/news/archive/2015-09/21/giant-3d-printer-builds-houses> > .

¹⁷ See e.g. Natural Machines, “Foodini — A 3D Food Printer” (2016) *Natural Machines*, online: < <https://www.naturalmachines.com/> > .

¹⁸ National Aeronautics and Space Administration, “3D Printing: Food in Space” (23 May 2013) *NASA*, online: < http://www.nasa.gov/directorates/spacetech/home/feature_3d_food.html#.VwrktnqGOT9 > .

¹⁹ Eddie Krassenstein, “The Dollo 3D Printer Can 3D Print a Replica of Itself in Just 18 Hours — Coming to Kickstarter” (12 May 2015) *3D Print*, online: < <https://3dprint.com/63229/dollo-3d-printer-prints-itself/> > .

²⁰ Louis Columbus, “2015 Roundup of 3D Printing Market Forecasts and Estimates” (31 March 2015) *Forbes*, online: < <http://www.forbes.com/sites/louiscolombus/2015/03/31/2015-roundup-of-3d-printing-market-forecasts-and-estimates/#6998de31dc67> > .

²¹ Bulent Yusuf, “27 Best Sites to Download Free STL Files to 3D Print” (3 April 2016) *All3DP*, online: < <https://all3dp.com/best-sites-free-stl-files-3d-printing/> > .

²² Thingiverse, “What is Thingiverse” (2016) MakerbotThingiverse, online: < <http://www.thingiverse.com/about/> > .

²³ *Ibid*; see also Creative Commons, “About The Licenses”, online: < <https://creativecommons.org/licenses/> > (where Creative Commons licenses are described as tools that forge a balance between no protection and strict protection over creative works by

and cheaper to operate. A San Francisco-based company recently ran a Kickstarter campaign for “the first ever smartphone 3D printer.”²⁴

Consumers can own custom 3D printed products even when they lack access to the hardware. Several 3D printing providers allow consumers to submit designs online, upon which the providers print them.²⁵ Alternatively, the same service providers offer a range of readily designed and printed products that can be purchased online. One can shop for jewellery, cellphone cases, art and various household gadgets.²⁶ Consumers can even hire their own designer to help them create custom 3D printed goods.²⁷ As such, 3D printing offers consumers a wide range of applications. Its ease of access, abundant opportunities to be creative, and increasing popularity make it a significant innovation in today’s economy.

(b) The Significance of 3D Printing

Some scholars predict that 3D printing will disrupt today’s manufacturing processes and that it has the potential to significantly alter economies.²⁸ Others expect that 3D printing will lead the third industrial revolution by changing where and how products are made.²⁹ The Boston Consulting Group found that,

allowing creators to retain copyright while giving others the permission to copy and distribute their work).

²⁴ OLO 3D Inc., “OLO — The First Ever Smartphone 3D Printer” (funded on 20 April 2016) *Kickstarter*, online: < <https://www.kickstarter.com/projects/olo3d/olo-the-first-ever-smartphone-3d-printer> > .

²⁵ See e.g. Shapeways, online: < <http://www.shapeways.com/> >; Sculpteo, online: < <http://www.sculpteo.com/en/> >; i.materialise, online: < <https://i.materialise.com/> > .

²⁶ *Ibid.*

²⁷ Shapeways, “Designers for Hire” (2016) *Shapeways*, online: < <http://www.shapeways.com/hire/designer/> > .

²⁸ See e.g. Christopher Barnatt, “3D Printing” (30 January 2016), *Explaining The Future* (blog), online: < <http://explainingthefuture.com/3dprinting.html> > (who predicts that “3D printing may therefore soon do for manufacturing what computers and the Internet have already done for the creation, processing and storage of information”); Weinberg, *supra* note 2 (who argues 3D printing is “[t]he next great technological disruption” at 1); Daniel Harris Brean, “Asserting Patents to Combat Infringement via 3D Printing: It’s No Use” (2012) 23:3 *Fordham IP Media & Ent LJ* 771 (who states that “3D printing has the capability to completely bypass traditional manufacturing and distribution practices” at 774) [Brean, “Asserting Patents”]; Charles W. Finocchiaro, “Personal Factory or Catalyst for Piracy: The Hype, Hysteria, and Hard Realities of Consumer 3-D Printing” (2013) 31:2 *Cardozo Arts & Ent LJ* 473 (who predicts that 3D printing “may have the potential to blur the bright line between consumers and producers,” and that “3-D printing, in the long term, has the potential to have a similarly disruptive effect on IP by decentralizing the means of production and challenging many of the assumptions on which modern IP law are based” at 473, 480). Davis Doherty, “Downloading Infringement: Patent Law as a Roadblock to the 3D Printing Revolution” (2012) 26:1 *Harv JL & Tech* 353 (who explains that “the ability to create prototypes almost immediately and manufacture custom designs in a cost-effective manner may well revolutionize modern industry” at 354).

with the help of 3D printing, 10-30% of imported products in the U.S. could be manufactured domestically by 2020, especially in industries such as transport, computers, fabricated metals and machinery.³⁰ 3D printing could revolutionize manufacturing by moving power and control away from incumbent companies that traditionally held a monopoly on the production of various goods.³¹ Brean, for example, envisions the following future:

Physical products would be designed, sold, and distributed entirely on computers and over the Internet, with the end consumer printing the only physical manifestation of the product. Factories, warehouses, product transportation infrastructures, and storefronts can potentially be replaced with a directory of CAD files and a website in a number of industries.³²

This would shift control over manufacturing to consumers, which is part of a larger economic trend commonly referred to as the sharing economy. Sharing is viewed as “a post-crisis antidote to materialism and overconsumption” that evolved in the aftermath of the global financial crisis.³³ 3D printing fosters this new market economy by allowing consumers to exchange products on community-based online services, such as Thingiverse, rather than forcing them to rely on large manufacturers to produce the goods.³⁴ 3D printing could move manufacturing from a vertical chain (manufacturer to consumer) to a horizontal network (consumer to consumer), whereby information and goods travel in all directions. This shift would lead to, what some have termed, the democratization of manufacturing.³⁵ Consumers would have greater input in manufacturing processes and be less dependent on higher authorities to supply

²⁹ The Economist, “Industrial Revolution”, *supra* note 6.

³⁰ *Ibid.*

³¹ Joseph C. Storch, “3-D Printing Your Way Down the Garden Path: 3-D Printers, the Copyrightization of Patents, and a method for Manufacturers to Avoid the Entertainment Industry’s Fate” (2014) 3:2 NYU J Intell Prop & Ent L 249 (where the author explains that “[f]or most of this nation’s history, creators of mass market intellectual property maintained a technological monopoly that allowed them to be essentially the sole creator and manufacturer of media upon which one could read, watch, or listen to books, music, films and other creative works” at 255).

³² Brean, “Asserting Patents”, *supra* note 28 at 781.

³³ The Economist, “All eyes on the sharing economy” (9 March 2013) *The Economist*, online: < <http://www.economist.com/news/technology-quarterly/21572914-collaborative-consumption-technology-makes-it-easier-people-rent-items> > .

³⁴ Thingiverse, *supra* note 22.

³⁵ Sangeet Paul Choudary, “From Social Media to the Sharing Economy: The Three Drivers of Business Disruption” (2015) *Platform Strategy*, online: < <http://platformed.info/social-media-sharing-economy-platforms/> > . See also Mark A. Lemley, “IP in a World without Scarcity” (2015) 90:2 NYU L Rev 460 (the internet encouraged “the democratization of content distribution. Once a work could be instantiated entirely in information, the copying of that work no longer required a factory to produce it or a fleet of trucks and stores to distribute it. The work could be transmitted to others with no loss

them with products. The democratization of media evolved in a similar way. Traditionally, media was transmitted from news stations and other businesses to consumers.³⁶ It was governed by a vertical supply chain. Social media changed this relationship drastically.³⁷ Today, any person can act as a media outlet by gathering and sharing information online.³⁸ Thus, the media's vertical supply chain developed into a horizontal network.

Similarly, 3D printing has the power to democratize manufacturing by shifting control away from large corporations to a multitude of independent designers and creators. In this sense, it is comparable to other sharing-based services, such as Uber and Airbnb.³⁹ Here, consumers circumvent traditional service providers and offer services directly to others. Although 3D printing is at an early stage of development, and unlike Uber and Airbnb, consumers themselves can use the technology privately; it faces similar legal, political and social challenges as a new technology. As power and control over these services shift, many stakeholders are left hurting.⁴⁰ Airbnb creates problems for renters in popular cities, such as San Francisco. Renters struggle to find affordable housing options while property owners rent their increasingly expensive homes to tourists.⁴¹ Taxi drivers are concerned about Uber's detrimental effects on their industry if the online ride-sharing platform is adopted across North America.⁴² A cause of these issues is that Airbnb and Uber quickly surpassed legislation. By the time the legislature learned about these problems, many stakeholders were already involved in deep disputes.⁴³ Current legal frameworks are structured to support incumbent businesses that often have monopolies over industries.⁴⁴ The

of quality and at virtually no cost. The fact that distribution was so cheap, in turn, mean that anyone could do it" at 470).

³⁶ Choudary, *ibid.*

³⁷ *Ibid.*

³⁸ *Ibid* (the author refers to this as the "democratization" of publishing and broadcasting).

³⁹ Andrew Anagnost, "Not Just Airbnb and Uber: Why Manufacturing is Already a Sharing Economy" (8 December 2015) *Line//Shape//Space*, online: <<https://line-shapespace.com/manufacturing-sharing-economy/>> .

⁴⁰ See Denise Cheng, "Is Sharing Really Caring? A Nuanced Introduction to the Peer Economy, Policy Primer" (October 2014) online: <<http://static.opensocietyfoundations.org/misc/future-of-work/the-sharing-economy.pdf>> ; Brishen Rogers, "The Social Costs of Uber" (2015) 82:85 *U Chi L Rev Dialogue* 85 — 102.

⁴¹ Kwan Booth, "Protesters occupy Airbnb HQ ahead of housing affordability vote" (2 November 2015) *The Guardian*, online: <<http://www.theguardian.com/us-news/2015/nov/02/airbnb-san-francisco-headquarters-occupied-housing-protesters>> .

⁴² Jay Turnbull, "Montreal taxi drivers take Uber protest downtown" (8 April 2016) *CBC News*, online: <<http://www.cbc.ca/news/canada/montreal/quebec-taxi-drivers-uber-protest-april-1.3526453>> .

⁴³ See e.g. Jim O'Sullivan, "Uber, Lyft would face new rules under state bill" (4 March 2016) *Boston Globe*, online: <<https://www.bostonglobe.com/metro/2016/03/04/uber-lyft-would-face-new-rules-under-state-bill/VyS7ciSX6pDmN9ldS1l0HO/story.html>> (where the author discusses that "[i]n part because public policy has lagged behind the

sharing economy, however, is a new market form.⁴⁵ Laws fail to match it because they are rooted in a vertical market system. As such, innovative technologies create gaps in the law and can fail to protect stakeholders and their interests. These principles also apply to 3D printing. Incumbent companies may increasingly see 3D printing as a threat and lobby for stricter laws.⁴⁶ However, stricter laws will not reverse market changes but will rather exacerbate the divide between consumers and manufacturers. It is vital that laws reflect the changing nature of markets, so consumers feel a personal duty to follow them. Outdated or strict laws will likely create resentment and greater piracy in the 3D community.⁴⁷ Storch warns that:

[t]he biggest, and arguably most permanent, error that the tangible goods industries can make when addressing those who share patented designs with others who can print them on 3-D printers, would be to treat this as a legal problem rather than a market or business problem, and to use the civil litigation and legislative process to seek redress.⁴⁸

In Canada, it is a fundamental feature of patent law that balance be maintained among interests maximizing technological innovation in the future and access to innovation in the present.⁴⁹ The purpose of granting patent protection in Canada is to “advance research and development and to encourage broader economic activity.”⁵⁰ Patents allow inventors to reap the fruits of their work by recuperating the costs invested to create the invention. At the same time, the public is allowed to use the product after paying a fee or purchase price. This exchange is called the patent bargain.⁵¹ It seeks to balance different interests, so

spread of technology-dependent companies like Uber and Lyft, lawmakers acknowledged struggling to devise rules for industries with little precedent.”).

⁴⁴ Storch, *supra* note 31 at 256.

⁴⁵ Rashmi Dyal-Chand, “Regulating Sharing: The Sharing Economy as an Alternative Capitalist System” (2015) 90:2 Tul L Rev 241 (discussing that “policy makers do not recognize the sharing economy as the different form of capitalism that it is” but that “[t]hey view it as breaking the rules of market behaviour, rather than creating a new set of rules” at 247).

⁴⁶ Andrew Coutts, “Is the 3D Printing Industry About to Start Turning Out Lawsuits?” (1 October 2012) *Digital Trends*, online: <<http://www.digitaltrends.com/cool-tech/3d-printing-and-copyright-lawsuits/>> .

⁴⁷ Storch, *supra* note 31 (where the author explains that legislative dominance by elite producers and manufacturers led many to adopt and “intense anti-copyright culture” at 184-185).

⁴⁸ *Ibid* at 301 [citations omitted].

⁴⁹ See E. Richard Gold & Michael Shortt, “The Promise Of The Patent In Canada And Around The World ” (2014) 30:1 CanIntellectual Property Rev.

⁵⁰ *Free World Trust c. Électro Santé Inc.*, 2000 SCC 66, 2000 CarswellQue 2728, 2000 CarswellQue 2731 (S.C.C.) at para. 42.

⁵¹ *Pfizer Canada Inc. v. Novopharm Ltd.*, 2012 SCC 60, 2012 CarswellNat 4250, 2012 CarswellNat 4251(S.C.C.) at para. 32 [*Teva*].

stakeholders can benefit from inventions. Maintained through a series of requirements such as disclosure of invention, the Supreme Court of Canada recently affirmed the need for a balancing of competing interests in patents, stating:

The patent system is based on a “bargain”, or *quid pro quo*: the inventor is granted exclusive rights in a new and useful invention for a limited period in exchange for disclosure of the invention so that society can benefit from this knowledge.⁵²

It is, therefore, vital to govern innovative technologies with laws that balance the interests of stakeholders and create an environment conducive for further growth and invention.⁵³ However, it is also important to recognize that the problem is not rooted in increased piracy or greater disregard for intellectual property laws.⁵⁴ Rather, the overarching trend is that markets are shifting from vertical structures to horizontal networks.⁵⁵ Laws around patents and 3D printing must evolve to allow the changing economy to flourish while still protecting the rights of patent-holders. Striking the right balance between consumer demands and patent-holder rights is vital to avoid unnecessary and lengthy legal disputes.

Appropriate legal frameworks are not only necessary to balance interests and to reflect economic shifts. Innovations create several other legal and safety concerns that must be addressed.⁵⁶ 3D printing technology poses challenges to heavily-regulated industries because ordinary people now have access to regulated items.⁵⁷ For example, 3D printers can print illicit drugs.⁵⁸ The ability to print guns has also been a hotly discussed issue.⁵⁹ This could create

⁵² *Ibid.*

⁵³ Sofia Ranchordas, “Does Sharing Mean Caring: Regulating Innovation in the Sharing Economy” (2015) 16:1 *Minn J L Sci & Tech* 413.

⁵⁴ Storch, *supra* note 31.

⁵⁵ Alex Stephany, *The Business of Sharing: Making it in the New Sharing Economy* (New York: Palgrave Macmillan, 2015).

⁵⁶ For Uber see e.g. Nellie Bowles, “Kalamazoo shooting spree puts Uber in spotlight over safety concerns” (22 February 2016) *The Guardian*, online: <<https://www.theguardian.com/technology/2016/feb/22/uber-driver-shooting-sprees-kalamazoo-michigan-ride-share-safety>>. For Airbnb see e.g. Ron Lieber, “Airbnb Horror Story Points to Need for Precautions” (14 August 2015) *The New York Times*, online: <http://www.nytimes.com/2015/08/15/your-money/airbnb-horror-story-points-to-need-for-precautions.html?_r=0>.

⁵⁷ Deven R. Desai & Gerard N. Magliocca, “Patents, Meet Napster: 3D Printing and the Digitization of Things” (2014) 102:6 *Geo LJ* 1691 at 1702.

⁵⁸ Ann Robinson, “Welcome to the complex world of 3D-printed drugs” (21 August 2015) *The Guardian*, online: <<http://www.theguardian.com/sustainable-business/2015/aug/21/welcome-to-complex-world-of-3d-printed-drugs-spritam-fda>>.

⁵⁹ See e.g. Danton Bryans, “Unlocked and Loaded: Government Censorship of 3D-Printed Firearms and a Proposal for More Reasonable Regulation of 3D-Printed Goods” (2015) 90:2 *Ind LJ* 901. See also Robert Beckhusen, “3-D Printer Company Seizes Machine From Desktop Gunsmith” (10 January 2012) *Wired*, online: <<http://>

increased pressure to restrict 3D printing.⁶⁰ However, the law should avoid overarching legal restrictions on the technology but rather limit access to the materials needed to create the questionable product.⁶¹ This would, again, prevent the dampening of innovation while ensuring the technology is not used for illegal purposes. Product liability is also a concern because consumers could print untested or malfunctioning products that could harm them.⁶² Commercial sellers would be liable for the harm under traditional strict liability.⁶³ However, the law becomes more complicated when other consumers' designs are responsible for damage.⁶⁴ Lawsuits will be challenging because harmed consumers would have to prove the CAD file was defective rather than the 3D printer, and it could be difficult to track down CAD file designers.⁶⁵ Plaintiffs would likely fail to establish claims, especially if they downloaded the design from a free, open-source sharing platform.⁶⁶ These issues illustrate that innovative technologies bear challenges beyond the intellectual property realm. These concerns must be considered when creating a legal framework to govern innovations.

Currently, 3D printing lacks an industry-specific legal regime but is regulated under existing intellectual property laws. In Canada, intellectual property is predominantly governed by the *Patent Act*,⁶⁷ *Copyright Act*,⁶⁸ and *Trade-marks Act*,⁶⁹ which stakeholders use to protect their products and creations. However, as explained above, fitting an innovation into existing legislation can hinder the innovation's growth or, alternatively, fail to protect stakeholders and their investments. While 3D printing technology brings challenging questions in all areas of intellectual property law,⁷⁰ this article focuses on those that arise in patent law, focusing on consumers' right to repair.

www.wired.com/2012/10/3d-gun-blocked/> (where a manufacturer of 3D printers revoked the lease on a 3D printer because the customer planned to use it to print a gun); Cyrus Farivar, "Worried about *accidentally* 3D printing a gun? New software will prevent it" (26 June 2013) *Ars Technica*, online: < <http://arstechnica.com/business/2013/06/worried-about-accidentally-3d-printing-a-gun-new-software-will-prevent-it/> > .

⁶⁰ Desai & Magliocca, *supra* note 57 at 1702.

⁶¹ *Ibid* at 1702.

⁶² See e.g. Nora Freeman Engstrom, "3-D Printing and Product Liability: Identifying the Obstacles" (2013) 162 U Pa L Rev Online 35 (for a discussion about the legal ramifications of 3D printing and product liability).

⁶³ Heidi Nielson, "Manufacturing Consumer Protection for 3-D Printed Products" (2015) 57:2 Ariz L Rev 609 at 616.

⁶⁴ *Ibid* at 617.

⁶⁵ *Ibid* at 618.

⁶⁶ *Ibid* at 618.

⁶⁷ *Patent Act*, R.S.C. 1985, c. P-4.

⁶⁸ *Copyright Act*, R.S.C. 1985, c. C-42.

⁶⁹ *Trade-marks Act*, R.S.C. 1985, c. T-13.

⁷⁰ See Tesh W. Dagne "Overview of Implications of 3D Printing upon Canadian Intellectual Property Law" (2015) 31 *Can Intellectual Property Rev.*

One of the technology's benefits is that consumers can repair or modify existing products by printing replacement parts that must be otherwise purchased.⁷¹ This can create financial losses for the product's patent-holders. There is a plethora of downloadable replacement parts on online-sharing platforms, ranging from parts for pools, over articles for vacuum cleaners, to car parts.⁷² Applying existing laws can have a negative impact on the sharing of these files and hinder the full potential of the technology. At the same time, improper legislation can damage the rights of patent-holders. The legislature must recognize the unique opportunities and challenges of 3D printing, so society can reap its benefits.⁷³ The tension with a consumer's right to repair in patent law is discussed in the upcoming sections.

(c) 3D Printing and Infringement of Patents

The unauthorized printing of a patented product constitutes "making" or "constructing" it and amounts to direct infringement.⁷⁴ Patent-holders can pursue claims against consumers who use a 3D printer to reconstruct their goods. Online sharing platforms of CAD files could also be held liable for indirect infringement if they facilitated the sharing of patent-protected products. Direct infringement occurs when anybody else but the patent-holder either makes, constructs, uses or sells the invention to others without permission or a license to do it because these activities fall within the exclusive right of the patent-holder.⁷⁵ Indirect infringement arises when a party materially contributes to, induces or facilitates the direct infringement of another person.⁷⁶ Brean argues that it will be

⁷¹ For a thorough examination of how repairing a Bugaboo stroller using 3D printing technology caused tension between a father and the creators of Bugaboo, see Kelsey W. Wilbanks, "The Challenges of 3D Printing To The Repair-Reconstruction Doctrine in Patent Law" (2013) 20:4 Geo Mason L Rev 1147.

⁷² Thingiverse, "Replacement Parts", online: < <https://www.thingiverse.com/explore/newest/household/replacement-parts/page:1> > .

⁷³ Weinberg, *supra* note 2.

⁷⁴ Brean, "Asserting Patents", *supra* note 28 at 789.

⁷⁵ Some of these activities have been given a broad interpretation, see e.g. *Monsanto Canada Inc. v. Schmeiser*, 2004 SCC 34, 2004 CarswellNat 1391, 2004 CarswellNat 1392 (S.C.C.) at para. 34 [*Monsanto*] (where the Supreme Court of Canada held that growing canola with genetically modified and patent-protected seeds amounts to "using" the invention and thus constitutes infringement); *Domco Industries Ltd. v. Mannington Mills Inc.*, 1990 CarswellNat 1038, [1990] F.C.J. No. 269 (Fed. C.A.), leave to appeal refused 1990 CarswellNat 1541 (S.C.C.) (where the Federal Court of Appeal held that "vending" has the same meaning as "selling"); *J.M. Voith GmbH v. Beloit Corp.*, 1997 CarswellNat 719, 1997 CarswellNat 2712, [1997] F.C.J. No. 486 (Fed. C.A.) (where the Federal Court of Appeal held that selling elements of a patent-protected invention for later assembly amounts to "making" and thus constitutes infringement).

⁷⁶ *Apotex Inc. v. Nycomed Canada Inc.*, 2011 FC 1441, 2011 CarswellNat 5280, 2011 CarswellNat 5738(F.C.) at paras. 4-18, affirmed 2012 CarswellNat 2154, 2012 CarswellNat 5764 (F.C.A.) (where the court discusses inducing infringement); see also *Dableh v. Ontario Hydro*, 1996 CarswellNat 2592, 1996 CarswellNat 735, [1996] 3 F.C.

more economical for patent-holders to pursue indirect rather than direct infringers.⁷⁷ He explains that “under the likely future business model where products are distributed via CAD files to be printed by the customers, it would be highly inefficient to combat infringement [by pursuing direct infringers]”.⁷⁸ Making and distributing a CAD file of a patented object does not amount to infringement.⁷⁹ Having mere possession over a CAD file also cannot constitute infringement because patents only extend to physical embodiments of inventions. It is also nearly impossible to track whether a customer actually printed the object using the CAD file. This leaves patentees vulnerable and helpless in combatting infringement.⁸⁰ Many scholars view this as problematic and argue that protection should extend to CAD files.⁸¹ As such, 3D printing technology

751 (Fed. C.A.), leave to appeal refused 1997 CarswellNat 3240 (S.C.C.) (the court held that the plaintiff was entitled to an injunction enjoining the defendant from inducing the use of the invention by third parties).

⁷⁷ Brean, “Asserting Patents”, *supra* note 28 at 804.

⁷⁸ *Ibid.*

⁷⁹ *Ibid.*

⁸⁰ *Ibid.*

⁸¹ See e.g. Gary N. Stewart, “A Three-Dimensional World in a Two-Dimensional Patent System: 3D Printing and the Importance of Claiming CAD Files” (2015) 118:1 W Va L Rev 477 (the author argues that current patent laws fail to protect products from infringement using 3D printing technology and proposes that CAD files should be protected as software. This would extend liability for infringement to the sharing of CAD files rather than just printing the actual product); Daniel Harris Brean, “Patenting Physibles: A Fresh Perspective for Claiming 3D-Printable Products” (2015) 55:4 Santa Clara L Rev 837 (the author laments that CAD files are currently unprotected by IP legislation. He suggests that *Beauregard* claims are the best option for protecting patents. This type of claim would extend patent protection to the CAD file of a patent-protected product. As such, any person that makes, uses, sells or offers to sell a CAD file would be liable for patent infringement); Sam Dillon, “Infringement by Blueprint: Protecting Patent Rights in a World of Low-Cost 3D Printing” (2014) 42:3 AIPLA QJ 425 (the author explains that “[e]xtending software *Beauregard* claims to create *Beauregard* blueprint claims, however, would allow patent holders to pursue direct infringement actions against digital blueprint distributors that drive the broader infringement of patent rights. This would move the liability for direct infringement upstream to the parties who are most responsible” at 457). But see Nicole A. Syzdek, “Five Stages of Patent Grief to Achieve 3D Printing Acceptance” (2015) 49:2 USF L Rev 335 (“the CAD file is not the actual invention. The CAD file digitally represents the novel invention [...] [and] claims covering the CAD file would fail under the non-obviousness requirement and could not be protected under the patent” at 353 [citations omitted]); Skyler R. Peacock, “Why Manufacturing Matters: 3D Printing, Computer-Aided Designs, and the Rise of End-User Patent Infringement” (2014) 55:5 Wm & Mary L Rev 1933 (“information contained within computer-aided design files is ultimately a product of the public domain and not immediately subject to regulation” at 1936). For a middle ground as to whether IP protection should extend to CAD files see Tabrez Y. Ebrahim, “3D Printing: Digital Infringement & Digital Regulation” (2016) 14:1 NW J Tech & Intell Prop 37 (“[i]n comparing the differences between an intangible electronic representation and its tangible physical embodiment, the time to transition, the complexity in

poses a threat to patent-holders, who seek to maintain the monopolies on their goods. At the same time, it is a well-established principle that intellectual property laws should not oppress the public:

[c]opyright, like patent right, is a monopoly restraining the public from doing that which, apart from the monopoly, it would be perfectly lawful for them to do. The monopoly is itself right and just, and is granted for the purpose of preventing persons from unfairly availing themselves of the work of others, whether that work be scientific, literary, or artistic. The protection of authors, whether of inventions, works of art, or of literary compositions, is the object to be attained by all patent and copyright laws. The Acts are to be construed with reference to this purpose. *On the other hand, care must always be taken not to allow them to be made instruments of oppression and extortion.*⁸²

Patents can become harmful and oppressive monopolies when granted to individuals without safeguards to the public's access to ideas and information.⁸³ Patent law, therefore, affords consumers several defences they can use when facing allegations of patent infringement.⁸⁴ This article specifically examines the defence of repair, whereby consumers are permitted to repair patent-protected products, and subsequently argues the defence should be expanded to an all-encompassing consumer right to repair and modify products entirely.

II. THE RIGHT TO REPAIR DEFENCE IN PATENT LAW

Defendants can successfully argue they merely repaired a patent-protected item rather than reconstructed it. It is trite law that consumers acquire a licence to repair a product when they purchase it.⁸⁵ However, the line between repair

transitioning, and the degree in transformation from intangible to tangible should be the focus. These comparisons should be the new test for differentiating what is tangible from what is intangible in patent law. An implication of such a new standard is that if the transition time, complexity, and degree of transformation are substantial, then the intangible electronic representation and the tangible electronic representation should not be treated alike" at 52).

⁸² *Hanfstaengl v. Empire Palace*, [1894] 3 Ch. 109 (U.K. H.L. (Eng.)) [emphasis added] [*Hanfstaengl*].

⁸³ See Ron D. Katznelson, "Bad Science in Search of 'Bad' Patents" (2007) 17 Federal Circuit Bar J; Christine G. Davik, "A Panoptic Approach to Information Policy: Utilizing a More Balanced Theory of Property in Order to Ensure the Existence of a Prodigious Public Domain" (2007) 15:1 J Intellectual Property L.

⁸⁴ Most commonly defendants argue that the patent is invalid, see e.g. *Teva*, *supra* note 51 at para. 32. There are also several fair uses of patent-protected items, such as research, education or, for the purpose of this paper, repair of an item.

⁸⁵ See e.g. *Solar Thomson Engineering Co. v. Barton*, [1977] R.P.C. 537 (C.A.) (where Lord Justice Buckley explains "[i]t has long been recognised that a purchaser of a patented article may carry out repairs to it without being held liable for infringement, On the other hand he cannot manufacture a new article which infringes the patent and claim that he has not infringed merely because in the manufacture he has used parts derived from a

and reconstruction is unclear. There is no bright-line test for determining whether something is a permissible repair or a prohibited reconstruction.⁸⁶ Several cases in Canada, the U.K., and the U.S. provide greater understanding for the distinction between both actions.

(a) Canada

One of Canada's leading decisions examining the distinction between repair and reconstruction is *Rucker Co. v. Gavel's Vulcanizing Ltd.*⁸⁷ (*Rucker*). Here, the Federal Court held that the defendant's actions amounted to manufacture rather than repair because the defendant's process essentially created a new merchantable product.⁸⁸ The plaintiff manufactured, sold and serviced equipment for oil and gas wells, including blowout preventers and rubber packing elements. These products were used at oil-drilling rigs to prevent flammable oil and gas from escaping the ground and reaching the surface. The plaintiff alleged the defendant's business engaged in reconstructing blowout preventers and rubber packing elements, which were produced by the plaintiff. The defendant maintained it only repaired these items when customers brought them in for repairs. The customers legally obtained the products from the plaintiff and generally received the same specific item back from the defendant they originally submitted. However, the defendant's brochure referred to an "exchange" when submitting items and also stated products were "completely rebuilt". The court ruled against the defendant:

[a]ll that is left of the packing element sent for reconstruction is really the teeth, all the rubber having been burned away. They are then assembled in the same manner as plaintiffs' packing element in a mould with new rubber, any damaged components or teeth being substituted if necessary, although this rarely takes place. *This really results in a new merchantable article and cannot be considered as a repair.*⁸⁹

In *MacLennan v. Produits Gilbert Inc.* the Federal Court of Appeal confirmed "[i]t is well-established that the purchaser of a patented article may repair the components without infringing the patent", which "is based on the fact that the patent holder is presumed to permit this type of activity".⁹⁰ At issue in this case was whether the defendant could replace the teeth of a patent-protected

patented article sold by the patentee" at 554); see also *Dunlop Pneumatic Tyre Co. v. Neal* (1899), 16 R.P.C. 247 (C.A.).

⁸⁶ *Hewlett-Packard Co. v. Repeat-O-Type Stencil Mfg. Corp. Inc.*, 123 F.3d 1445 (U.S. Fed. Cir., 1997) at 1452 [*Hewlett-Packard*].

⁸⁷ *Rucker Co. v. Gavel's Vulcanizing Ltd.*, 1985 CarswellNat 571, [1985] F.C.J. No. 1031 (Fed. T.D.), varied 1987 CarswellNat 1256 (Fed. T.D.).

⁸⁸ *Ibid.*

⁸⁹ *Ibid* at 57 [emphasis added].

⁹⁰ *MacLennan c. Gilbert Tech Inc.*, 2008 FCA 35, 2008 CarswellNat 196, 2008 CarswellNat 2435 (F.C.A.) at para. 14.

chainsaw, which was used in the logging industry. The patent was a combination patent, which consisted of several non-patented parts. The novelty of a combination patent comprises of the way these parts are combined to work together. The chainsaw was constructed so its teeth broke off when it hit a hard object. This preserved the more expensive part of the chainsaw, namely the disc that was attached to the teeth. The patent-holder argued that “[t]he very essence of the patented invention [was] based on the fact that the tooth and the tooth holder detach[ed] from the [chainsaw] disc during normal use, thus saving the disc”.⁹¹ The defendant’s business was to replace chipped-off chainsaw teeth. Thus, every time the defendant company replaced the teeth for its customers, it reconstructed the invention rather than repaired it.⁹² The court ruled in favour of the plaintiff holding that replacing the chainsaw teeth amounted to reconstruction.

(b) United Kingdom

The distinction between repair and reconstruction in the United Kingdom is similar to Canada’s approach. Justice SwinfenEady explained the distinction in *Sirdar Rubber Company, Limited v. Wallington, Weston & Co.*:

it is a question of fact in each case whether the work which has been done may fairly be termed a “repair”, regard being had in each case to the exact nature of the invention. The purchaser of a patented article has a right to prolong its life by fair repair, but he has not any right to obtain, without licence from the patentee, a substantially new article, made in accordance with the invention, retaining only some subordinate part of the old article, so that it may be said that the combination is not entirely new.⁹³

In that case, the court held that replacing the rubber part of a tire constituted a repair and did not infringe on the patent. Lord Halsbury explained this concept concisely by stating that “[the] principle is quite clear although its application is sometimes difficult; you may prolong the life of a licensed article but you must not make a new one under the cover of repair”.⁹⁴

The U.K. Supreme Court recently revisited the subject again in *Schütz (UK) Ltd. v. Werit (UK) Ltd.*⁹⁵ The product at issue was a bulk container used to transport large quantities of liquids. The plaintiffs held a patent over constructing these bulk containers. The defendant’s business comprised of purchasing old or damaged containers, removing the bottles within them,

⁹¹ *Ibid* at para. 17.

⁹² *Ibid*.

⁹³ *Sirdar Rubber Co. v. Wallington Weston & Co.*, [1905] 1 Ch. 451 (Eng. Ch. Div.) at 453-454, SwinfenEady J. [citations omitted].

⁹⁴ *Sirdar Rubber Co. Ltd. v. Wallington Weston & Co.* (1907), 24 R.P.C. 539 (U.K. H.L. (Eng.)) at 543.

⁹⁵ *Schütz (UK) Ltd. v. Werit (UK) Ltd.*, [2013] U.K.S.C. 16 (U.K. S.C.).

repairing these bottles and re-selling the containers at a discount. Here the court explained that “[r]epair of an item frequently involves replacement of one or some of its constituents”.⁹⁶ Repairs can also be substantial in terms of cost or the amount of the original item that is replaced.⁹⁷ Each case must be assessed according to its own circumstances.⁹⁸ The court decided that the invention consisted of the entire container structure rather than just the bottle.⁹⁹ Removing and replacing the bottle failed to amount to reconstruction.

(c) United States

U.S. case law concerning repair and reconstruction evolved over time. The first major decision was *American Cotton-Tie Co. v. Simmons*¹⁰⁰ (“*Cotton-Tie*”). In this case, the plaintiff produced metallic ties for cotton bales. The metallic ties were patent-protected and were used to transport cotton to a mill. Upon arrival, workers cut the cotton ties to access the raw material. At this point the ties became unusable and were sold as scrap iron. The defendants bought these scrap cotton ties and refurbished them, so they could be used again.¹⁰¹ It then sold these refurbished ties to customers. Here the U.S. Supreme Court explained that “[b]ecause the defendants *prepare and sell* the arrow tie, composed of the buckle or link and the band, intending to have it used to bale cotton and to produce the results set forth [. . .] they infringe those patents”.¹⁰² As such, selling the product was part of the reason the defendants were held liable for patent infringement. However, several cases suggest that *Cotton-Tie* is no longer valid law and that the distinction is more relaxed today.¹⁰³

The current leading U.S. decision that distinguishes repair and reconstruction is *Aro Manufacturing Co. v. Convertible Top Replacement Co.*,¹⁰⁴ commonly referred to as *Aro I* because the U.S. Supreme Court considered an issue concerning the same parties again in a later case.¹⁰⁵ Here the plaintiff held a patent over the rooftop of convertible cars. The patent was a combination patent consisting of the fabric part that extended over the roof and metal components that attached the fabric to the car.¹⁰⁶ The fabric itself was

⁹⁶ *Ibid* at para. 50.

⁹⁷ *Ibid* at para. 51.

⁹⁸ *Ibid* at para. 58.

⁹⁹ *Ibid* at para. 71.

¹⁰⁰ *American Cotton-Tie Co. v. Simmons*, 1 S.Ct. 52 (U.S.S.C., 1882).

¹⁰¹ *Ibid* at 91.

¹⁰² *Ibid* [emphasis added].

¹⁰³ See e.g. *TSC Industries, Inc. v. International Harvester Co.*, 406 F.2d 53 (U.S. C.A. 7th Cir., 1968); *Fromberg, Inc. v. Gross Mfg. Co.*, 328 F.2d 803 (U.S. C.A. 9th Cir., 1964).

¹⁰⁴ *Aro Manufacturing Co. v. Convertible Top Replacement Co.*, 365 U.S. 336 (U.S.S.C., 1961) [*Aro I*].

¹⁰⁵ *Aro Manufacturing Co. v. Convertible Top Replacement Co.*, 377 U.S. 476 (U.S. S.C., 1964).

unpatented,¹⁰⁷ but was the “heart” of the invention.¹⁰⁸ Owners of these convertible cars often sought to replace the fabric because it became stained over time.¹⁰⁹ The defendant replaced these rooftop fabrics but refused to pay a royalty fee to the patent-holder. The issue was whether replacing the worn-out fabric of the patented convertible top amounted to infringing reconstruction or was permissible repair.¹¹⁰ The court explained that “if anything is settled in the patent law, it is that the combination patent covers only the totality of the element in the claim and that no element, separately viewed, is within the grant”.¹¹¹ Replacing an unpatented part of a patented product “is no more than the lawful right of the owner to repair his property”.¹¹² The defendant’s actions were permissible repairs.

A few years later, the Texas District Court applied these principles in *Hydril Company v. Crossman Engineering Inc.*¹¹³ The court was asked to examine whether the defendant’s business of refurbishing blowout preventers, similar to the product in *Rucker*, constituted a permissible repair or a reconstruction. These blowout preventers were required as standard equipment on oil rigs and were a great commercial success.¹¹⁴ The court held that the articles in question “[were] a new product in all respects, except that salvaged metal parts instead of newly-cast metal parts [were] used”.¹¹⁵ Similar to *Rucker*, the defendants sold the product on an exchange or trade-in basis, where the customer traded a worn out item for a refurbished one.¹¹⁶ The defendant was found liable for infringement because it reconstructed the plaintiff’s patent-protected product.¹¹⁷

A more recent noteworthy decision is *Hewlett-Packard Co. v. Repeat-O-Type Stencil Mfg. Corp. Inc.*¹¹⁸ The plaintiff manufactured disposable printer cartridges, which were non-refillable.¹¹⁹ Customers were expected to discard cartridges after they ran out of ink to purchase new ones. The defendant bought the plaintiff’s cartridges and modified them so they could be refilled and sold them as refillable printer cartridges.¹²⁰ According to the plaintiff, these

¹⁰⁶ *Aro I*, *supra* note 104 at 599.

¹⁰⁷ *Ibid* at 601.

¹⁰⁸ *Ibid* at 603.

¹⁰⁹ *Ibid* at 338.

¹¹⁰ *Ibid* at 602.

¹¹¹ *Ibid* at 604, Whittaker J.

¹¹² *Ibid*.

¹¹³ *Hydril Co. v. Crossman Engineering Inc.*, 152 U.S.P.Q. 171 (U.S. E.D. Tex., 1966).

¹¹⁴ *Ibid* at para. 19.

¹¹⁵ *Ibid* at para. 19.

¹¹⁶ *Ibid* at para. 21.

¹¹⁷ *Ibid* at para. 26.

¹¹⁸ *Hewlett-Packard*, *supra* note 86.

¹¹⁹ *Ibid* at 1448.

modifications created a new product and constituted reconstruction.¹²¹ The court explained that “[the plaintiff] [failed] to recognize the distinction between what it intended to be the life of the cartridge, as determined by the ink supply, and its actual useful life”.¹²² The defendant’s modifications were repairs because they extended the life of the cartridge. The court also dismissed the plaintiff’s argument that the patent-holder’s intentions should be considered when determining whether something amounted to a reconstruction.¹²³

In conclusion, all three jurisdictions have a similar approach to distinguishing repair from reconstruction. The courts look at whether the defendant prolonged the life of the contested product, which would amount to permissible repair, or whether the defendant created a new merchantable article, which would amount to impermissible reconstruction. Notably, the cases predominantly concern defendants, who re-sell the plaintiff’s original goods for a profit. Unlike commercial actors, we argue that consumers should be permitted to repair and modify patent-protected goods and subsequently share their innovations online for free without breaching the rights of patent-holders.

III. THE CONSUMER’S RIGHT TO REPAIR USING 3D PRINTING TECHNOLOGY

As discussed, patent law is unprepared for the fundamental shift in product manufacturing as 3D printing becomes increasingly widespread.¹²⁴ A failure to reflect new dynamics in the economy can cause increased tensions between patent-holders and consumers. Absent defined rights and responsibilities, conflicts could evolve to mirror the Peer-to-Peer (P2P) file sharing battles with respect to the internet.¹²⁵ The disputes between consumers and music producers in the wake of the internet revolution were costly, time-consuming and did not lead to positive outcomes.¹²⁶ The problem was that the digitization of the music industry turned rivalrous goods, such as CDs and tapes, into non-rivalrous information, thereby eradicating music producers’ monopolies.¹²⁷ Desai and Magliocca explain that “[t]he reproduction of an idea does not consume it” and that consumers “can all use it simultaneously”.¹²⁸ Once products are turned into information that can be shared online, companies that originally controlled

¹²⁰ *Ibid.*

¹²¹ *Ibid* at 1450.

¹²² *Ibid* at 1453.

¹²³ *Ibid.*

¹²⁴ Brean, “Asserting Patents”, *supra* note 28 at 813.

¹²⁵ Ben Depoorter, “Intellectual Property Infringements & 3D Printing: Decentralized Piracy” (2014) 65: 6 *Hastings LJ* 1483 at 1493-1495.

¹²⁶ *Ibid* at 1493-1495; Lemley, *supra* note 35 at 484.

¹²⁷ Desai & Magliocca, *supra* note 57 at 1697.

¹²⁸ *Ibid.*

access to these products will have a hard time maintaining that control. In the same manner, 3D printing turns physical products into information that can be shared infinitely between consumers, which instinctively goes against the interests of patent-holders.¹²⁹

This conflict is engrained in the blurry distinction between repair and reconstruction when it comes to 3D printing technology. Consumers want freedom to repair and modify products using 3D printing technology. Patent-holders want control over their inventions to reap the benefits of their labour and efforts in creating the patented product. A clear distinction between permissible repair and prohibited reconstruction would decide whether a patent-holder should be compensated for consumers' actions.¹³⁰ It would show where a patent-holder's rights end and a consumer's freedom begins. Storch argues that "[u]ltimately, technology moves on and. . .you can't put the proverbial toothpaste back in the tube".¹³¹ As such, a consumer's right to repair patent-protected items using 3D printing technology should be clear to avoid legal disputes and avoid stifling innovation. The following part of the article examines challenges in distinguishing between repair and reconstruction in 3D printing and provides clear guidelines that could properly balance stakeholder interests and support the growth of a new market economy in patent law.

(a) Challenges

There are several challenges in distinguishing permissible repair from impermissible reconstruction using 3D printing technology.¹³² As illustrated in the case law, the distinction varies on a case-by-case basis and is unclear. This makes it difficult for patent-holders to track and establish infringement. The technology can easily help consumers create small replacement parts as well as reconstruct an entire product from the comfort of their home.¹³³ Consumers can also download and print components of a patented product instead of copying or sharing the whole item.¹³⁴ Tracing patent infringement into people's homes is difficult. A patent does not extend to the CAD file and it is challenging, if not impossible, for patent-holders to monitor the use of CAD files.¹³⁵ 3D printers allow consumers to move seamlessly between the physical and digital world.¹³⁶ Although possessing a CAD file is not infringement "[t]he physical object is

¹²⁹ *Ibid.*

¹³⁰ James C. Bageman, "Contributory Infringement and the Repair Doctrine" (1965) 38:2 S Cal L Rev 363 at 370.

¹³¹ Storch, *supra* note 31 at 252.

¹³² Wilbanks, *supra* note 71 at 1150; see also Weinberg, *supra* note 2 at 9.

¹³³ Depoorter, *supra* note 125 at 1495.

¹³⁴ Wilbanks, *supra* note 71 at 1170.

¹³⁵ Brean, "Asserting Patents", *supra* note 28 at 807.

¹³⁶ Timothy R. Holbrook & Lucas S. Osborn, "Digital Patent Infringement in an Era of 3D Printing" (2014) 48:4 UCD L Rev 1319 at 1321-1322.

merely a button press (and a bit of time and print material) away”.¹³⁷ The difference between a CAD file and the printout of a file is thus described as arbitrary by some.¹³⁸ Extending protection to CAD files under patent law, however, wouldn’t protect patented products from a consumer’s ability to reproduce objects using a 3D scanner.¹³⁹ Aggressive protection and warnings may also stigmatize a consumer’s ability to make lawful repairs and thwart innovation.¹⁴⁰ Wilbanks outlines that applying varying standards under the repair doctrine confuses consumers and patent-holders alike.¹⁴¹ Neither know what their legal rights and obligations are and neither can predict the outcomes of their claims. This will affect their legal decisions, such as whether to settle outside of court.¹⁴² Uncertain legal rights, therefore, open the possibility for unpredictable and inconsistent outcomes in litigation.¹⁴³ As such, distinguishing between repair and reconstruction is challenging in the use of 3D printing technology.

A lack of clarity can have unfavourable consequences on the development of the technology. Manufacturers will fight to gain a monopoly over replacement parts.¹⁴⁴ They will lobby to restrict 3D printing, which can prevent growth and stifle consumer innovation. Patent-holders will argue for expanded protection over patents as consumers find more convenient and efficient ways to repair and modify products.¹⁴⁵ They will claim that failing to protect intellectual property will dampen innovation although there is increasing skepticism whether it actually would.¹⁴⁶ Weinberg explains that 3D printing will struggle to fight restrictive laws as have many industries in the past:

[a]fter all, the ability to copy and replicate is the ability to infringe on copyright, patent, and trademark. But the ability to copy and replicate is also the ability to create, expand upon, and innovate. Just as with the printing press, the copy machine, and the personal computer before it, some people will see 3D printing as a disruptive threat. Similarly, just as

¹³⁷ *Ibid* at 1331.

¹³⁸ *Ibid*; see also discussion in *supra* note 81.

¹³⁹ Syzdek, *supra* note 81 at 357.

¹⁴⁰ *Ibid* at 354.

¹⁴¹ Wilbanks, *supra* note 71 at 1165.

¹⁴² *Ibid* at 1170.

¹⁴³ *Ibid*.

¹⁴⁴ Weinberg, *supra* note 2 at 14.

¹⁴⁵ *Ibid* at 13; see also Desai & Magliocca *supra* note 57 (“the argument is that the law must rush in, because norms, markets, code and architecture are no longer enough. Without legal protection, they say, some creations or inventions will not occur” at 1704-1705); Depoorter, *supra* note 125 (“IP holders might resort to aggressive tactics: strike hard and set salient examples that highlight the dangers of infringing patent. . . by way of unauthorized 3D printing” at 1497); Syzdek, *supra* note 81 at 345, 354; Lemley, *supra* note 35 at 507-508.

¹⁴⁶ See Lemley, *supra* note 35 at 463.

with the printing press, the copy machine, and the personal computer, some people will see 3D printing as a groundbreaking tool to spread creativity and knowledge. It is crucial that those who fear not stop those who are inspired.¹⁴⁷

Essentially, the legislature and judiciary “will be asked to weigh concrete losses today against future benefits that will be hard to quantify and imagine”.¹⁴⁸ Governments instinctually protect existing industries that are the driving forces behind current economies, rather than support new emerging technologies that could destroy them.¹⁴⁹ However, overly aggressive protection of patents can undermine consumers’ support for IP rights.¹⁵⁰ Ultimately, 3D printing will not disappear and patent-holders will have to accept the technology.¹⁵¹ Nonetheless, governments will have to provide protection to patent-holders.¹⁵² Furthermore, although the sharing economy has many positive aspects, it is still susceptible to greed.¹⁵³ Rather than supporting the growth of horizontal markets, some companies may try to capitalize on ineffective patent laws. An innovation “may be disruptive and it may not be business as usual, but it’s business all the same”.¹⁵⁴ Therefore, the needs of consumers must be balanced with the rights of patent-holders to preserve the principles of patent law and the sharing economy. Clarity is required to avoid unfavourable consequences of the tensions between repair, reconstruction, and competing interests.

¹⁴⁷ Weinberg, *supra* note 2 at 4.

¹⁴⁸ *Ibid* at 15.

¹⁴⁹ The Economist, “Industrial Revolution”, *supra* note 6.

¹⁵⁰ Depoorter, *supra* note 125 at 1498-1501.

¹⁵¹ See Syzdek, *supra* note 81 (the author applies the Kübler-Ross model of grief to patent-holders showing how they will deal with 3D printing technology. The model is normally used to illustrate stages of grief in individuals with terminal illnesses. The author argues that patent-holders will ultimately have to accept the technology); see also Lemley, *supra* note 35 at 502.

¹⁵² Scholars propose a number of different ways to address the rights of patent-holders. See e.g. Tyler Macik, “Global Data Meets 3-D Printing: The Quest for a Balanced and Globally Collaborative Solution to Prevent Infringement in the Foreseeable 3-D Printing Revolution” (2015) 22:1 *Ind J Global Legal Stud* 149 (the author proposes the creation of an intergovernmental 3-D CAD file database run by the World Intellectual Property Organization(WIPO) that would enable member nations to cross-reference patents and utilize file recognition software prior to printing any object); Desai & Magliocca, *supra* note 57 at 1714 (the authors propose a legislation that would impose notice and takedown rules on websites hosting CAD files); Ebrahim, *supra* note 81 at 67 (the author also proposes a legislation targeting file sharing websites that would be liable for contributory infringement).

¹⁵³ Jason Proctor, “Debate over Airbnb and Uber reveals hypocrisy of ‘sharing’ economy” (10 April 2016) *CBC News*, online: < <http://www.cbc.ca/news/canada/british-columbia/uber-airbnb-sharing-economy-1.3526114> > .

¹⁵⁴ *Ibid*.

(b) Balancing Interests in 3D printing: Recommendation

Consumers should be granted an all encompassing legal right to repair and modify patent-protected items in patent law given three conditions: (1) the original product was purchased legally; (2) the repair or modification is used for private purposes; and (3) consumers gain no financial benefit from posting the repair or modification online for others. As such, consumers could not sell their innovations for a profit. These conditions would give them freedom to repair and modify products while patent-holders still generated revenues through the articles' initial sale. Sharing or selling CAD files for the original patent-protected product would still amount to infringement.¹⁵⁵ However, any replacement parts or modifications would not constitute infringement if they were shared for free. On a broader scale, this recommendation could encourage the sharing economy and build positive relationships between consumers and patent-holders. It could even have a positive impact on product sales because consumers would be enticed to purchase articles knowing they could easily repair, modify and even customize them by downloading related CAD files for free.

There are several theories discussed by other authors that support this recommendation. For example, Lemley uses basic principles of economics to illustrate that IP rights artificially replicate scarcity.¹⁵⁶ He explains that "IP has allowed us to cling to scarcity as an organizing principle in a world that no longer demands it".¹⁵⁷ Information is a public, non-rivalrous good.¹⁵⁸ People are creating an astonishing amount of content without the incentive of IP rights,¹⁵⁹ which indicates that IP theory may be wrong about what motivates people to create.¹⁶⁰ Rather than wanting monetary rewards, consumers may be inspired to create for internal motivations or to share their work with others.¹⁶¹ IP laws, however, will still be necessary for products and services that require a great amount of time and resources to be produced.¹⁶²

Storch argues that patent-holders will be more successful in protecting their inventions by relying on moral persuasion than on stricter laws.¹⁶³ He explains that "the path forward is through good business practices and engagement with consumers", and that "[m]anufacturers should acknowledge their loss of a technical monopoly, and the concomitant loss of legal monopoly protection".¹⁶⁴ Patent law should not be an "[instrument] of oppression and extortion".¹⁶⁵

¹⁵⁵ Wilbanks, *supra* note 71 at 1176.

¹⁵⁶ Lemley, *supra* note 35.

¹⁵⁷ *Ibid* at 465.

¹⁵⁸ Desai & Magliocca, *supra* note 57 ("[n]onrivalrous goods are like an idea; once created, their capacity is infinite" at 1697).

¹⁵⁹ Lemley, *supra* note 35 at 486-487.

¹⁶⁰ *Ibid* at 492.

¹⁶¹ *Ibid*.

¹⁶² *Ibid* at 496.

¹⁶³ Storch, *supra* note 31.

Rather, companies should focus on turning challenges into business opportunities. iTunes and Amazon, for example, turned the threat of rampant online sharing of music and books into new business ventures.¹⁶⁶ They are very successful today. There is evidence to show that “[c]itizens are willing to comply with laws they view as legitimate and aligned with their values. . . and such feelings of legitimacy are a better predictor of compliance than are deterrent actions”.¹⁶⁷ An attempt at squashing consumers’ enthusiasm for 3D printing would backfire on patent-holders. Furthermore, infringement through the use of 3D printers will likely not be as rampant as some predict. The technology still fails to rival the cost and convenience of traditional manufacturing because consumers have to buy a 3D printer and know how to design or modify CAD files.¹⁶⁸ These obstacles could prevent some consumers from adopting the technology. Therefore, premature restrictions are unnecessary and could be damaging to the consumers’ perception of manufacturers.¹⁶⁹ Giving consumers an all-encompassing right to repair and modify patent-protected goods would strike the right balance between the challenges and opportunities of 3D printing.

(c) The Way Forward

In the future, consumers “will look to solve problems by designing and creating their own solutions”.¹⁷⁰ 3D printing is increasingly appealing to consumers as the costs of printers decrease and their technological capabilities increase.¹⁷¹ Some basic printers already rival the abilities of more industrial designs used by large companies.¹⁷² Doherty also explains the vast benefits of online-sharing platforms:

3D printing technology has the potential to open up a vast commons of inventive ideas, stocked with user-generated innovations. Such a commons would generate substantial social good, serving the disclosure function of patent law without the need to offer monopolies in exchange. Growth of this commons, and the preservation of the knowledge users commit to it, should be a priority for members and supporters of this growing community of user-innovators.¹⁷³

¹⁶⁴ Storch, *supra* note 31 at 309.

¹⁶⁵ Hanfstaengl, *supra* note 82.

¹⁶⁶ Desai & Magliocca, *supra* note 57 (where the authors explain that “[l]ower prices for single items, safe files rather than corrupted or malware-infested ones, easy access, and playability opened new markets for digital content. Similar factors should benefit patentees who embrace 3D printing” at 1705).

¹⁶⁷ Storch, *supra* note 31 at 283-284.

¹⁶⁸ Finocchiaro, *supra* note 28 at 507.

¹⁶⁹ *Ibid.*

¹⁷⁰ Weinberg, *supra* note 2 at 5.

¹⁷¹ Brean, “Asserting Patents”, *supra* note 28 at 780.

¹⁷² *Ibid.*

As the technology advances, its legal framework must do the same.¹⁷⁴ It is crucial to establish a predictable and informed legal regime that properly balances the interests between consumers and manufacturers without inhibiting the potential of the technology. Weinberg explains that “the community must work to educate policy-makers and the public about the benefits of widespread access”, so that “when legacy industries portray 3D printing as a hobby for pirates and scofflaws, their claims will fall on ears too wise to destroy the new new [sic] thing”.¹⁷⁵ Finocchiaro also urges that “social benefits of creativity and innovation must remain paramount in calculating the . . . balance [between IP protection and technical innovation]”.¹⁷⁶ Lemley offers the following insight with respect to the future of 3D printing and patent laws:

[w]e are still a long way from a post-scarcity world. But as more and more pieces of the economy are based on information coupled with cheap, decentralized supplies of physical goods, our IP rules will take on increasing importance. The point of the IP laws is to encourage creation. If those laws are not promoting innovation and creation in that new world, we need to rethink them.¹⁷⁷

Our recommendation to provide consumers with an all-encompassing right to repair and modify patent-protected goods, as well as share their innovations with others online, aligns with the above-mentioned principles. 3D printing technology is here to stay and nurturing and supporting it while balancing the interests of patent-holders will benefit consumers and society as a whole.

IV. CONCLUSION

This article examined the consumer’s right to repair patent-protected objects using 3D printing technology in Canadian patent law. Due to its innovative nature and connection to the sharing economy, 3D printing is bound to disrupt today’s manufacturing markets. The current legal system, however, is not equipped to address this new technology appropriately. It is vital to balance the interests of patent-holders with innovative consumers, so 3D printing can thrive without eroding existing patent rights and investments by stakeholders. As such, we argued consumers should be granted an all-encompassing legal right to repair and modify patent-protected items given three conditions: (1) the consumers legally purchased the good; (2) the consumers use the repaired, modified, or reconstructed item for private purposes; and (3) the consumers gain no financial benefit from the repair or modification of the item. This would give consumers enough freedom to pursue greater innovation. At the same time, patent-holders

¹⁷³ Doherty, *supra* note 28 at 371.

¹⁷⁴ Wilbanks, *supra* note 71 at 1181.

¹⁷⁵ Weinberg, *supra* note 2 at 15.

¹⁷⁶ Finocchiaro, *supra* note 28 at 490.

¹⁷⁷ Lemley, *supra* note 35 at 504.

would be able to seek legal recourse if consumers shared the entire patent-protected good or sold their innovations for profit.