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Title

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Permalink

<https://escholarship.org/uc/item/7ph6p35h>

Journal

UC Irvine Law Review , 8(1)

ISSN

2327-4514

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Publication Date

2018

Extending Liability to the Micro-Manufacturers of the Future: Applying the Casual Seller Exception in the Context of 3-D Printing

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3-D printing's growing affordability has, for the first time, given small household manufacturers the ability to match the complexity and sophistication of products manufactured by large manufacturers. Although some scholars suggest that the casual seller exception will limit the application of products liability laws to some small manufacturers who use 3-D printing to make and sell products, this is not the case in all jurisdictions and should not be the case in others. First, these scholars overlook the fact that some jurisdictions, such as California, do not apply the casual seller exception to manufacturers. Second, there are policy justifications, such as deterring the production of defective products, which warrant the application of products liability laws to small 3-D printing manufacturers in those jurisdictions that protect casual manufacturers from the application of products liability laws.

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INTRODUCTION

Prior to the eighteenth century, product manufacturing depended primarily on handcraftsmanship and manual labor.¹ Preindustrial craftsmen relied on their technical expertise of specialty trades to produce goods.² However, with the Industrial Revolution came a decreased dependence on technical expertise. Although factory workers held more specialized roles in the manufacturing process, the development of automated-labor allowed less-skilled workers to replace their preindustrial predecessors.³ Society no longer relied exclusively on expert craftsmen to produce household items. The same remains true today. Mass production still dominates the manufacturing industry.⁴ So much so that it seems hard to imagine a world where everyday household products are created by individuals, not by large manufacturing plants.

Despite this, some believe that three-dimensional (3-D) printing has the potential of ushering in a new era of craftsmen-manufacturers. 3-D printing is the process of creating 3-D objects by laying down successive layers of material until the entire object is created.⁵ Many believe that the growing popularity and affordability of 3-D printing has the capability to revolutionize the manufacturing

1. PETER N. STEARNS, *THE INDUSTRIAL REVOLUTION IN WORLD HISTORY* 21 (4th ed. 2013).

2. *Id.*

3. *Id.* at 21, 31–32.

4. PETER F. DRUCKER, *THE PRACTICE OF MANAGEMENT* 86 (Routledge 2011) (1955).

5. *What is 3D Printing?*, 3DPRINTING.COM, <https://3dprinting.com/what-is-3d-printing/> [<https://perma.cc/3CSV-FPRS>] (last visited Aug. 1, 2016).

industry.⁶ For the first time ever, there exists technology that allows small-localized manufacturers to match the sophistication and complexity of goods manufactured by commercial manufacturers.⁷ Although 3-D printing is a few decades old, it has only recently become available to household consumers.⁸ Accordingly, some in the industry predict that 3-D printers will eventually become a common household item.⁹

Although 3-D printing may spawn a new era of craftsmen-manufacturers, there will be one big difference between this new generation and the preindustrial cobblers and blacksmiths. Printing in 3-D requires almost no expertise.¹⁰ To make a shoe by hand, a shoemaker must traditionally draw upon a wide range of skills and technical knowledge, such as leather stretching, leather dyeing, leather burnishing, lasting the upper to the last and creating, and sewing on the sole.¹¹ However, creating a shoe with a 3-D printer can now be as simple as clicking “print.”¹² Among other issues, this raises significant safety concerns. Perhaps a defectively-produced shoe poses little danger to its unlucky buyer, but 3-D printing can be used to make

6. Steven Kurutz, *A Factory on Your Kitchen Counter*, N.Y. TIMES (Feb. 20, 2013), http://www.nytimes.com/2013/02/21/garden/the-3-d-printer-may-be-the-home-appliance-of-the-future.html?pagewanted=all&_r=o.

7. Avi Reichental, *What's Next in 3D Printing*, TED (Mar. 2014), https://www.ted.com/talks/avi_reichental_what_s_next_in_3d_printing#t-131238 [<https://perma.cc/TH3B-RRMN>].

8. Many manufacturers now offer sub-\$1000.00 options for their entry-level printers. See Brian Voo, *10 Affordable 3D Printers You Can Get Right Now*, HONGKIAT, <http://www.hongkiat.com/blog/affordable-3d-printer/> [<https://perma.cc/H87H-XG99>] (last visited Nov. 30, 2017).

9. Reichental, *supra* note 7.

10. One 3-D printer manufacturer has specifically marketed its products to children by advertising safety features that allow “[k]ids . . . to enjoy countless hours of 3D printing.” See *Da Vinci Jr. 1.0*, XYZ PRINTING, http://us.xyzprinting.com/us_en/Product/da-Vinci-1.0-Junior [<https://perma.cc/5B9Z-R7H6>] (last visited Apr. 3, 2017). Another manufacturer has created a one-click interface, which its cofounder boasts is so easy to use, “you don’t have to think about it. When it’s printing, it’s printing.” See Jackie Dove, *Formlabs’ New Desktop 3D Printer Targets Creatives and Entrepreneurs*, NEXT WEB (Sept. 22, 2015), https://thenextweb.com/creativity/2015/09/22/formlabs-new-desktop-3d-printer-targets-creatives-and-entrepreneurs/#.tnw_ux2VqoWR [<http://perma.cc/CAQ4-MWXG>].

11. See JOHN BEDFORD LENO, *THE ART OF BOOT & SHOEMAKING* (Martino Publishing 2010) (1865).

12. There are various online file-sharing websites that allow individuals to download designs that they can print into actual products instantly. One website even provides a design for a woman’s shoe that is available to be printed for free. Oneira3D, *Lace Woman High Wedge Shoe*, THINGIVERSE (Dec. 17, 2014), <http://www.thingiverse.com/thing:597498> [<https://perma.cc/XB5Q-CH55>].

just about anything. Already, 3-D printing has been used to create items such as bicycles,¹³ guns,¹⁴ and even cars.¹⁵

A seventeenth-century gunsmith had to develop a wide array of skills and expertise before being able to sell his first guns. This ensured a basic level of quality and craftsmanship. On the other hand, a 3-D printing gunsmith needs nothing more than Internet access and a 3-D printer. She does not need to know anything about design or basic engineering principles. More importantly, she does not need to know how to ensure the quality and the safety of the products she produces. Some scholars assert that, in certain circumstances, these novice manufacturers will not be subject to the special liability rules of products liability law.¹⁶

They assert that because of the casual seller exception,¹⁷ individuals who casually produce 3-D printed items will not be subjected to the special rules of products liability for injuries resulting from their defectively produced products, which protect consumers and deter the production of defective goods.¹⁸ Instead, these scholars argue that the casual 3-D printing craftsmen will only be subject to negligence, making claims against them less likely to succeed.¹⁹

However, there is reason to question these scholars' assertions. First, they overlook the fact that some jurisdictions, such as California, have not consistently applied the casual seller exception to manufacturers. Second, there are policy justifications that warrant the application of products liability laws to small 3-D printing manufacturers in jurisdictions that protect casual manufacturers from the application of products liability laws.

I begin by overviews products liability law in general in Part I. I explain the original policy justifications for the special rules of products liability and discuss the casual seller exception. In Part II, I examine California's application of the casual seller exception and explain why California courts will likely subject casual 3-D

13. *World's First Metal 3D Printed Bike in Guinness World Records*, RENISHAW (Mar. 9, 2015), <http://www.renishaw.com/en/worlds-first-metal-3d-printed-bike-in-guinness-world-records-32537> [<https://perma.cc/E2TD-NV7Y>].

14. Guns have become one of the most popular and controversial items to be 3-D printed. See Andy Greenberg, *How 3-D Printed Guns Evolved into Serious Weapons in Just One Year*, WIRED (May 15, 2014, 6:30 AM), <http://www.wired.com/2014/05/3d-printed-guns/> [<https://web.archive.org/web/20140515125751/http://www.wired.com/2014/05/3d-printed-guns/>].

15. Will Wei, *This Drivable Car was 3D Printed in 44 Hours*, BUS. INSIDER (Feb. 12, 2015, 1:01 PM), <http://www.businessinsider.com/car-3d-printing-local-motors-strati-2015-2> [<https://web.archive.org/web/20150213033243/http://www.businessinsider.com/car-3d-printing-local-motors-strati-2015-2>].

16. E.g., Nicole D. Berkowitz, *Strict Liability for Individuals? The Impact of 3-D Printing on Products Liability Law*, 92 WASH. U.L. REV. 1019, 1041–42 (2015); Nora Freeman Engstrom, *3-D Printing and Product Liability: Identifying the Obstacles*, 162 U. PA. L. REV. ONLINE 35, 37–38 (2013).

17. Under the casual seller exception, courts do not apply the special rules of products liability to *noncommercial* sellers or distributors of products. RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 1 cmt. c (AM. LAW INST. 1998) (emphasis added).

18. Berkowitz, *supra* note 16, at 1046–52; Engstrom, *supra* note 16.

19. Berkowitz, *supra* note 16, at 1046–52; Engstrom, *supra* note 16, at 40 n.29.

printing manufacturers to the rules of products liability. In Part III, I contrast California's application of the casual seller exception with other jurisdictions and provide a spectrum of how courts typically treat casual manufacturers. In Part IV, I explain how 3-D printing is used and how we can expect it to be used in the future. In Part V, I argue that 3-D printing creates a new problem that the law of products liability has yet to address. I briefly explain that casual manufacturers using 3-D printing manufacturing processes are atypical because there are almost no requisite skills to manufacture something using a 3-D printer. I also discuss why this matters when determining whether or not to apply the laws of products liability. Finally, in Part VI, I assert that in order to deter the production of defective products, we should extend products liability to casual manufacturers using 3-D printing manufacturing.

I. OVERVIEW OF PRODUCTS LIABILITY

Originally, products liability imposed an “absolute liability” on manufacturers for injuries caused by defectively produced products.²⁰ The origins of the concept of strict products liability can be traced back to Justice Traynor's concurrence in *Escola*.²¹ Courts still consider Traynor's policy justifications for imposing greater liability to manufacturers.²² Traynor reasoned that:

Those who suffer injury from defective products are unprepared to meet its consequences. The cost of an injury and the loss of time or health may be an overwhelming misfortune to the person injured, and a needless one, for the risk of injury can be insured by the manufacturer and distributed among the public as a cost of doing business. It is to the public interest to discourage the marketing of products having defects that are a menace to the public. If such products nevertheless find their way into the market it is to the public interest to place the responsibility for whatever injury they may cause upon the manufacturer, who, even if he is not negligent in the manufacture of the product, is responsible for its reaching the market.²³

Strict liability ensures “that the cost of injuries resulting from defective products are borne by the manufacturers that put such products on the market rather than by the injured persons who are powerless to protect themselves.”²⁴ Products liability rules also extend to various individuals and entities within the chain of distribution, such as distributors and retailers that serve as “a link in the chain of getting goods from the manufacturer to the ultimate user or consumer.”²⁵

20. See *Escola v. Coca Cola Bottling Co.*, 150 P.2d 436, 440 (Cal. 1944) (Traynor, J., concurring).

21. See *id.*

22. See *Cincinnati Ins. Co. v. PPL Corp.*, 979 F. Supp. 2d 602, 612 (E.D. Pa. 2013) (quoting Justice Traynor's concurrence in *Escola*, 150 P.2d 436, in considering the application of the laws of products liability).

23. *Escola*, 150 P.2d at 441 (Traynor, J., concurring).

24. *Greenman v. Yuban Power Products, Inc.*, 377 P.2d 897, 901 (Cal. 1963).

25. *Fortman v. Hemco, Inc.*, 211 Cal. App. 3d 241, 251 (1989) (quoting *Silverhart v. Mount Zion Hosp.*, 20 Cal. App. 3d 1022, 1026 (1971)); *Gehl Bros. Mfg. Co. v. Superior Court*, 183 Cal. App. 3d 178, 185 (1986).

The Restatement (Third) of Torts: Products Liability recognizes three separate types of product defects: manufacturing, design, and warning defects.²⁶ Since *Escola*, products liability laws have backed away from a strict liability approach for design and warning defects. The Third Restatement asserts a reasonableness standard for both warning and design defect cases.²⁷ The standard used in cases of manufacturing defects is still strict liability.²⁸

A. Original Policy Justifications for Products Liability

In *Escola*, Justice Traynor referenced three main policy justifications for the imposition of strict liability.²⁹ The first is that the manufacturer is in the best position to minimize danger.³⁰ The manufacturer occupies the role of least cost avoider because the resources and knowledge of the manufacturer enable it to ensure the quality of its products much more easily and effectively than the consumer. Because of this, manufacturers are also much more likely to respond to the deterrence created by the special products liability rules.

Justice Traynor's second policy justification for the imposition of strict liability was the desire to eliminate proof complications. In products liability cases, there are often many handlers of a product before it reaches the hands of the consumer.³¹ Furthermore, obtaining evidence of the defect can often be impossible when the product in question has been destroyed. Strict liability moves the burden of proving the manufacturer's liability for the defect off the shoulders of the victim. Shifting this burden eliminates the proof complications associated with the application of the doctrine of *res ipsa loquitur*.

The final, and perhaps most important policy justification relied on by Justice Traynor for imposing strict liability, was the loss-spreading rationale. Manufacturers can transfer the liability costs of injuries resulting from defective products to the consumers of those products by means of a sale price increase.³² Stated most simply, the manufacturer can sell the consumer insurance for the risk of being injured by its products through a higher sale price of said product. Because of this, the "risk

26. RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 2 (AM. LAW. INST. 1998).

27. *Id.* at § 2(b)–(c). See generally Sheila L. Birnbaum, *Unmasking the Test for Design Defect: From Negligence [to Warranty] to Strict Liability to Negligence*, 33 VAND. L. REV. 593 (1980) (analyzing the different versions of the risk utility test).

28. RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 2 cmt. a (AM. LAW. INST. 1998).

29. *Escola v. Coca Cola Bottling Co.*, 150 P.2d 436, 440–41 (Cal. 1944) (Traynor, J., concurring).

30. *Id.*

31. This is the rationale behind the subsequent decision in California and in jurisdictions across the country to extend strict liability to all of the entities that serve as a link within the chain of distribution. Justice Traynor also addresses this issue. However, he states that imposing strict liability on a retailer would be "needlessly circuitous" as "[m]uch could be gained if the injured person could base his action directly on the manufacturer's warranty." *Id.* at 442.

32. *Id.* at 441.

of injury can be insured by the manufacturer and distributed among the public as a cost of doing business.”³³

In *Price v. Shell Oil Co.*, the California Supreme Court stated that “the paramount policy to be promoted by the rule is the protection of otherwise defenseless victims of manufacturing defects and the spreading throughout society of the cost of compensating them.”³⁴ The court did not, however, give any indication of a hierarchy amongst the “paramount policy concerns.”³⁵ Thus, questions arise when these policy concerns conflict with one another. In Part VI, I will discuss how applying products liability to 3-D printing hobbyist manufacturers³⁶ puts these two “paramount policy” concerns at odds with one another.

B. *The Casual Seller Exception*

Through the development of products liability law, courts have limited its application by declining to extend it to noncommercial sellers. The Restatement (Second) of Torts: Products Liability asserts that the laws of products liability do not apply to isolated transactions, but rather to any person “engaged in the business of selling products for use or consumption.”³⁷ The Restatement (Third) of Torts: Products Liability reiterates this concept by stating that strict liability “applies only to manufacturers and other commercial sellers and distributors who are engaged in the business of selling or otherwise distributing the type of product that harmed the plaintiff.”³⁸ This rule is commonly referred to as the “casual” or “occasional seller” exception.

At first glance, the casual seller exception raises several questions: What does it mean to be in the business of selling? Is this exception available to manufacturers or just sellers and retailers? If an individual manufactures a product in her garage and sells it online, is she a casual seller? The language of the text is unclear as to whether or not courts should treat product manufacturers and product retailers equally. The wording of this section is ambiguous as to whether the clause “engaged in the business of selling or otherwise distributing” modifies commercial sellers and distributors alone, or also modifies manufacturers. In California, at least, manufacturers are not likely to benefit from this exception.

33. *Id.*

34. *Price v. Shell Oil Co.*, 466 P.2d 722, 725–26 (Cal. 1970).

35. *Id.*

36. For the purpose of this note, a “3D printing hobbyist-manufacturer” means a person using a 3D printer or some form of additive manufacturing to manufacture products that she then sells on the open market, who a court would view as a casual seller or manufacturer.

37. RESTATEMENT (SECOND) OF TORTS: PRODS. LIAB. § 402A cmt. f (AM. LAW INST. 1965).

38. RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 1 cmt. c (AM. LAW INST. 1998).

II. CASUAL SELLER EXCEPTION IN CALIFORNIA

The California Supreme Court has accepted the view expressed in the Restatement (Second) of Torts which states that strict liability does not apply to isolated transactions, but rather to sellers “found to be in the business of manufacturing or retailing.”³⁹ Despite the Supreme Court of California’s acknowledgment that manufacturers and retailers are alike in the fact that they both are engaged in the business of distributing goods to the public, the case law shows that manufacturers and retailers receive unequal treatment under the casual seller exception.⁴⁰

California case law suggests that the casual seller exception does not apply to manufacturers, but rather only to the other entities within the chain of distribution. As a practical matter, most of the cases that raise the casual seller exception involve one-time sales or sales of second-hand goods. The Court of Appeal has ruled that products liability is applicable to instances where the seller of a secondhand good has made such extensive modifications to the product in question that it was “tantamount to a manufacturer insofar as liability . . . is concerned.”⁴¹ This indicates that in California, the casual seller exception is not available to manufacturers of goods.

Furthermore, in cases involving an isolated sale, such as one-time factory liquidation sales, California courts acknowledge that defendants who manufacture the products in question would be exposed to the rules of products liability.⁴² For example, in *Ortiz v. HPM Corp.*, the California Court of Appeal considered the application of strict liability to a defendant who had sold a second-hand punch press to the plaintiff, who then sustained serious injuries while using the punch press.⁴³ The defendant was not the manufacturer of the product, but had made modifications. The defendant sold the machine as part of its liquidation sale following the closing of its Southern California operating facility.⁴⁴ The court ruled that the defendant was not engaged in the business of selling the product in question as defined by Restatement (Second) of Torts § 402A(1).⁴⁵ Rather, the defendant’s sale of the punch press was an isolated transaction not related to its regular business.⁴⁶

39. *Price*, 466 P.2d at 728 n.8 (citing RESTATEMENT (SECOND) OF TORTS: PRODS. LIAB. § 402A cmt. f (AM. LAW INST. 1965) with approval).

40. *Id.* at 727–28.

41. *Green v. City of Los Angeles*, 115 Cal. Rptr. 685, 697 (Cal. Ct. App. 1974).

42. *See generally Ortiz v. HPM Corp.*, 285 Cal. Rptr. 728 (Cal. Ct. App. 1991).

43. *Id.*

44. *Id.* at 734.

45. RESTATEMENT (SECOND) OF TORTS: PRODS. LIAB. § 402A(1) (AM. LAW INST. 1965).

46. *Ortiz*, 285 Cal. Rptr. at 734. There is little case law informing us of the point at which modifications become so extensive that they become tantamount to remanufacturing. The language in *Green* indicates that both manufacturers and remanufacturers receive equal treatment in applying products liability. Because this note only considers the application of strict liability to manufacturers using 3-D printing, the distinction between remanufacturer and manufacturer need not be discussed.

Despite finding that the defendant was a casual seller, the court went on to consider whether or not certain modifications to the product made by the defendant were enough to consider it a “remanufacturer.”⁴⁷ Although the court found that the defendant was not a remanufacturer, it acknowledged that the law would have barred the application of the casual seller exception to a manufacturer-defendant.⁴⁸ Thus, in California, the defendant’s status as manufacturer can serve as an exception to the casual seller exception.⁴⁹

Accordingly, a casual manufacturer that produces goods through the process of 3-D printing would be subject to the special rules of products liability for any products that she manufactures. This would include any products that she creates, whether or not she is the designer.⁵⁰ Therefore, in California, it is unlikely that small manufacturers producing goods using 3-D printing will be treated any differently than commercial manufacturers.

III. CASUAL SELLER EXCEPTION OUTSIDE OF CALIFORNIA

Other jurisdictions outside of California are more reluctant to impose strict liability on casual manufacturers. New York applies the casual seller exception to entities where the sale of the product in question is secondary to the seller’s business. In *McCarthy v. Checchin*, a New York court held that a manufacturer was not subject to strict liability because the defendant was not in the “business of manufacturing or selling roll press machines,” which was the type of product at issue.⁵¹ The court further relied on the fact that the defendant had “never built or manufactured any other piece of machinery before this isolated task nor [had] he done so since.”⁵² Among the most important factors to be considered in this inquiry are the “number of items sold and the frequency of sales.”⁵³

Other jurisdictions have created a more elaborate test for determining whether a manufacturer is a casual seller. In *Galindo v. Precision American Corp.*, the Fifth Circuit, while interpreting Texas law, asserted a three-factor test for determining whether to impose strict liability:⁵⁴

The relevant inquiry, however, is whether the seller’s conduct would justify a conclusion that (1) he has undertaken a special responsibility for product

47. *Id.*

48. *Id.* (citing *Green v. City of Los Angeles*, 115 Cal. Rptr. 685, 685 (Cal. Ct. App. 1974)).

49. Citing *Ortiz*, the Ninth Circuit considered declining the application of strict liability to a manufacturer on the basis of the casual seller exception. *Kennedy v. S. Cal. Edison Co.*, 219 F.3d 988, 1001 (9th Cir. 2000) (citing *Ortiz*, 285 Cal. Rptr. at 733). The case was later withdrawn. *Kennedy v. S. Cal. Edison Co.*, 265 F.3d 1080 (9th Cir. 2001).

50. In California and many other states, designers are typically not subject to products liability. *Romine v. Johnson Controls, Inc.*, 169 Cal. Rptr. 3d 208, 222–23 (Cal. Ct. App. 2014).

51. *See generally*, *McCarthy v. Checchin*, 806 N.Y.S.2d 751, 752 (N.Y. App. Div. 2005).

52. *Id.*

53. *Sukljan v. Charles Ross & Son Co.*, 503 N.E.2d 1358, 1362–63 (N.Y. 1986) (holding that General Electric was not strictly liable for selling a second-hand grinding mill in one of its multiple equipment surplus sales of the year).

54. *Galindo v. Precision Am. Corp.*, 754 F.2d 1212, 1221 (5th Cir. 1985).

safety; (2) the public has a right to expect that he will stand behind the product; and (3) as between the consumer and the seller, it is equitable to impose upon the seller the loss caused by the product and the burden of spreading that loss as a cost of doing business.⁵⁵

Although many states apply the casual seller exception to manufacturers, even jurisdictions such as New York recognize that the imposition of products liability “rests largely on considerations of public policy.”⁵⁶ Because of this, in determining whether to impose products liability on casual manufacturers who use 3-D printers to manufacture products that they in turn sell, we must consider whether the policy justifications underlying the laws of products liability warrant its application.

IV. WHAT IS 3-D PRINTING AND HOW IS IT USED

In this section, I will explain the basics of 3-D printing technology and how 3-D printing can be used in the manufacturing of goods. I will also show why 3-D printing is an attractive option for casual manufacturers.

A. Introduction to 3-D Printing

3-D printing enables users to create three-dimensional objects from computer-aided design (CAD) files.⁵⁷ In the same way an inkjet or laser printer can create two-dimensional pictures from electronic files, 3-D printers can create tangible objects from three-dimensional digital files. Although 3-D printers have only recently become affordable to consumers, the technology has existed for a few decades.⁵⁸ Many large manufacturers use 3-D printing to create prototypes because it allows for a greater degree of customizability than other fabrication processes.⁵⁹ Instead of fabricating a prototype, designers can make simple manipulations to CAD files in order to create new prototypes.

Large manufacturers are not alone using 3-D printing. Several 3-D printing companies now advertise consumer 3-D printers designed to be used in small labs or on one’s desktop.⁶⁰ There are several different types of 3-D printers. Fused Deposition Modeling (FDM)⁶¹ printers create objects by ejecting melted plastic filament layer by layer. A nozzle releases and heats the filament in a pattern specified by a CAD file.⁶² It moves in a similar fashion as an inkjet nozzle of the

55. *Id.*

56. *Sukjian*, 503 N.E.2d at 1360.

57. *What is 3D Printing?*, supra note 5.

58. HOD LIPSON & MELBA KURMAN, FABRICATED: THE NEW WORLD OF 3D PRINTING 38 (2013).

59. *Id.* at 33–34.

60. See, e.g., *Desktop 3D Printers*, 3D SYSTEMS, <https://www.3dsystems.com/3d-printers/desktop> [<https://perma.cc/2FTC-8HLG>] (last visited Mar. 22, 2018).

61. The term fused deposition modeling and its abbreviation to FDM are trademarked by Stratasys Inc. Others in the industry refer to this technology using different terminology. *What is 3D Printing?*, supra note 5.

62. *Id.*

typical office printer, except that once the nozzle has laid the first layer of plastic, the platform on which the first layer was laid is then lowered for the second layer to be fused onto the existing layer.⁶³ The machines work layer by layer until the object is finished.

There are other popular types of 3-D printers such as Stereolithography (SLA) Printers that create objects by shooting ultraviolet lasers onto a bed of plastic resin.⁶⁴ As the laser traces the design onto the resin bed, the resin hardens and then the object is raised layer by layer until the final design is complete.⁶⁵

B. *Is 3-D Printing Feasible for Casual Manufacturers?*

As with most new forms of technology, 3-D printers are expected to become more affordable as they become more prevalent.⁶⁶ Despite this, entry-level 3-D printers are already cheap enough for a hobbyist-manufacturer to afford. SLA printers start at around \$3,000, but the resin used in making the objects can be quite costly.⁶⁷ FDM printers, on the other hand, are much more affordable. Entry-level FDM printers can be purchased for as little as \$600.⁶⁸ With a relatively low upfront investment cost, 3-D printers are attractive to novice designers, hobbyist-craftsmen, and manufacturers.⁶⁹

Along with affordability, 3-D printers are also very user-friendly. Many require minimal setup time and designs can be purchased online for little to no cost at all. Several websites offer file-sharing portals where users can download files for free to be printed with the click of a button.⁷⁰ This allows individuals with absolutely no manufacturing experience to create and manufacture goods. Because hobbyist-craftsmen are less likely to possess conventional manufacturing skills, 3-D printing is an attractive option to produce sophisticated goods. Because of this, many expect a growth in the number of casual manufacturers.⁷¹ This growth, however, poses a large problem: household manufacturers using 3-D printing will need no technical manufacturing skills or experience whatsoever. As such, we can expect the products

63. *Id.*

64. *Id.*

65. *Id.*

66. Selena Larson, *The da Vinci Junior Is an Adorable, Affordable 3D Printer*, DAILY DOT (Jan. 9, 2015, 8:14 AM), <http://www.dailydot.com/technology/3d-printing-xyzprinting-ces/> [<https://perma.cc/7STQ-TL6W>].

67. *Buy the Form 2 SLA 3D Printer*, FORMLABS, <http://formlabs.com/store/us/buy-printer/> [<https://web.archive.org/web/20160817084657/http://formlabs.com/store/us/form-2/buy-printer/>] (last visited Aug. 17, 2016).

68. *XYZprinting da Vinci 2.0 Duo - 3D Printer*, WALMART, <https://www.walmart.com/ip/XYZprinting-da-Vinci-2-0-Duo-3D-printer/46107279> [<https://perma.cc/ZQJ7-VCRR>] (last visited Mar. 22, 2018).

69. B.T. Wittbrodt et al., *Life-Cycle Economic Analysis of Distributed Manufacturing with Open-Source 3-D Printers*, 23 MECHATRONICS 713, 720 (2013) (showing that 3-D printing is a feasible option for manufacturing various household goods).

70. *See, e.g.*, THINGIVERSE, <https://www.thingiverse.com/> [<https://perma.cc/Y4EZ-QKCC>] (last visited Mar. 22, 2018).

71. Reichental, *supra* note 7.

they manufacture to be more likely to have defects and less likely to have received proper safety testing.

V. WHY 3-D PRINTING CAN POSE A DANGER WHEN USED BY UNTRAINED HOUSEHOLD MANUFACTURERS WITHOUT PROPER QUALITY CONTROL PROCEDURES

3-D printing enables hobbyists to create complex products without acquiring any expertise in manufacturing or quality assurance. 3-D printing enables casual manufacturers to produce products with a level of complexity that, until relatively recently, was accessible only to large manufacturers. Although 3-D printing gives casual manufacturers the ability to create products without any expertise, it does not give them the ability to assure the quality of the products they produce. Furthermore, quality-assurance technology has yet to become as affordable or available as 3-D printers.⁷² Without manufacturing expertise or the ability to assure the quality of the products they produce, casual manufacturers using 3-D printing are more likely to produce defective products than other manufacturers, hence posing a serious danger to the consumers of their products.

A. *3-D Printing Casual Manufacturers Will Not Be Required to Have Manufacturing Expertise*

Prior to the development of 3-D printing, the expertise required to manufacture products served as a general bar against non-expert manufacturers. For example, to manufacture a bicycle frame, a casual manufacturer previously needed a baseline level of expertise. This expertise would include an understanding of the mechanics of how bicycles work and ability to weld and bend metals. A casual manufacturer wanting to print a bicycle frame also needs a baseline level of skills; however, these skills are different from the skills required to build the frame by hand.

A 3-D printing manufacturer needs to know how to maintain and operate her 3-D printer; and although having design experience is useful, it is not necessary. There are a number of open-source digital modeling software programs that give novice designers the ability to create 3-D designs.⁷³ Admittedly, the types of products that a beginner could design would be limited to simple things like cups and paper weights; however, with the advent of 3-D scanning, one can create complex digital designs without any technical training at all. 3-D scanners make designing products in 3-D as easy as taking a picture with a cell phone. As a matter

72. Miller Allen et al., *3D Printing Standards and Verification Services*, 2 APPLIED INNOVATION REV. 34, 44 (2016).

73. See Ashutosh KS, *20 Useful 3D-Modeling Software You Can Use for Free*, HONGKIAT, <http://www.hongkiat.com/blog/25-free-3d-modelling-applications-you-should-not-miss/> [<https://perma.cc/3ETE-822A>] (last visited Mar. 22, 2018).

of fact, there is a mobile application for that.⁷⁴ It should be noted that 3-D scanners only analyze the exterior shape of an object, and do not analyze the object's density, composition, or any internal componentry. This can become an issue because in many cases, an object's internal engineering dictates its durability and quality.

Although both 3-D printing manufacturers and hand-craftsmen both must be able to proficiently operate and maintain their equipment, hand-craftsmen possess something that 3-D printers do not. The skill set of the hand-craftsman is closely tied to the safety and quality of the product. The quality of the welds of the bike frame affects the quality of the bike. If the bike builder cannot bend the metal properly, it is more likely to fail under pressure.

Conversely, the skills required to print a product in 3-D do not have the same effect on the final product's safety. Although a proficient digital designer or engineer might be able to create a safe and reliable bike frame, some 3-D printing manufacturers will be able to simply take a picture of an item, and then print it moments later. The skills required to take a photo are not the same skills that enable the manufacturer to ensure the quality of a product. Accordingly, this lack of technical expertise will make the product more prone to defects.

For example, when a group of engineering students from Carleton University built a bicycle frame using a readily available 3-D printer,⁷⁵ the students called a press conference to unveil their creation. But as one of the students mounted the bike to demonstrate its sturdiness, the bike suddenly snapped in half.⁷⁶ The students acknowledged that the bike had received inadequate quality testing.⁷⁷ They explained that there were a few imperfections in the frame, such as a "part where the printer had run out of plastic and not finished the print" and a part "with a small crack."⁷⁸ Ignoring these imperfections, they decided that the frame was ready to be unveiled. Not only does this show that 3-D printing can create products with non-obvious defects, but also how it can give non-expert manufacturers a veil of legitimacy that they would not otherwise have with traditional manufacturing processes. With a click of a button, users can create elaborate products that they have no way of testing.

Some may argue that the non-expert casual manufacturer is not a new phenomenon created by the advent and increasing affordability of 3-D printing. However, without 3-D printing, a manufacturer must have some skill in order to turn raw or pre-manufactured materials into finished products. In the bicycle frame

74. 3D Systems' iSense 3D scanner allows Apple iPad owners to attach an enhanced camera to their iPad in order to scan physical items. The scanner then creates a digital file that can be printed or shared with others. *Support: 3D Scanners*, 3D SYSTEMS, <https://www.3dsystems.com/shop/support/isense/videos> [<https://perma.cc/A8C2-BJB9>] (last visited Mar. 22, 2018).

75. TE Halterman, *3D Printed Bike Snaps in Half During Carleton University Press Conference to Show It Off*, 3DPRINT.COM (Feb. 11, 2015), <http://3dprint.com/43882/3d-printed-bike-fails/> [<https://perma.cc/URD3-B9MH>].

76. *Id.*

77. *Id.*

78. *Id.*

example, the hand-craftsman is able to assess the quality of the product as it is manufactured. Even with minimal welding skills, she can assess the general quality of her welds. However, a 3-D printer that scans and prints a three-dimensional object can be less engaged with the manufacturing process. Just as one who uses word-processing software does not need to know how a computer works, casual 3-D printing manufacturers do not need to know how 3-D printers work. Without this knowledge, they are less able to ensure the quality of the products they produce.

B. How 3-D Printing Is Used to Create Products Where Safety is Crucial

To demonstrate how 3-D printing can pose a serious safety concern, it is important to discuss the types of products that are created using 3-D printers. This is because not all defective products are equally as dangerous. A defective cell phone case is undoubtedly less dangerous to a consumer than a defective bicycle helmet or automotive part. Although there is already a large market of 3-D printed cell phone cases and clothing accessories on the Internet,⁷⁹ many expect 3-D printing to be especially popular among automotive specialty part manufacturers.⁸⁰ 3-D printing has already been used to make fully functional cars.⁸¹ Further, because 3-D printing gives manufacturers a greater degree of customizability, 3-D printers will likely be popular amongst niche automotive car part manufacturers where there is a need for rare parts or parts no longer in production.

Moreover, 3-D printing makes the cost of manufacturing these parts relatively low.⁸² Because of this, novice manufacturers will likely begin manufacturing various automotive parts through 3-D printing. Perhaps they will do this for personal use, but some will likely share their creations by selling them to others.

Along with automotive part manufacturers, gun enthusiasts are also keeping a close eye on the development of 3-D printing technology. Defense Distributed, a

79. See, e.g., 3D PRINTED CASES, <http://3dpcase.sculpteo.com/en/> [<https://web.archive.org/web/20160809210152/https://3dpcase.sculpteo.com/en/>] (last visited Aug. 9, 2016); CONTINUUM, <http://www.continuumfashion.com/projects.php> [<https://perma.cc/7CTM-DJY4>] (last visited Mar. 22, 2018).

80. Cedric Lizotte, *3D Printed Auto Parts Marketplace Seeks Funding on Indiegogo*, 3DPRINT.COM (June 17, 2014), <http://3dprint.com/6383/3d-print-auto-parts/> [<https://perma.cc/448X-AESX>].

81. Wei, *supra* note 15.

82. GoEngineer is a 3-D design and engineering consulting company that offers classroom and webinar training. In one of their webinars, they show how one can design, print, assemble and install 3-D printed parts into a racecar engine bay. Among the parts that they use in their demonstration were a throttle body spacer and a firewall wire feedthrough. It is important to note that these parts are all critical to the function of the car and could result in an injury if designed or manufactured defectively. The instructor in the video explained how little time it took to make these parts, calling the throttle body spacer design and manufacturing a “morning project.” GoEngineer, *Stratasys - 3D Printed Car Parts*, YOUTUBE (Nov. 10, 2014), <https://www.youtube.com/watch?v=mlUOzZtnu5w> (webinar presented by Tyler Reid).

Texas-based non-profit⁸³ firearm manufacturer has received quite a bit of notoriety for producing the first ever fully 3-D-printed gun.⁸⁴ Defense Distributed and its founder, Cody Wilson, have been the subject of some controversy primarily due to Defense Distributed's mission to publish open-source gun designs to be printed by users all over the country.⁸⁵ In an interview with Vice, Wilson proudly showed interviewers some of Defense Distributed's testing procedures.⁸⁶ According to what could be gathered from the interview, Defense Distributed's testing mainly involved field-testing their components.⁸⁷ Conversely, commercial firearm manufacturers test their products with advance quality assurance equipment such as machine tool laser probes in order to verify the exact dimensions of the finished products.⁸⁸

The fact that a casual manufacturer with little manufacturing expertise can download and manufacture a gun within an afternoon is a testament to how accessible 3-D printing has made manufacturing. However, because this access comes at such a low cost, almost anyone—no matter their experience—can create complex products such as firearms. Because 3-D printers can create products in which quality control is critical to safety, a danger arises when untrained manufacturers are creating these products without the ability to test the products' safety. This danger is exacerbated by the fact that these manufacturers are more likely to create defective products when compared to commercial manufacturers, because casual manufacturers may not have technical manufacturing expertise.

VI. WHY COURTS SHOULD IMPOSE STRICT LIABILITY ON HOBBYIST-MANUFACTURERS USING 3-D PRINTING MANUFACTURING TECHNOLOGY

As mentioned above, the two key policy concerns advanced by the imposition of strict liability are: (1) “the protection of otherwise defenseless victims of [product] defects”; and (2) “the spreading throughout society of the cost of

83. Defense Distributed is a pending 501(c)(3) non-profit corporation in the state of Texas. Def. Distributed, *About*, FACEBOOK, https://www.facebook.com/pg/DefenseDistributed/about/?ref=page_internal [<https://perma.cc/E7FF-HZTP>] (last visited Mar. 3, 2017).

84. Andy Greenberg, *Meet the 'Liberator': Test-Firing the World's First Fully 3D-Printed Gun*, FORBES (May 5, 2013, 5:30 PM), <http://www.forbes.com/sites/andygreenberg/2013/05/05/meet-the-liberator-test-firing-the-worlds-first-fully-3d-printed-gun/#21930bcf511e> [<https://web.archive.org/web/20130507040530/http://www.forbes.com/sites/andygreenberg/2013/05/05/meet-the-liberator-test-firing-the-worlds-first-fully-3d-printed-gun/>].

85. *Id.*

86. Vice, *3D Printed Guns (Documentary)*, YOUTUBE (Mar. 25, 2013), <https://www.youtube.com/watch?v=DconsfGsXyA>.

87. To indicate how informal Defense Distributed's testing protocols are, during one of the field tests, Wilson commented, “Maybe this paint will give it like a 0.01% strength improvement, and we'll break 100 rounds today.” *Id.*

88. See GunsForSaleDotCom, *Benelli Firearms Factory - Quality Assurance at Benelli's Plant in Italy*, YOUTUBE (May 23, 2011), <https://www.youtube.com/watch?v=PklJZd8mqA>; *Machine Tool Probes for Component Setting and Inspection*, RENISHAW, <http://www.renishaw.com/en/machine-tool-probes-for-component-setting-and-inspection--6075> [<https://perma.cc/YDX2-X7ZG>] (last visited Mar. 3, 2017).

compensating them.”⁸⁹ However, these two policy concerns are put at odds with one another in the context of applying strict liability to the 3-D printing hobbyist-manufacturer. Casual manufacturers are unable to spread the loss of injuries associated with defective products because they sell small quantities. Thus, applying products liability to these manufacturers defeats the aim of product liability laws to heighten liability standards where the defendant can spread the cost of injury amongst its consumers. Despite this, in the context of 3-D printing micro-manufacturers, there is a greater need to deter and protect consumers, because of the dangers expressed above. This raises the question of how courts might balance these competing policy concerns.

A. Deterrence Concerns Support the Application of Products Liability to 3-D Printing Casual Manufacturers

As stated previously, 3-D printing enables household-manufacturers to create sophisticated products, but these manufacturers are not able to ensure the quality or safety of these products. Furthermore, these manufacturers are not required to have any technical expertise. The special rules of products liability were created in order to protect consumers from the burden and the cost of injuries resulting from defective products.⁹⁰ Because 3-D printing hobbyist-manufacturers pose a greater safety risk to their consumers, society has a desire to deter these manufacturers from producing defective products.

Products liability laws are aimed at manufacturers and producers of goods because manufacturers are most able to respond to safety incentives created by stricter liability laws. Accordingly, imposing products liability on 3-D printing hobbyist-manufacturers will likely have one of two possible outcomes. First, it may discourage individuals from selling the products they print to others. Many will argue that this might chill innovation, or at least stifle the sharing of products and ideas.⁹¹ This outcome, which many would view as negative, will have to be considered by courts in deciding whether or not to impose the products liability.⁹² One scholar asserts that this concern justifies applying the casual seller exception to casual 3-D printing manufacturers.⁹³ Another possible outcome is that 3-D printing hobbyist-manufacturers will engage in more advanced levels of quality control.

89. *Price v. Shell Oil Co.*, 466 P.2d 722, 725–26 (Cal. 1970).

90. *See generally* *Escola v. Coca Cola Bottling Co.*, 150 P.2d 436 (Cal. 1944).

91. Products liability is not normally imposed on designers. *Romine v. Johnson Controls, Inc.*, 169 Cal. Rptr. 3d 208, 222–23 (Cal. Ct. App. 2014). Therefore, in the cases where a manufacturer purchases and downloads a design from a designer, innovation will not be stifled.

92. However, in cases of manufacturing and warning defects, the rules of products liability do not apply to designers. *Romine*, 169 Cal. Rptr. 3d at 222–23. If we assume that a product’s design is what determines how innovative the product is, then applying products liability would not stifle innovation in cases of manufacturing and warning defects.

93. Berkowitz, *supra* note 16, at 1046–52.

Whether innovation is stifled or micro-manufacturing is done more safely, both end results will lead to a reduction of unsafe products on the market. Thus, not only does the imposition of products liability to 3-D printing hobbyist-manufacturers transfer “the costs of injuries resulting from defective products . . . [from] the injured persons who are powerless to protect themselves”⁹⁴ to the manufacturer, it also encourages manufacturers to “anticipate some hazards and guard against the recurrence of [them].”⁹⁵ Courts have consistently put the safety of products as a primary concern when considering the application of products liability.⁹⁶ Accordingly, the safety of consumers should trump the innovation of products in determining whether the rules of products liability should apply to 3-D printing hobbyist-manufacturers.

B. The Inability to Spread Loss Supports the Application of the Casual Seller Exception to 3-D Printing Casual Manufacturers

Although the greater need to deter the production of unsafe products supports the application of products liability to 3-D printing casual manufacturers, the inability of casual manufacturers to spread loss weighs against it. A hobbyist-manufacturer who only manufactures two or three products cannot insure the risk of injury by distributing the cost of injury amongst the public as a cost of doing business.⁹⁷

C. Should the Inability of Loss-Spreading Be Enough to Outweigh the Need to Deter the Production of Defective Products?

Many have criticized the loss-spreading rationale as a justification for the application of strict liability because it takes the defendant’s ability to pay the judgment into account.⁹⁸ Loss-spreading is essentially a form of insurance where the consumers bear the premiums in the form of the losses resulting from defective products.⁹⁹ Some have criticized the loss-spreading rationale because it does not base liability on culpability, but rather on purely economic resource-allocation concerns.¹⁰⁰ Furthermore, loss-spreading allows courts to achieve the type of wealth redistribution that is typically the province of the legislature.¹⁰¹

94. Greenman v. Yuban Power Products, Inc., 377 P.2d 897, 901 (Cal. 1963).

95. *Escola*, 150 P.2d at 440–41 (Traynor, J., concurring).

96. *Escola*, 150 P.2d at 440; W. PAGE KEETON ET AL., PROSSER & KEETON ON THE LAW OF TORTS § 98, at 692 (W. Page Keeton ed., 5th ed. 1984).

97. See *Escola*, 150 P.2d at 441 (Traynor, J., concurring).

98. See David J. Molnar, *Should Loss-Spreading Be the Paramount Public Policy Rationale for the Imposition of Strict Products Liability? A Study of the Intersection of Strict Products Liability and Landlord-Tenant Law*, 22 J. CORP. L. 93, 102–03, 103 n.93 (1996).

99. See *Escola*, 150 P.2d at 441 (Traynor, J., concurring); 1 MARSHALL S. SHAPO, SHAPO ON THE LAW OF PRODUCTS LIABILITY § 7.05(G), at 7-45 (2013).

100. Molnar, *supra* note 98, at 103.

101. SHAPO, *supra* note 99, at 7-44.

These criticisms raise the issue of whether the absence of the ability to engage in loss-spreading should be enough to preclude the application of products liability. The California Court of Appeal stated that the loss-spreading rationale “is probably insufficient, by itself, to justify strict liability.”¹⁰² Courts have been led astray in the past by applying strict liability without sufficiently considering other policy concerns or equity towards the parties.¹⁰³ In overruling *Becker v. IRM Corp.*, the California Supreme Court recognized the importance of considering other policy concerns aside from the loss-spreading rationale.¹⁰⁴

3-D printing enables manufacturers to make sophisticated products whether or not the manufacturer has the ability to ensure the product’s safety. This danger has yet to be addressed by the laws of products liability. Accordingly, one can only speculate as to how courts will balance the greater need to deter the production of unsafe products with inability to spread the risk of injury. However, considering that the main goal of products liability laws is to ensure the safety of consumers, courts are justified in extending the special rules of products liability to 3-D printing casual manufacturers. The risk of hidden defects in 3-D printed products, lack of manufacturing expertise required to use 3-D printers, and the inability of casual manufacturers to ensure the quality of the products they produce warrant the application of products liability to 3-D printing casual manufacturers.

CONCLUSION

3-D printing enables household-manufacturers to match the complexity and sophistication of products manufactured by large manufacturers. Although going back to a time when consumer goods were made by individuals and not by mass-produced factories may sound like a refreshing change of pace, there are reasons to worry. 3-D printing’s growing popularity presents many reasons to question its effects on the overall safety of consumer products.

In some jurisdictions, such as California, it is unlikely that the casual seller exception will apply to small manufacturers using 3-D printing. In jurisdictions outside California, casual manufacturers using 3-D printing may still receive the benefit of the exception.

102. *LaRosa v. Superior Court*, 176 Cal. Rptr. 224, 235 (Cal. Ct. App. 1981).

103. *Molnar*, *supra* note 98, at 103 & n.92 (citing *Becker v. IRM Corp.*, 698 P.2d 116, 13[5] (Cal. 1985) (Lucas, J., concurring and dissenting), *overruled by* *Peterson v. Superior Court*, 899 P.2d 905 (Cal. 1995); *LaRosa*, 176 Cal. Rptr. at 235). It is important to note that the Supreme Court of California overruled its decision in *Becker* because it “relied upon [the loss-spreading rationale] almost exclusively” in imposing strict liability upon a landlord. *Peterson*, 899 P.2d at 918. When considering other policy concerns, the Supreme Court of California determined that a landlord may not be held strictly liable on the basis of products liability for injuries to a tenant caused by a defect in a leased dwelling. *Id.* at 918–19, 920.

104. Although courts have recognized the importance of considering other rationales aside from loss-spreading, the only cases that have been overruled due to an over-reliance on the loss-spreading rationale are cases in which the court rejected the imposition of products liability. *See Peterson*, 899 P.2d at 918–19.

Despite this, there are several reasons that courts should impose the special rules of products liability upon 3-D printing hobbyist-manufacturers. First, these manufacturers are more likely to produce defective products because they lack expertise in designing and engineering manufactured products. Second, they do not possess the training or equipment necessary to adequately ensure the safety of these products. Because of this, the law has an increased incentive to impose strict liability on these manufacturers to discourage the production of defective products. However, courts will have to balance this incentive against the fact that imposing strict liability on 3-D printing hobbyist-manufacturers destroys the loss-spreading rationale supporting strict liability.