
ESSAY

3-D PRINTING AND PRODUCT LIABILITY: IDENTIFYING THE OBSTACLES

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3-D printers—with the capacity to make three-dimensional solid objects from digital designs—have arrived. Home 3-D printers are already affordable (some are less than \$1000), and, though these printers make mostly straightforward products, that’s apt to change. A quick tour of the web reveals pictures of myriad “printed” objects, from the simple (a plastic vase¹), to the stunning (a bionic ear!²), to the terrifying (an operational handgun dubbed “the Liberator”³). Those within the industry have high hopes. Brook Drumm, the founder of one 3-D printing company, for example, envisions “a printer in every home.”⁴ *The New York Times* has predicted that 3-D printers will “become a part of our daily lives . . . much sooner than anyone anticipated.”⁵ Even President Obama has embraced this

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¹ See Dan Nosowitz, *A Smooth, 3-D-Printed, Multicolored, High-Resolution Vase*, POPULAR SCI. (July 19, 2013), <http://www.popsci.com/technology/article/2013-07/smooth-3-d-printed-vase-has-four-times-resolution-makerbot>.

² See Carol Torgan, *3-D Printing of Working Bionic Ears*, NIH RES. MATTERS (May 20, 2013), <http://www.nih.gov/researchmatters/may2013/05202013ears.htm>.

³ See Andy Greenberg, *This Is the World’s First Entirely 3D-Printed Gun*, FORBES (May 3, 2013), <http://www.forbes.com/sites/andygreenberg/2013/05/03/this-is-the-worlds-first-entirely-3d-printed-gun-photos>.

⁴ Steven Kurutz, *A Factory on Your Kitchen Counter*, N.Y. TIMES (Feb. 20, 2013) (internal quotation marks omitted), http://www.nytimes.com/2013/02/21/garden/the-3-d-printer-may-be-the-home-appliance-of-the-future.html?pagewanted=all&_r=0.

⁵ Nick Bilton, *Disruptions: On the Fast Track to Routine 3-D Printing*, N.Y. TIMES BITS (Feb. 17, 2013, 11:00 AM), <http://bits.blogs.nytimes.com/2013/02/17/disruptions-3-d-printing-is-on-the-fast-track>.

technology, declaring in his most recent State of the Union address that 3-D printing “has the potential to revolutionize the way we make almost everything.”⁶ In short, though it’s just in its infancy, 3-D printing seems poised to transform the goods we buy, the products we use, and the world we inhabit.

Following any significant technological breakthrough, legal scholars, practitioners, and policymakers must consider how the innovation meshes with—or poses challenges to—our existing laws and system of governance. Will it fit? What must change? Where are the pitfalls and opportunities? 3-D printing is no exception. The laws it implicates are numerous, and the challenges it poses are profound. To begin the inquiry in just one area, I attempt to apply contemporary product liability (PL) law to defective products printed from home 3-D printers.⁷ This analysis suggests that if home 3-D printing really does take off, PL litigation as we know it may, in large measure, dry up. And, if it doesn’t, the technology threatens to unsettle the theoretical justification for product liability law’s development.

In general, we have, and have long had, strict liability for defective products. In the words of the Third Restatement: “One engaged in the business of selling or otherwise distributing products who sells or distributes a defective product is subject to liability for harm to persons or property caused by the defect.”⁸ What are the implications for PL law, however, if Brook Drumm’s hope of a printer in every home is even partially realized?

⁶ President Barack Obama, State of the Union Address (Feb. 12, 2013), in 159 CONG. REC. H445 (daily ed. Feb. 12, 2013), available at <http://www.gpo.gov/fdsys/pkg/CREC-2013-02-12/pdf/CREC-2013-02-12-pt1-PgH443-2.pdf>.

⁷ Three limits are best made explicit. The foregoing analysis (1) is confined to the home printing context; (2) considers only the viability of strict liability actions (as opposed to straightforward negligence claims); and (3) tables the question of liability for 3-D-printed firearms, as the creation and distribution of homemade, unregistered, and unlicensed firearms (that are plastic and consequently don’t show up in x-ray machines) raise a slew of additional regulatory challenges. See, e.g., 18 U.S.C. § 922(p)(1) (2006) (making it unlawful for any person to manufacture or possess any firearm that is not detectable “by walk-through metal detectors” or that does not show up in “x-ray machines commonly used at airports”); Andy Greenberg, *Lawmaker Seeks to Extend 3D-Printed Gun Ban Bill to Ammo Magazines and Other Components*, FORBES (Apr. 15, 2013), <http://www.forbes.com/sites/andygreenberg/2013/04/15/lawmaker-seeks-to-extend-3d-printed-gun-ban-bill-to-magazines-and-other-components> (discussing a recent push to outlaw 3-D-printed firearms).

⁸ RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 1 (1998). A product is “defective” if it has a manufacturing defect, a design defect, or if it is accompanied by an inadequate instruction or warning. *Id.* § 2. Though contemporary product liability law is said to apply a “strict liability” standard, the determination that a design is defective or a warning is inadequate involves an assessment that mimics the negligence inquiry. See *id.* cmt. d (“Assessment of a product design in most instances requires a comparison between an alternative design and the product design that caused the injury, undertaken from the viewpoint of a reasonable person. That approach is also used in administering the traditional reasonableness standard in negligence.”); *id.* cmt. i (noting the adoption of “a reasonableness test for judging the adequacy of product instructions and warnings”).

The first consequence is obvious and uncontroversial: *many* more individuals will make, in their kitchens and on their countertops, products that are complex, sophisticated, and dangerous. The second consequence is equally uncontroversial: over time, these hobbyist inventors will start selling some of the complex, sophisticated, and dangerous products they create, and certain individuals who purchase their creations will, unfortunately but inevitably, sustain injuries. The third consequence is, I think, surprising: in many instances, no one will be strictly liable for these injuries under current PL doctrine.

Injured by a 3-D-printed product, an individual would likely sue one (or more) of the following: (1) the hobbyist inventor who created and sold the defective 3-D-printed product, (2) the manufacturer of the 3-D printer that “printed” the defective item, and/or (3) the “digital designer” who wrote the code that instructed the printer what to print. Yet, as I will show, even assuming that the product is unambiguously defective, a plaintiff will have trouble prevailing in a PL action against any one of these three possible defendants.⁹

The first and most obvious potential defendant would be the hobbyist inventor who actually manufactured and sold the defective product. Here, though, exists a significant impediment. Strict product liability applies only to *commercial* sellers—those “engaged in the business of selling or otherwise distributing products.”¹⁰ Occasional or casual vendors, such as a child who makes and sells tainted lemonade or a housewife who makes and sells contaminated jam, fall outside strict liability’s scope.

On which side of the commercial–occasional divide will hobbyist 3-D inventors fall? The answer will depend on a number of particulars, including the relationship of the allegedly defective product to the hobbyist’s general business (if she even has a business), the frequency and volume of similar sales, and the existence and nature of any mass marketing.¹¹ Certainly, someone who starts as a 3-D hobbyist could become so wrapped up in her product’s creation and distribution that she could morph into a commercial seller for PL purposes. But if the hobbyist forswears advertising,

⁹ Of course, individuals injured by products they *themselves* print will have an even harder time prevailing, suggesting that we are apt to see a new wave of uncompensated injuries.

¹⁰ RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 1 & cmt. c; *see also* RESTATEMENT (SECOND) OF TORTS § 402A cmt. f (1965) (“The rule does not . . . apply to the housewife who, on one occasion, sells to her neighbor a jar of jam or a pound of sugar.”).

¹¹ *See* Donald M. Zupanec, Annotation, *When Is Person “Engaged in the Business” for Purposes of Doctrine of Strict Tort Liability*, 99 A.L.R.3d 671, 673 (1980) (noting the importance of these factors); *see also* *Agurto v. Guhr*, 887 A.2d 159, 163 (N.J. Super. Ct. App. Div. 2005) (holding that a defendant is merely an “occasional” seller if the good’s sale “is not part of the ‘purpose’ of the seller’s business” (citation omitted)).

keeps volumes low, and limits her product's distribution, this "commercial seller" requirement, unless it's relaxed, will limit liability.

Assuming a product liability suit against the hobbyist inventor is unavailing, a second potential defendant would be the company that manufactured the 3-D printer itself. But here, a likely insurmountable obstacle blocks recovery. To prevail in such a suit, the plaintiff will have to show not simply that the printer churned out a defective product, but, instead, that the printer was *itself* defective. And, it's not enough that the printer was defective at the time it printed the troublesome item—it must have been defective at the time it left the printer manufacturer's possession and control.¹² If the plaintiff can't make this showing, a product liability suit is probably a nonstarter.¹³

The third possible defendant is, of course, the digital designer—the programmer who wrote the code that was fed into the printer to create the product at issue. Yet, here too, there are obstacles. Most importantly, just as strict liability law applies only to "commercial sellers" and implicates only those items that are themselves "defective," it also applies only to "products"—defined by the Third Restatement as "tangible personal property."¹⁴ And, though there's some contrary authority, there are strong arguments that code does not qualify.

The digital designer will liken his code to information contained in books—and a number of cases hold that such content is not a "product" for PL purposes.¹⁵ The leading case is *Winter v. G.P. Putnam's Sons*.¹⁶ There, two unlucky souls relied on inaccurate information contained in *The Encyclopedia of Mushrooms* to harvest and consume certain poisonous mushrooms.¹⁷ They became critically ill and sued, claiming, among other things, that the encyclopedia was a defective product.¹⁸ The Ninth Circuit disagreed. The book, the court reasoned, was fine. The book's *content* was

¹² See RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 2 (noting that the defect must exist "at the time of sale or distribution").

¹³ To be sure, if a 3-D printer malfunctions and churns out a defective product that deviates from its digital design, the ensuing PL case would be easier. Even so, it would not be a slam dunk. For one, the sale of the 3-D printer (to party A) and the ensuing injury (to party B, who never himself used the printer but was, instead, injured at some time in the potentially distant future by one of a million products that the printer could conceivably create) are quite attenuated—raising potentially difficult issues of proximate causation.

¹⁴ RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 19.

¹⁵ See *id.* cmt. d (recognizing this authority and endorsing these decisions as "appropriate[]"); David G. Owen et al., *Publications and Products Liability*, 141 PRODUCTS LIABILITY ADVISORY 1, 1-2 (Nov. 2000) (collecting cases).

¹⁶ 938 F.2d 1033 (9th Cir. 1991).

¹⁷ *Id.* at 1033.

¹⁸ *Id.* at 1033-34.

defective, but content is intangible, and intangible products, said the court, can't give rise to product liability actions.¹⁹ Other courts have drawn a similar tangible–intangible line in actions involving videogames, shielding game manufacturers from liability.²⁰

To be sure, 3-D plaintiffs have some authority in their favor. For one, in *Winter* itself, the Ninth Circuit suggested in dictum that computer software could be considered a “product.”²¹ In addition, a number of courts have held that inaccurate information contained in navigational or aeronautical charts qualifies²²—and, reasoning by analogy, a digital design is arguably more like an aeronautical chart than a monograph or videogame. After all, both digital designs and aeronautical charts raise few delicate First Amendment concerns, and both are highly technical and instructional. Further, and more broadly, whether computer code qualifies as a product has not, so far, been widely considered or aggressively litigated,²³ so there is ample room for argument and, thereafter, doctrinal development. Nevertheless, it's important to recognize that this tangible–intangible distinction might end up being a significant barrier.

Further, even if digital designs *are* “products,” the plaintiff is hardly out of the woods. First, digital designers may not be “commercial sellers.” Especially if they are hobbyists who freely share their designs, they probably aren't—returning us to the occasional seller–commercial seller problem considered previously.²⁴ Second, digital designers are in some ways like architects, and courts have thus far refrained from imposing strict liability on these professionals.²⁵ And third, to prevail under the Second Restatement, a plaintiff

¹⁹ See *id.* at 1034–36 (declining “to expand products liability law to embrace the ideas and expression in a book”).

²⁰ See, e.g., *Sanders v. Acclaim Entm't, Inc.*, 188 F. Supp. 2d 1264, 1277–79 (D. Colo. 2002) (granting defendant videogame producers' motion to dismiss because, among other reasons, “intangible thoughts, ideas, and expressive content are not ‘products’ as contemplated by strict liability doctrine”); see also 2 AMERICAN LAW OF PRODUCTS LIABILITY 3D § 16:80 (2012) (“[T]he words and images purveyed on video cassettes, game cartridges, and internet sites are not ‘products’ for purposes of strict liability.”).

²¹ 938 F.2d at 1036.

²² See, e.g., *Aetna Cas. & Sur. Co. v. Jeppesen & Co.*, 642 F.2d 339, 341–43 (9th Cir. 1981) (concluding that defendant's instrument approach chart was a “defective product”); see also Susan M. Gilles, “Poisonous” Publications and Other False Speech Physical Harm Cases, 37 WAKE FOREST L. REV. 1073, 1076 n.11 (2002) (collecting cases).

²³ See 3 RAYMOND T. NIMMER, THE LAW OF COMPUTER TECHNOLOGY § 12:31, at 12–78 (4th ed. 2013) (stating that “whether computer software qualifies as a tangible ‘product’ has been mostly “unaddressed in modern case law”).

²⁴ See *supra* notes 10–11 and accompanying text.

²⁵ See, e.g., *City of Mounds View v. Walijarvi*, 263 N.W.2d 420, 423–25 (Minn. 1978); *Chubb Grp. of Ins. Cos. v. C.F. Murphy & Assocs., Inc.*, 656 S.W.2d 766, 779–81 (Mo. Ct. App. 1983). Of course, there are also relevant differences between digital designers and architects: as compared to architects, digital designers are less obviously service providers, are less likely to have a one-on-one

must, with various caveats, show that the defendant's product "is expected to and does reach the user or consumer without substantial change."²⁶ Here, however, a digital designer's "product" (its code) will arguably reach the end user only after undergoing substantial alteration, via the printing process itself. In a case that's somewhat analogous—and might end up being important—Judge José Cabranes considered this point determinative.²⁷ He refused to consider an architect's design through the lens of PL because, even *if* the architect's "working drawings, plans and specifications" qualified as a product for PL purposes, the design was utilized by the plaintiff (the building lessee) only after its transformation, via construction, "from designs drawn on paper into a large building suitable for [the plaintiff's] business."²⁸ Digital designers will have at their fingertips a very similar argument.

* * *

Above, I map the doctrinal terrain to identify a few potential PL obstacles. Notwithstanding these apparent pitfalls, courts may well, in typical common law fashion, end up softening lines and blurring boundaries in order to impose strict liability on hobbyist 3-D inventors and digital designers, especially if uncompensated injuries mount.²⁹ If they do, it will raise an interesting challenge to the theoretical foundation on which the doctrine of product liability logically rests.

When tort theorists are asked why courts impose strict liability on manufacturers and sellers of products, they often spin out the following syllogism: liability is imposed on those who manufacture and sell products because (1) those who manufacture and sell products tend to be enterprises; (2) imposing liability on enterprises is beneficial; and, consequently, (3) imposing

relationship with their "purchasers," and are more likely to have a hand in the production of mass-marketed consumer goods.

²⁶ RESTATEMENT (SECOND) OF TORTS § 402A(1)(b) & cmt. p.

²⁷ See *K-Mart Corp. v. Midcon Realty Grp. of Conn., Ltd.*, 489 F. Supp. 813 (D. Conn. 1980).

²⁸ *Id.* at 817, 820 (internal quotation marks omitted). On the other hand, *K-Mart* (decided in 1980) is somewhat dated. In recent years, some courts have interpreted the Second Restatement's "substantial change" language less literally, demanding only that the defect exist in the given defendant's product at the time the product left the defendant's possession and control. See RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 19 reporters' note cmt. b.

²⁹ After all, "[i]t is the glory of the common law that it is not a rigid, immutable code." Caporaletti v. A-F Corp., 137 F. Supp. 14, 16 (D.D.C. 1956), *rev'd on other grounds*, 240 F.2d 53 (D.C. Cir. 1957). On the contrary, its "rules are subject to gradual modification and continuous adjustment to changing social and economic conditions and shifting needs of society." *Id.* It is also possible that, rather than expanding current product liability doctrine to capture 3-D-printed items, courts will impose liability by expansively applying the negligence standard. Defective code, for example, might be held to support an inference of negligence, perhaps *via ipsa loquitur*.

liability on manufacturers and sellers is beneficial. Step 2 of the syllogism is, in turn, often defended in terms of basic fairness (it's only right that those who profit from the imposition of risk should bear the costs of the accidents that are the price of their profits), superior loss spreading (shifting losses to enterprises reduces the social cost of accidents because enterprises are better than injury victims at absorbing and distributing losses), and/or accident reduction (as compared to accident victims, enterprises are better equipped to respond to the safety incentives created by liability rules).³⁰

This matters for 3-D printing because 3-D printing *democratizes* product creation. It empowers ordinary Americans to become countertop creators—and not merely of jam and lemonade, but of material that's complicated, sophisticated, and potentially dangerous. In so doing, 3-D printing *severs* the long-established identity between manufacturers and sellers, on the one hand, and enterprises, on the other. And this decoupling, in turn, destroys the first step of the above syllogism—and unsettles product liability law's traditional theoretical foundation.

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³⁰ These justifications are not exhaustive. For more on these, and other, justifications for enterprise liability, see Gregory C. Keating, *The Theory of Enterprise Liability and Common Law Strict Liability*, 54 VAND. L. REV. 1285, 1287-88 (2001); George L. Priest, *The Invention of Enterprise Liability: A Critical History of the Intellectual Foundations of Modern Tort Law*, 14 J. LEGAL STUD. 461, 466 (1985); and Robert L. Rabin, *Some Thoughts on the Ideology of Enterprise Liability*, 55 MD. L. REV. 1190, 1190-91 (1996). For the classic articulation of the risk distribution rationale, see *Escola v. Coca Cola Bottling Co.*, where Justice Traynor, in concurrence, noted,

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.

150 P.2d 436, 441 (Cal. 1944) (Traynor, J., concurring). Of course, existing justifications for product liability law are also susceptible to criticism. For a sustained critique, see generally A. Mitchell Polinsky & Steven Shavell, *The Uneasy Case for Product Liability*, 123 HARV. L. REV. 1437 (2010).