

The Coming Connected-Products Liability Revolution

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I. Introduction

Technological innovation begets legal revolution. And tort law, perhaps more than any other area of law, makes the most profound doctrinal leaps when technology changes our everyday lives. As the 20th century began, torts existed as a “twig on the great tree of law,” dismissively described as “totally insignificant.”¹

Still, it was far from non-existent. The advanced technology of the mid-19th century, railroads, signaled an importance to tort law that was only slowly realized. Trains were “wild beasts” that traversed the nation. For all the railroads contributed positively to economic development, their powerful sweep of the landscape also killed livestock, caused destructive fires, injured passengers, and destroyed much in their path, including other trains.² It is no hyperbole to say that “[r]ailroad law and tort law grew up together” and were essentially one and the same.³

The Industrial Revolution further changed tort law from what was still a sleepy backwater of the law, even if it boasted some well-established doctrines and impressive treatises,⁴ into a growing powerhouse needed to address the “marvelous

¹ Lawrence M. Friedman, *A History of American Law* 467 (2d ed. 1985).

² *Id.* at 468.

³ *Id.*

⁴ The first tort treatise appeared in 1859. Thomas H. Koenig & Michael L. Rustad, *In Defense of Tort Law* 15 (2001). Perhaps no scholarly treatise achieved the same renown in the 19th century as

capacity” its machines had “for smashing the human body.”⁵ The stringent rules that blocked recovery required reconsideration and adjustment. Assumption of the risk and contributory negligence, for example, provided seemingly insuperable barriers to liability. The harshness of these rules, for example, gave rise to the “last clear chance” rule that imposed liability regardless of the risk assumed or the plaintiff’s own negligence, as long as the tortfeasor had a final opportunity to avoid the injury.⁶ Even longer down the road, contributory negligence was largely replaced with comparative negligence.⁷

Once again, we are living in an age of great technological change. Smart devices have become ubiquitous. In 2011, 35 percent of Americans owned a smart

Thomas M. Cooley, *A Treatise on the Law of Torts or the Wrongs which Arise Independent of Contract* (1879), in part due to its rejection of forms of action as the organizing principle for torts in favor of a more plaintiff-rights/defendant-misconduct approach. See Kenneth S. Abraham, G. Edward White, *Conceptualizing Tort Law: The Continuous (and Continuing) Struggle*, 80 Md. L. Rev. 293, 307 (2021). Presciently, Cooley recognized that “new inventions and improvements . . . have a powerful tendency in the direction of creating new wants and desires, and of establishing people in new occupations, and as these increase, the interests, desires and passions of men must necessarily breed more frequent controversies.” Cooley, *Law of Torts* 1. Cooley expressed doubt that the necessary “infinity of legislation” could keep up with “new conditions” but put his faith in “judicial legislation,” as he termed the common law, as a “necessary condition of any steady improvement in the law.” *Id.* at 2, 11-12. Because so much of tort law is common law, the law experienced that “steady improvement” disproportionately through tort.

⁵ Friedman, *supra* note 1, at 467.

⁶ G. Edward White, *Tort Law in America: An Intellectual History* 47 (1980).

⁷ Contributory negligence was a common-law doctrine developed in the early 19th century that barred recovery if the plaintiff’s own negligence contributed in any way to the injury. 78 A.L.R.3d 339. The harshness of that doctrine was recognized quickly, but largely survived into the 20th century until the use of comparative negligence, which assigns percentages of fault, became the majority rule. Still today, four states continue to employ contributory negligence. Peter Nash Swisher, *Virginia Should Abolish the Archaic Tort Defense of Contributory Negligence and Adopt A Comparative Negligence Defense in Its Place*, 46 U. Rich. L. Rev. 359, 360 (2011).

phone.⁸ A decade later, that number has jumped to 85 percent, with those aged 18-49 reaching above 95 percent in smartphone usage.⁹ The trend toward youthful adoption suggests that smart phones will continue to claim common adherence in all but the poorest and least industrialized nations.

Yet, smartphones are but the tip of the iceberg. Computers, connected to other computers through the Internet, can be found in a wide variety of items we use every day. At least one projection estimates that “by 2035 the world will have a trillion connected computers, built into everything from food packaging to bridges and clothes.”¹⁰ These connections, known as the Internet of Things, or IoT, enable communication between computers to assure efficiency and convenience.¹¹ As the ability to do so increases at the same time costs decrease, “[c]ountless tiny chips will be woven into buildings, cities, clothes and human bodies, all linked by the internet.”¹² The result:

⁸ Pew Research Center, Mobile Fact Sheet, <https://www.pewresearch.org/internet/fact-sheet/mobile/>.

⁹ *Id.* Globally, more than half of the world’s 5 billion cellphone users have smartphones. Laura Silver, “Smartphone Ownership Is Growing Rapidly Around the World, but Not Always Equally,” <https://www.pewresearch.org/global/2019/02/05/smartphone-ownership-is-growing-rapidly-around-the-world-but-not-always-equally/>.

¹⁰ “How the World Will Change as Computers Spread into Everyday Objects,” *The Economist*, Sept. 14, 2019, available at <https://www.economist.com/leaders/2019/09/12/how-the-world-will-change-as-computers-spread-into-everyday-objects>. In 2020, the number of IoT devices was 11.3 billion, despite slowdowns because of COVID-19 and a shortage of computer chips. Satyajit Sinha, “State of IoT 2021: Number of connected IoT devices growing 9% to 12.3 billion globally, cellular IoT now surpassing 2 billion,” <https://iot-analytics.com/number-connected-iot-devices/>.

¹¹ *See* Fed. Trade Comm’n, *Internet of Things: Privacy & Security in a Connected World 5* (Jan. 2015).

¹² “Drastic Falls in Cost Are Powering Another Computer Revolution,” *The Economist*, Sept. 14, 2019, available at <https://www.economist.com/technology-quarterly/2019/09/12/drastic-falls-in-cost-are-powering-another-computer-revolution>.

Microchipped clothes could tell washing machines how to treat them. Smart traffic systems will reduce waiting times at traffic lights and better distribute cars through a city. Some will be the sorts of productivity improvements that are the fundamental drivers of economic growth. Data from factory robots, for instance, will allow algorithms to predict when they will break down, and schedule maintenance to ensure that does not happen. Implanted sensors will spot early signs of illness in farm animals, and micromanage their feeding. Collectively, those benefits will add up to a more profound change: by gathering and processing vast quantities of data about itself, a computerised world will allow its inhabitants to quantify and analyse all manner of things that used to be intuitive and inexact.¹³

In addition, we have smart mattresses with sleep tracking capabilities, as well as implanted medical devices that deliver medication as needed, stimulate the heart, and monitor insulin levels.¹⁴ Automobile insurers encourage drivers to use smart devices that allow the insurance company to monitor driving habits and frequency to incorporate into their calculations of risk assessment and premium charges.¹⁵

The IoT has already touched nearly all aspects of everyday life. It has revolutionized government services, interpersonal communications, modern education, healthcare delivery, and business relations. And, as with every previous major societal change, the law struggles to keep up. Nowhere is that more evident in the areas where duties and liability attach. Some of that is a function of old concepts and doctrines continuing to hold sway, given the tradition-bound and

¹³ *Id.*

¹⁴ “How the World,” *supra* note 9.

¹⁵ *Id.*

precedent-oriented nature of law. Yet, as with other liability-inhibiting doctrines, certain existing liability rules that may have once made sense will require reexamination and, perhaps, abandonment, as continued adherence to them becomes less a matter of considered choice than blind allegiance to a world that no longer exists.

Products liability provides helpful perspective on how law must adapt to the changes of a society more connected than ever before through the Internet. It raises challenges that have historical antecedents and others that require reinvention. It also taps into the value of a common-law system capable, if properly utilized, of advancing as technological does with increasing rapidity.

This paper attempts to sketch out some of the challenges and potential doctrinal changes ahead, understanding that change occurs swiftly in ways that we often cannot anticipate. One must always be mindful that many past predictions about technology and its impact have demonstrated little prescience.

II. The Inadequate State of Products Liability Law

While some products liability law sports a certain timeless quality that has proven infinitely adaptable to more modern applications, other aspects of it seem as antiquated as *caveat emptor* has proven as a useful guiding principle for consumer rights. At its most basic level, products liability law permits parties injured by defective products to sue manufacturers and sellers for negligence, breach of

warranty, strict liability, or misrepresentation.¹⁶ The rationale behind products liability contemplates that a manufacturer is in the best position to understand the risks to a user that a product creates while marketing the item in a quest for profit, thereby undertaking a duty to the product's users.¹⁷

A. A Short History of Products Liability

Automobiles were responsible for the beginnings of modern products liability law,¹⁸ often tracked to Benjamin Cardozo's famous opinion in *MacPherson v. Buick Motor Co.*¹⁹ To assess liability over a broken wheel due to defective wooden spokes, *MacPherson* loosened the then-prevalent privity rule to allow the injured plaintiff to sue the manufacturer directly, even though the vehicle was purchased from an intermediary retailer so that the buyer had no relationship with the manufacturer. Cardozo reasoned, in terms familiar today, that the manufacturer should have discovered the wheel's flaw upon reasonable inspection and must take responsibility.²⁰ Ever since, historian Lawrence Friedman has described the

¹⁶ See generally, Restatement (Second) of Torts § 402A (1965); Restatement (Third) of Torts: Product Liability §§ 1-2 (1998).

¹⁷ See David G. Owen, *The Moral Foundations of Products Liability Law: Toward First Principles*, 68 Notre Dame L. Rev. 427, 430 (1993).

¹⁸ Automobiles have also had a profound effect on tort law outside of products liability. For a helpful discussion of that development, see Nora Freeman Engstrom, *When Cars Crash: The Automobile's Tort Law Legacy*, 53 Wake Forest L. Rev. 293 (2018). An early observation of how "automobile law" had grown quickly was written by then-student and later president Richard Nixon. Richard M. Nixon, *Changing Rules of Liability in Automobile Accident Litigation*, 3 Law & Contemp. Probs. 476 (1936).

¹⁹ 217 N.Y. 382, 111 N.E. 1050 (1916).

²⁰ *Id.* at 390, 111 N.E. at 1051.

evolution of products liability spawned by *MacPherson* as a movement away from requirements of privity.²¹

It took nearly another thirty years after *MacPherson* for products liability to develop further in a significant way. An exploding Coca Cola bottle injured the hand of a waitress who had just picked the bottle up. She sued successfully based on *res ipsa loquitur* even though the cause of the bottle's shattering remained unexplained,²² but a concurring opinion by Justice Roger Traynor laid the groundwork for strict liability. Traynor wrote that "it should now be recognized that a manufacturer incurs an absolute liability when an article that he has placed on the market, knowing that it is to be used without inspection, proves to have a defect that causes injury to human beings."²³ Proof of negligence, he said, was unnecessary, had proven unworkable, and usually spelled doom for an injured plaintiff.²⁴ Traynor had to bide his time to see his advocacy of doctrinal change implemented. That time came in 1963 when he wrote the majority opinion in *Greenman v. Yuba Power Prod., Inc.*,²⁵ adopting the view he had expressed earlier.

Soon afterwards, the American Law Institute incorporated that view into section 402A of the Restatement (Second) of Torts, guided to that result by its

²¹ Lawrence M. Friedman, *American Law in the 20th Century* 356 (2002).

²² *Escola v. Coca Cola Bottling Co. of Fresno*, 24 Cal. 2d 453, 461, 150 P.2d 436, 440 (1944).

²³ *Id.* (Traynor, J., concurring).

²⁴ *Id.* at 440-41 (Traynor, J., concurring).

²⁵ 59 Cal. 2d 57, 377 P.2d 897 (1963).

reporter, William Prosser. The section stated that a defendant should be liable for selling “any product in a defective condition unreasonably dangerous to the user or consumer.”²⁶ Section 402A is widely regarded as the most important and most cited section of any Restatement.²⁷ With the ALI’s endorsement of strict liability for product defects, courts throughout the nation quickly adopted the approach and products liability law came into its own. The growth of product liability in the aftermath of strict liability has predictably produced a certain amount of retrenchment as manufacturers and insurers have fought to limit their exposure and bring back concepts of negligence.²⁸

B. Contemporary Products Liability Principles and Some Applications

Modern products liability law focuses heavily on the condition of a product when it leaves the hands of the manufacturer or retailer without necessarily ascribing responsibility to them for upgrades or responses to unanticipated developments. The current Restatement classifies products liability in three categories: manufacturing defects, design defects, and inadequate instructions or warnings.²⁹

²⁶ Restatement (Second) of Torts § 402A(1) (ALI 1965).

²⁷ See James A. Henderson, Jr., *A Proposed Revision of Section 402a of the Restatement (Second) of Torts*, 77 Cornell L. Rev. 1512, 1546 n.1 (1992).

²⁸ For a description of those changes, see Michael L. Rustad & Thomas H. Koenig, *Taming the Tort Monster: The American Civil Justice System As a Battleground of Social Theory*, 68 Brook. L. Rev. 1, 88-93 (2002).

²⁹ Restatement (Third) of Torts: Product Liability § 19.2 (ALI 1998). Still, many jurisdictions have rejected the reasonable alternative design approach.

That Restatement reformulated some key components of products liability law. Most sweepingly, in design-defect cases, it jettisoned Section 402A strict liability and the consumer-expectations test,³⁰ in favor of a “reasonable alternative design” approach, imposing on plaintiffs an obligation to mount a risk-utility case for why a different design approach would have been reasonable and would not have substantially detracted from the products’ features.³¹ The risk-utility test reintroduces negligence into products liability, and many states have adopted it.³² State courts are split on which test to apply and sometimes even allow the plaintiff a choice between the two.³³

The difficulty of using a reasonable alternative design test may be exacerbated in the era of connected devices. When the product design issue arises from miles of coding in a smart device, a demonstration of reasonable alternative design could be particularly problematic, for it forces a plaintiff to produce experts that review the code and “fix” the software, an engineering feat that seems beyond what may reasonably be required of a plaintiff.

Another potential limitation on liability is the economic-loss doctrine, which bars recovery for purely financial harms that do not involve injury to person or

³⁰ Under the consumer-expectations test, liability hinges on whether the product “failed to perform as safely as an ordinary consumer would expect when used in an intended or reasonably foreseeable manner.” *Tincher v. Omega Flex, Inc.*, 104 A.3d 328, 368 (Pa. 2014).

³¹ Restatement (Third) of Torts, at § 2.

³² See *Evans v. Lorillard Tobacco Co.*, 465 Mass. 411, 426, 990 N.E.2d 997, 1012 (2013).

³³ Clayton J. Masterman and W. Kip Viscusi, *The Specific Consumer Expectations Test for Product Defects*, 95 Ind. L. Rev. 183, 191 (2020).

property.³⁴ It has proven an obstacle in some cybersecurity data breach litigation and has faced calls for its revision.³⁵

Proximate cause may also pose some challenges. To the extent that smart devices are capable of being hacked or otherwise fail due to atmospheric conditions, weak signals, or overwhelming Internet traffic, questions may arise about whether the outside events were foreseeable and redressable by manufacturer. Yet, as more of those types of events occur, foreseeability may become an easier question to answer.

III. Products Liability and the Age of the Connected Device

The distinguishing feature of today's Internet-connected devices is a continuing relationship between product and manufacturer. Just as federal law requires a drug manufacturer to compile adverse incident reports and change warning labels as new and unanticipated dangers are discovered,³⁶ expectations are high that manufacturers must produce software updates, correct security holes in connected devices, have real-time information about the devices from monitoring sensors that provide continuous data on the device's operation, and assure the connections essential to basic operations through the Internet.

³⁴ Peter Benson, *The Problem with Pure Economic Loss*, 60 S.C. L. Rev. 823, 823 (2009).

³⁵ For a discussion of this issue, see Catherine M. Sharkey, *Can Data Breach Claims Survive the Economic Loss Rule?*, 66 DePaul L. Rev. 339, 382 (2017).

³⁶ 21 U.S.C. § 355(k); see also *Wyeth v. Levine*, 555 U.S. 555, 568 (2009) (describing the "changes being effected" (CBE) regulation, 21 CFR §§ 314.70(c)(6)(iii)(A), (C)).

Connected devices tout potential efficiencies otherwise unavailable. For example,

Microchipped clothes could tell washing machines how to treat them. Smart traffic systems will reduce waiting times at traffic lights and better distribute cars through a city. Some will be the sorts of productivity improvements that are the fundamental drivers of economic growth. Data from factory robots, for instance, will allow algorithms to predict when they will break down, and schedule maintenance to ensure that does not happen. Implanted sensors will spot early signs of illness in farm animals, and micromanage their feeding.³⁷

Pampers, the disposable diaper brand, has incorporated sensors into a smart diaper it offers that connects to an app. A baby's sleep patterns are recorded and sent both to the app and to Pampers. It also alerts parents when the diaper must be changed. Both daily and weekly "sleep insight reports" from Pampers measure a baby's progress and provide coaching on getting the baby to sleep through the night.³⁸

As welcome as some of the assistance offered by connected devices might be, there are downsides that some consumers have already experienced. For example, tractor manufacturer John Deere offers a high-end, advanced technology tractor, which utilizes proprietary connected software that John Deere licenses to purchasers. The software enables more efficient use of the tractors, resulting in

³⁷ "Drastic Falls," *supra* note 10.

³⁸ Lumi by Pampers, "How It Works," available at <https://www.lumibypampers.com/#how-it-works>.

increased productivity, but also prevents farmers from undertaking common repairs to the machinery themselves and has spawned a right-to-repair movement.³⁹

A. Internet-Connected Products and Malfunctions or Failures

These changes in how manufacturers interact with products long after they have left their hands implicates new duties and new potential liabilities. For example, in 2019, Hurricane Dorian traveled along the Southeast coast of the United States after wreaking havoc in the Bahamas. To help his customers get away from the storm, Elon Musk announced that some Tesla drivers would find a suddenly increased range for their vehicles. It turns out that even the most basic Teslas are capable of driving much further than the car's specifications indicate because implanted software lowers that range, apparently to encourage sales of their longer-range option.⁴⁰

Recognizing that a customer trapped in a hurricane because the battery charge gave out, Tesla, headquartered in Palo Alto, California, simply removed the battery limitations at the “tap of a keyboard” and provided drivers with “temporary access to the full power of their batteries.”⁴¹

³⁹ Peter Waldman and Lydia Mulvany, “Farmers Fight John Deere Over Who Gets to Fix an \$800,000 Tractor,” *Bloomberg Businessweek* (Mar. 5, 2020), available at <https://www.bloomberg.com/news/features/2020-03-05/farmers-fight-john-deere-over-who-gets-to-fix-an-800-000-tractor>.

⁴⁰ “How the World,” *supra* note 9.

⁴¹ *Id.*

But consider if Tesla had not done so. Tesla drivers stranded and injured in the storm because their vehicle lost power preventing them from getting far enough away or because they had to stop and recharge, losing precious time to beat their retreat, might argue that the company had a duty to undertake the assistance that it actually provided. That Tesla has now done so at least once suggests that customers may have similar expectations when a future catastrophe occurs. A Tesla driver stuck in dangerous circumstances might even call the company and ask for the same range-enhancing treatment. When it does not come to pass and injury occurs, it is not difficult to imagine a case that argues in favor of a duty to assist, as well as a defense about the driver's own lack of foresight in fully charging the vehicle.

In some ways, Tesla's ability to enable longer drives for their vehicles might be comparable to the complaints that exist when cellphone service providers slow Internet speeds on their devices. When the customer has an "unlimited" plan, some carriers will "throttle," or slow the speed of the connection, after customers hit a defined usage amount.⁴² In a crisis affecting a portion of the country, when overwhelming cellphone usage could otherwise jam networks, continued throttling could become a "but-for" cause of injury.

⁴² Rayna Hollander, "The 4 Biggest US Wireless Carriers Are Reportedly Throttling Mobile Video Content — Even When Networks Aren't Congested," *Insider* (Aug. 21, 2019), available at <https://www.businessinsider.com/big-four-us-carriers-are-throttling-mobile-video-streams-2019-8> (reporting on study by researchers at Northeastern University and the University of Massachusetts Amherst).

Other failures can occur when a manufacturer loses interest in the smart product it once enthusiastically marketed. Microsoft, for example, after two years in the ebook business, shut down its library in 2019, deleting all content from the devices that customers used to read the books and thought that they had purchased.⁴³ The capability for doing so, even if the content had been saved to a personal device, exists because a “digital media transaction is continuous, linking buyer and seller, and giving the seller post-transaction power that would be impossible in physical markets.”⁴⁴

Smart devices contain software that make the devices work. For the most part, like the Microsoft ebooks, the John Deere connected tractors, and Tesla’s battery capabilities, the software to run them is licensed to the consumer, rather than purchased by them, giving the manufacturer continuing contact and control over the device, and making apparent that the device never fully leaves the manufacturer’s hands.

That continuing connection is further demonstrated through software updates that can improve the device’s functioning and provide security improvement. It often happens without the customer’s intervention, such as when a

⁴³ Josh Axelrod and Lulu Garcia-Navarro, “Microsoft Closes the Book on Its E-Library, Erasing All User Content,” NPR (Jul. 7, 2019), available at <https://www.npr.org/2019/07/07/739316746/microsoft-closes-the-book-on-its-e-library-erasing-all-user-content>. Microsoft refunded their customers payments to make up for the decision. *Id.*

⁴⁴ Aaron Perzanowski and Chris Jay Hoffnagle, *What We Buy When We Buy Now*, 165 U. Penn. L. Rev. 315, 318 (2017).

person finds that Microsoft updated its Windows operating system on a personal computer overnight, causing it to reboot unexpectedly.

Yet, what happens when the delivery system for a connected device fails? Home security systems could leave a door or window open so an intruder may enter; sprinkler systems could go off and cause water damage and mold in a home. An implanted medical device could under- or over-deliver medication. Should liability attach? The answer may well depend on how we approach proximate cause and the role we assign to foreseeability. Where a manufacturer discovers a security hole or knows that its over-the-air updates are glitchy but takes no steps to either warn customers or overcome the obstacle, liability may attach. As is traditional in tort law, that means redefining what constitutes a duty, as Justice Traynor did in developing the concept of strict liability.

At the same time, the ongoing connection between the manufacturer and the device, essential to its functioning, makes the actual discharge of that duty relatively easy to accomplish. Yet, for a variety of unanticipated reasons, the update may be delayed. Thus, capability and foresight may be critical considerations. While programming errors probably provide no defense, lines will need to be drawn about delays in software updates, understandings about Internet traffic, and other malfunctions and failures – and perhaps warnings at specific times, rather than through boilerplate, necessary.

B. Lost Control for Hacked Devices and Other Cybersecurity Breaches

Connected devices are subject to hacking and other breaches. In the largest cyber hack ever, some 18,000 U.S. companies and governmental agencies were hacked.⁴⁵ It occurred because code was embedded in a patch automatically downloaded and installed on thousands of computers through a tech company called SolarWinds, giving the hackers access to the infiltrated computers and to their data.⁴⁶

A hack of autonomous vehicles (AVs) could have cars careening out of control or causing massive traffic jams that impede essential services.⁴⁷ A recent report by the European Union Agency for Cybersecurity found that the use of artificial intelligence to improve cognitive functions in autonomous vehicles are “highly vulnerable to a wide range of attacks that could compromise the proper functioning of autonomous vehicles, and pose serious threats to the safety of persons, both inside and outside of a vehicle.”⁴⁸

Researchers at the RAND Corporation looked at potential civil liability and concluded:

- AV manufacturers, component part makers, software designers, and distributors “may face civil liability for the criminal hacks on AVs;” and,

⁴⁵ Lance Eliot, “Largest Ever Cyber Hack Provides Vital Lessons for Self-Driving Cars,” *Forbes* (Dec 29, 2020), available at <https://www.forbes.com/sites/lanceeliot/2021/12/29/largest-ever-cyber-hack-provides-vital-lessons-for-self-driving-cars/?sh=46fe0ff1715e>.

⁴⁶ *Id.*

⁴⁷ AVs also utilize artificial intelligence

⁴⁸ European Union Agency for Cybersecurity, *Cybersecurity Challenges in the Uptake of Artificial Intelligence in Autonomous Driving* 6 (2021).

- AV owners themselves could also be open to liability for damage their vehicles cause if they have rejected a security update.⁴⁹

The researchers nonetheless expressed confidence that existing liability law has the flexibility to adapt and manage small and medium hacks, and assumed that criminal hacking is a foreseeable event, particularly where known vulnerabilities exist.⁵⁰ They also expect that the cases will require courts to use cost-benefit analyses that will put a premium on judicial understanding of the technology.⁵¹ Yet, where there is certainty and especially high stakes, a strict-liability regime for avoidable injuries due to security breaches may be necessary to avoid mammoth battles of technology experts about what could or could not have been done.

C. Privacy

With increasing amounts of data compiled by manufacturers based on information transmitted from devices they put in consumers' hands, not only will new privacy rules be needed, but rules related to liability for privacy breaches for manufacturers maintaining connections to the product.

One area ripe for development concerns consumer choice. Can a connected-device manufacturer minimize or provide a menu of options on the type and extent of data shared through the device? To the extent that connected devices depend on

⁴⁹ Zev Winkelman, *et al.*, Hacked Autonomous Vehicles: Who May Be Liable for Damages? An Initial Investigation into How Civil Liability Systems Can Prepare, 2 (2019).

⁵⁰ *Id.*

⁵¹ *Id.*

data-driven innovation, privacy will remain a challenge and the applicable principles are likely to develop over time.

D. The Retailer and the Connected Product

Retailers have long shared liability with manufacturers, although some states have enacted statutes that entitles an innocent seller to seek indemnity for litigation costs from the manufacturer of a product alleged to be defective.⁵² Yet, where the retailer implemented modifications or kept an independent connection to the product, even when coordinated or implemented with the manufacturer's consent or involvement, independent liability may attach.

E. A Short Note on Proximate Cause

Foreseeability has long served as the touchstone for proximate cause in tort law and should remain a key factor for liability for injuries caused by connected products. Proximate cause itself has a mercurial quality that defies easy definition.⁵³ Even without the advent of connected devices and the forces that could alter their operation, courts have found proximate cause “notoriously confusing” and characterized by an utter “lack of consensus on any one definition.”⁵⁴

Generally, a proximate cause must only be “substantial enough and close enough to the harm to be recognized by law, [and] a given proximate cause need not

⁵² See, e.g., Tex. Civ. Prac. & Rem. Code Ann. § 82.002(a).

⁵³ Lexmark Int'l, Inc. v. Static Control Components, Inc., 572 U.S. 118, 133 (2014).

⁵⁴ CSX Transp., Inc. v. McBride, 564 U.S. 685, 701 (2011). See also W. Page Keeton *et al.*, Prosser and Keeton on the Law of Torts § 41, at 263 (5th ed. 1984) (describing the disagreeing opinions as a “welter of confusion”).

be, and frequently is not, the exclusive proximate cause of harm.”⁵⁵ It is a tool used to eliminate liability for remote causes, meaning those “so attenuated that the consequence is more aptly described as mere fortuity.”⁵⁶ Whether an intervening criminal event, such as hacking, breaks the causal chain and becomes a superseding event, depends upon “whether the type of intervention was a reasonably foreseeable consequence of the product defect.”⁵⁷ Still, there is likely to be some fluidity for a time in what might be reasonably anticipated and avoided as the capacity to do so evolves.

Although significant defects and insecure devices create obvious vulnerabilities to hacking, reasonable efforts at plugging security holes may still prove ineffective. Where the cause of action exists by statute, proximate-cause standards are statute-specific,⁵⁸ with more lenient requirements applied in some instances,⁵⁹ and far more rigorously in others.⁶⁰ Still, even in the statutory context, the applicable proximate cause must be consonant with “what justice demands.”⁶¹

⁵⁵ *Sosa v. Alvarez-Machain*, 542 U.S. 692, 704 (2004).

⁵⁶ *Paroline v. U.S.*, 572 U.S. 434, 445 (2014) (citation omitted).

⁵⁷ David G. Owen & Mary J. Davis, *Owen & Davis on Products Liability* § 1:16 (4th ed. 2014).

⁵⁸ *Lexmark*, 572 U.S. at 133.

⁵⁹ *See McBride*, 564 U.S. at 701.

⁶⁰ *See, e.g., Holmes v. Sec. Investor Prot. Corp.*, 503 U.S. 258, 269 (1992).

⁶¹ *Id.* at 268.

For connected devices, a rigid proximate cause standard will often mean an assessment of what the manufacturer knew or should have known and what it should have done and when it should have done it. Yet, because in some ways, the manufacturer remains in possession of the device through the software that it alone controls, a far more forgiving causal standard seems apt that looks to a form of strict liability.

IV. Rethinking Personal Jurisdiction for Products Liability

Most products liability cases take place in state court or federal courts sitting in diversity. Modern personal-jurisdiction doctrine is less concerned about haling a defendant into a jurisdiction unknown to it than about federalism limits on a state's authority to try a case.⁶² Today's generally more restrictive approach to personal jurisdiction is at odds with predictions the Supreme Court ventured more than 60 years ago. In 1957, it assumed that "modern transportation and communication" would continue the trend of "expanding the permissible scope of state jurisdiction over foreign corporations and other nonresidents" in state courts as commercial transactions lead to a further "nationalization of commerce."⁶³ Forty years later, a federal district court predicted that the Internet, which "makes it possible to conduct business throughout the world entirely from a desktop," creates a "likelihood that personal jurisdiction can be constitutionally exercised [in] direct[ly] proportion[] to the nature and quality of commercial activity that an entity conducts over the Internet."⁶⁴

These predictions have not come to pass – yet. To date, personal jurisdiction based on the Internet's reach into a jurisdiction is a non-starter.⁶⁵ A manufacturer's website is generally deemed a passively available way for a customer to interact a

⁶² *Bristol-Myers Squibb Co. v. Superior Court*, 137 S. Ct. 1773, 1781 (2017).

⁶³ *McGee v. Int'l Life Ins. Co.*, 355 U.S. 220, 222-23 (1957).

⁶⁴ *Zippo Mfg. Co. v. Zippo Dot Com, Inc.*, 952 F. Supp. 1119, 1123–24 (W.D. Pa. 1997).

⁶⁵ *See, e.g., Cadle Co. v. Schlichtmann*, 123 F. App'x 675, 678 (6th Cir. 2005) ("the operation of the website alone is insufficient to confer [personal] jurisdiction.

manufacturer. It therefore does not satisfy the requirement that the relationship that conveys jurisdiction “must arise out of contacts that the ‘defendant *himself*’ creates with the forum State.”⁶⁶ While the website does not reach out to the customer, the manufacturer of a connected device is repeatedly reaching out to the device, wherever located, and changes the equation tremendously.

The Supreme Court’s most recent pronouncement on personal jurisdiction appears to support that view. *Ford Motor Co. v. Montana Eighth Jud. Dist. Ct.*⁶⁷ involved two cases about Ford vehicles not originally sold in the states where the drivers lived and were injured. Ford resisted personal jurisdiction, asserting that it could only be made to answer in the state of original sale, where the car’s flawed feature was designed, or where the vehicle had been manufactured. The Court rejected those limitations, holding that “[w]hen a company like Ford serves a market for a product in a State and that product causes injury in the State to one of its residents, the State’s courts may entertain the resulting suit.”⁶⁸

Influential to its decision was the global reach of Ford’s business, where it “markets, sells, and services its products across the United States and overseas.”⁶⁹ The Court pointedly noted that nearly all of its dealerships provide repair and maintenance services for the vehicles to assure they continue to operate long after

⁶⁶ *Walden v. Fiore*, 571 U.S. 277, 284 (2014) (citing *Burger King Corp. v. Rudzewicz*, 471 U.S. 462, 475 (1985)).

⁶⁷ 141 S. Ct. 1017 (2021).

⁶⁸ *Id.* at 1022.

⁶⁹ *Id.*

the sale. Ford also urges customers to “Keep Your Ford a Ford,” “provides original parts to auto supply stores and repair shops across the country,” thereby “fostering an ongoing relationship between Ford and its customers.”⁷⁰ The *Ford* decision came after a decade of precedent that continuously contracted the reach of personal jurisdiction. In a concurrence joined by Justice Thomas, Justice Gorsuch described those limitations as “almost quaint” and certainly dated, suggesting an openness to rethinking personal jurisdiction’s due-process limitations.⁷¹

Connected devices may accelerate that rethinking. Their features satisfy traditional considerations because the manufacturer continuously reaches out to the device for data, provides updates, and usually owns the devices embedded software. Its “ongoing relationship,” to use *Ford*’s terminology, is directly with the device and thus implicitly with the customer or user of the device. Its actions initiate contact with the device, which may not be the type of purposeful availment that has animated some personal-jurisdiction jurisprudence. Still, it is the type of contact that a defendant initiates itself. The increasing presence of connected devices in the marketplace will no doubt accelerate the recognitions that Ford expressed about the sensibility of permitting judicial authority over persons outside a geographically limited area and may yet make the Supreme Court’s 1957 prediction about modern transportation and communications opening personal jurisdiction even further come true.

⁷⁰ *Id.* at 1022-23.

⁷¹ *Id.* at 1034 (Gorsuch, J., concurring).

V. Conclusion

Technology has long shaped the law of products liability, requiring it to adjust to the realities of the types of products manufactured and what consumers face in the marketplace. Connected devices open a new world to consumers and will similarly require reconceiving aspects of the applicable law. Ownership of a connected device, as a functioning item, may no longer be lodged solely in the purchaser, but shared with the manufacturer who maintains proprietary software within the device. The relationship might not be accurately characterized as manufacturer and customer, but as co-owners or customer and service provider.

The manufacturer maintains frequent, if not continuous interaction with the device, giving it a form of shared possession over the product. Preserving the device's usefulness through software and security updates, capturing real-time data about its use and functioning, and conveying useful information to the customer are central features of connected devices. The new relationship that grows out of those attributes will necessarily impose new duties that, if not discharged or if discharged negligently, will produce liability. To the extent that consumers can expect to rely on those features, it may even bring a revitalization and expansion of strict liability. Perhaps most inevitably, it will expand the reach of personal jurisdiction in state courts.