PROXIMITY-DRIVEN LIABILITY

Bryant Walker Smith[*]

102 GEORGETOWN L.J. (forthcoming 2014)
November 2013 Working Draft

This paper argues that commercial sellers' growing information about, access to, and control over their products, product users, and product uses could significantly expand their point-of-sale and post-sale obligations toward people endangered by these products. The paper first describes how companies are embracing new technologies that expand their information, access, and control, with primary reference to the increasingly automated and connected motor vehicle. It next analyzes how this proximity to product, user, and use could impact product-related claims for breach of implied warranty, defect in design or information, post-sale failure to warn or update, and negligent enabling of a third-party's tortious behavior. It finally flips the analysis to consider how the uncertainty caused in part by changing liability could actually drive companies to further embrace this proximity.

[*] Fellow, Center for Internet and Society at Stanford Law School; Fellow, Center for Automotive Research at Stanford; Lecturer in Law, Stanford Law School. My thanks to Mark Geistfeld, Bob Rabin, Ryan Calo, Bernadette Meyler, David Kamin, Dick Stewart, Ryan Bubb, Amber Jordan, Jared Smith, Aleecia McDonald, Eric P. Dennis, Jon Peha, Patrick Lin, Chris Bradley, Sien Rivera, and my fellow fellows at Stanford Law School for their early comments.

1 INTRODUCTION

Visa, Google, Amazon, Facebook, and FedEx know more about my purchases over the last five years than I do. AT&T can find me—or at least my phone—whenever it wants.[1] And Microsoft updates my computer's software several times a month. But what about a manufacturer that discovers a new risk in something that it made and I bought? The Restatement (Third) of Torts: Products Liability stresses that warning me could be "difficult"[2] and "daunting,"[3] would be "invariably costly,"[4] and, if required for every risk, would impose "costly and potentially crushing burdens."[5] This view, which is based in part on products, practices, and precedents that predate the modern web, may no longer accurately describe today's burdens of communication. It is just one example of the potential anachronisms created by the increasing (and increasingly dynamic) information, access, and control that commercial sellers[6] enjoy with respect to their products, product users, and product uses—relationships encompassed by what I call proximity.

This article argues that growing proximity could significantly expand sellers' point-of-sale and post-sale obligations toward people endangered by their products. I first describe how companies are embracing new technologies for information, access, and control, with primary reference to the increasingly automated and connected motor vehicle.[7] I next analyze how this proximity could impact product-related claims for breach of implied warranty, defect in design or information, post-sale failure to warn or even update, and negligent enabling of a third-party's tortious behavior.[8] I finally flip my analysis to consider how the uncertainty caused in part by

[1] For recent confirmation of this, see Scott Shane and Colin Moynihan, *Drug Agents Use Vast Phone Trove, Eclipsing N.S.A.'s*, N.Y. TIMES, Sept. 1, 2013, http://www.nytimes.com/2013/09/02/us/drug-agents-use-vast-phone-trove-eclipsing-nsas.html (describing an AT&T database of every call passing through an AT&T switch since 1987).

[2] Restatement (Third) of Torts: Prod. Liab. § 10 cmt. e (1998).

[3] *Id.* cmt. a.

[4] *Id.* cmt. d.

[5] *Id.* If only marketing departments felt the same way.

[6] Throughout this article, "seller" refers to any of the commercial actors upstream of the consumer, including retailers, distributors, manufacturers, and suppliers, whether they sell, lease, or potentially even operate.

[7] *See* discussion *infra* Part 2. I use motor vehicles because of the huge legal and social impact they have had over the last century, *see* discussion *infra* Part 2.4, and because of the technical and commercial changes they reflect and portend, *see* discussion *infra* Parts 2.4-2.5.

[8] *See* discussion *infra* Part 3.

changing liability could actually drive companies to further embrace proximity.[9]

This spiral of liability and proximity could mean that sellers are—perhaps unwittingly and probably unwillingly—ushering in a new age of product stewardship. More than before, companies may have to live with the products that they have made and marketed.

2 INCREASING PROXIMITY

More than at any point since the advent of industrialization, commercial sellers today have greater knowledge about, access to, and control over their products, the people who use them, and the ways in which they are used, even after those products have left the factory, warehouse, or showroom. In contrast to a 20th Century that was, from the perspective of a large manufacturer or merchant, highly impersonal,[10] the coming decades are likely to feature sellers wading deep into the vast deltas of well-charted streams of commerce. This section briefly describes three overlapping, multidisciplinary aspects of this expanded pre- and post-sale presence: greater proximity to the product, to the product user, and to the product use. It then considers all three aspects as they relate to the modern automotive industry. Finally, it looks ahead to automated motor vehicles as well as other emerging consumer and industrial products.

2.1 Proximity to the Product

The proximity between a commercial seller and its product at the point of sale is manifest: Implicit in the law of warranty is the expectation that a seller knows what it is selling, and companies have long been liable for defects introduced by their suppliers.[11] Indeed, "control" of a product is generally assumed to end upon its sale.[12] This section therefore focuses on

---

[9] *See* discussion *infra* Part 4.

[10] *See, e.g.*, *Escola v. Coca Cola Bottling Co. of Fresno*, 24 Cal. 2d 453, 467, 150 P.2d 436 (1944) (Traynor, J., concurring) ("As handicrafts have been replaced by mass production with its great markets and transportation facilities, the close relationship between the producer and consumer of a product has been altered."); David G. Owen, *The Evolution of Products Liability Law*, 26 REV. LITIG. 955, 962 (2007) ("As courts began imposing implied warranties of quality on manufacturers in the latter part of the nineteenth century, manufacturers increasingly were handing over the retail function to third-party dealers.").

[11] *Cf.* Sally H. Clarke, *Unmanageable Risks: Macpherson v. Buick and the Emergence of A Mass Consumer Market*, 23 LAW & HIST. REV. 1, 27 (2005) (describing relationship between automaker and wheels supplier).

[12] *Cf. infra* notes 243-251 and accompanying text. Control is a vexing concept. *See* BRYANT WALKER SMITH, AUTOMATED VEHICLES ARE PROBABLY LEGAL IN THE UNITED

the expansion of post-sale proximity in two ways: product connectivity and lifecycle management.

Consumer products are increasingly connected to larger digital networks. Phones, tablets, gaming systems, and even cars already send and receive information through cellular, Bluetooth, and Wi-Fi networks.[13] Functions like border processing,[14] toll payment,[15] "medical monitoring, natural event monitoring, object tracking," and product quality control,[16] among others,[17] already rely in part on radio frequency identification (RFID).[18] An extreme, though not yet realized, vision of the "Internet of Things" describes a networked world in which every physical object—from a bolt in a bridge to a cardigan in a closet—is electronically identifiable and addressable.[19] Eventually connecting these smart products to the Internet is unlikely to overwhelm the latest version of the Internet's communications protocol (IPv6), which can at least in theory accommodate 3.4x10^38 unique addresses[20]—or roughly one for every atom in every human on the planet.[21]

STATES 24-27, 68-69 (Center for Internet and Society, 2012), 1 TEX. A&M L. REV. (forthcoming 2014). Because of the potential for confusion, particularly given the different conceptions of control in engineering and law, the SAE On-Road Automated Vehicle Standards Committee has at my urging avoided any use of the term "control" in its draft document defining levels of automation. *See* Summary of SAE International's Draft Levels of Automation for On-Road Vehicles (July 2013), http://www.vehicleautomation.org/program/agenda.

[13] *See, e.g.*, Ching-Yao Chan, *Connected Vehicles in a Connected World* 2 (2011 International Symposium on VLSI Design, Automation and Test (VLSI-DAT), Jan. 2011).

[14] *See generally* Electronic Passport, 70 Fed. Reg. 61553 (October 25, 2005).

[15] Lisa Grossman, *New RFID Tag Could Mean the End of Bar Codes*, WIRED, Mar. 26, 2010, *available at* http://www.wired.com/wiredscience/2010/03/rfid/.

[16] Amirhosein Taherkordi, Majid Alkaee Taleghan & Mohsen Sharifi, *Achieving Availability and Reliability in Wireless Sensor Networks Applications* (Proceedings of the First International Conference on Availability, Reliability and Security (ARES'06), IEEE Computer Society (2006), Apr. 2006).

[17] *E.g.*, Mike Olson, *10 Best Uses for RFID Tags*, WIRED MAGAZINE, Feb. 23, 2009, http://www.wired.com/techbiz/it/magazine/17-03/st_best.

[18] *See* Kevin Werbach, *Sensors and Sensibilities*, 28 CARDOZO L. REV. 2321, 2330 (2007).

[19] ALESSANDRO BASSI, HITACHI EUROPE & GEIR HORN, INTERNET OF THINGS IN 2020: A ROADMAP FOR THE FUTURE (Workshop Report, 2008), *available at* http://www.smart-systems-integration.org/public/internet-of-things.

[20] *See, e.g.*, Sean Captain, *Internet Grows by Trillions of Addresses, as IPV6 Rolls Out Worldwide*, TECHNEWSDAILY, http://www.foxnews.com/tech/2012/06/06/internet-grows-by-trillions-addresses-as-ipv6-rolls-out-worldwide/.

[21] There are roughly 10^10 humans currently alive, *e.g.*, Population Clock, U.S. Census Bureau, http://www.census.gov/popclock/ (last visited Sept. 9, 2013), and 10^28 atoms in each human, *see* Robert A. Freitas Jr., Nanomedicine, http://www.foresight.org/Nanomedicine/Ch03_1.html. I prospectively thank my cite

The companies that make, sell, and support these products are sometimes part of these networks. Software, which is arguably a product,[22] is the most obvious example. The personal computers, cell phones, and other advanced electronic devices on which this software runs are others. Product connectivity enables sellers to monitor their products long after the date of sale. It also facilitates firmware updates, including the over-the-air updates used by cellular service providers. Apple's 2007 iPhone update notoriously if unintentionally "bricked" phones that customers had unlocked without authorization.[23] Amazon.com's ill-fated 2009 decision to remotely delete the unauthorized digital editions of some books, including George Orwell's 1984, from customers' Kindle devices similarly demonstrated the power of access.[24]

Technology is not the only driver of product proximity. A number of related concepts that fall broadly under the heading "lifecycle management" suggest that companies have product-specific interests or obligations that continue beyond the product sale.[25] For example, the International Organization for Standardization's functional safety standard for road vehicles considers an entire "automotive safety lifecycle" that at least cursorily extends through "operation, service, [and] decommissioning."[26] Manufacturers, distributors, and sellers regularly conduct recalls that are nominally if not actually voluntary.[27] Concerns about electronic waste have led some twenty-five states to pass takeback laws[28] and more than thirty

---

checkers for counting.

[22] *See* discussion *infra* Part 4.4.

[23] Greg Keizer, *Update: Apple Plays Hardball: Upgrade 'Bricks' Unlocked iPhones*, COMPUTERWORLD, Sept. 27, 2007, http://www.computerworld.com/s/article/9039479/Update_Apple_plays_hardball_Upgrade_bricks_unlocked_iPhones. "Bricking" an electronic device means turning it into a very expensive paperweight. *Cf. id.*

[24] *See* Brad Stone, *Amazon Erases Orwell Books from Kindle*, N.Y. TIMES, July 18, 2009. "Amazon effectively acknowledged that the deletions were a bad idea." *Id.*

[25] "X by design"—as in safety by design, privacy by design, security by design, and sustainability by design—treats certain characteristics of use as essential and integrated elements of the design process.

[26] ISO 26262-7:2011 at v; see generally ISO 26262-7 ("Production and operation").

[27] *See, e.g.*, Consumer Product Saftey Commission, Recalls, http://www.cpsc.gov/en/Recalls/ (last visited Sept. 15, 2013); U.S. Food and Drug Administration, Recalls, Market Withdrawals, & Safety Alerts, http://www.fda.gov/safety/recalls/ (last visited Sept. 15, 2013); National Highway Traffic Safety Administration (NHTSA), Recalls & Defects, http://www.nhtsa.gov/Vehicle+Safety/Recalls+&+Defects (last visited Sept. 15, 2013).

[28] Electronics TakeBack Coalition, Legislative Toolkit, http://www.electronicstakeback.com/promote-good-laws/state-legislation-toolkit/ (last visited Sept. 15, 2013); *see generally* Nicole Buseman, *A Second-Generation Solution to Electronic Waste: The New York Approach*, 37 COLUM. J. ENVTL. L. 245 (2012); Hannah G. Elisha, *Addressing the E-Waste Crisis: The Need for Comprehensive Federal E-Waste*

companies to launch voluntary takeback programs.[29] And some legal scholars have advocated a different form of "product stewardship" for pharmaceutical developers, arguing that these companies should have post-sale duties of research and testing.[30]

Although law is an important and, as this paper argues, growing source of post-sale duties,[31] engineering, economics, and ethics are also powerful motivators. The user is also central to a seller's considerations—and the subject of the next section.

2.2 Proximity to the User

User proximity contemplates pre-sale, point-of-sale, and post-sale relationships between the sellers and the users of a product. Although the person who actually uses a manufactured item is not necessarily that item's first buyer, or even any buyer,[32] companies are increasingly able to obtain information about, access to, and control over buyers as well as users.

Consumer privacy scholars have written extensively about the consumer data collection that enables savvy companies to know more about an individual than she knows they know—and, in some cases, more than she even knows about herself.[33] One story tells of an angry father who marched into a Target store, demanding to know why his teen daughter had received coupons for baby clothes, only to apologize a few days later when he realized that Target had surmised his daughter's pregnancy well before he had.[34] Companies may calibrate the content of a customer interaction based

---

Regulation Within the United States, 14 CHAP. L. REV. 195 (2010); Velissa Chapa, *Dying in A Digital Dump: Why Texas Must Improve Its Electronics Recycling Efforts*, 14 TEX. TECH ADMIN. L.J. 173 (2012).

[29] Electronics TakeBack Coalition, Manufacturer Takeback Programs in the U.S., http://www.electronicstakeback.com/how-to-recycle-electronics/manufacturer-takeback-programs/ (last visited Sept. 15, 2013).

[30] *See, e.g.*, Lars Noah, *Platitudes About "Product Stewardship" in Torts: Continuing Drug Research and Education*, 15 MICH. TELECOMM. & TECH. L. REV. 359 (2009); George W. Conk, *Punctuated Equilibrium: Why Section 402A Flourished and the Third Restatement Languished*, 26 REV. LITIG. 799 (2007).

[31] *See generally* discussion *infra* Part 3.

[32] Similarly, a products liability plaintiff is not necessarily a buyer or a user. *See* discussion *infra* Part 3.2.

[33] *See generally, e.g.*, Jeff Sovern, *Opting In, Opting Out, or No Options at All: The Fight for Control of Personal Information*, 74 WASH. L. REV. 1033 (1999); Stan Karas, *Privacy, Identity, Databases*, 52 Am. U. L. Rev. 393 (2002); Xuan-Thao N. Nguyen, *Collaterizing Privacy*, 78 TUL. L. REV. 553 (2004); Lior Jacob Strahilevitz, *Reputation Nation: Law in an Era of Ubiquitous Personal Information*, 102 Nw. U. L. Rev. 1667, 1670 (2008); Eugene Volokh, *Tort Law vs. Privacy* (UCLA Sch. of Law, Working Paper), 114 COL. L. REV. (forthcoming 2014).

[34] Charles Duhigg, *How Companies Learn Your Secrets*, N.Y. TIMES, Feb. 16, 2012, *available at* http://www.nytimes.com/2012/02/19/magazine/shopping-habits.html.

on "the weather, the time of day or day of the week, and whether or not a customer is accompanied."[35] Several lending platforms use a loan applicant's specific social media and online spending data, including in one case the payment history of that applicant's social media contacts, to determine credit risk.[36] Scores of third parties track Internet users' web activity through cookies and other digital tools.[37]

Certain physical devices expand this potential. Apple's iPhone 5s is the latest product to include a fingerprint scanner.[38] Google now owns "a small biometric firm … that has developed face recognition, video tracking and recognition, and face-based soft-biometric technologies."[39] And Microsoft's Kinect, designed for its Xbox and loved by researchers,[40] "can monitor users' movements with a camera that sees in the dark, pick[] up voice commands with a microphone, and read[] your heart rate using infrared cameras that track blood flow underneath the skin."[41] These capabilities exist, but have not been widely deployed commercially.[42]

---

[35] Thomas H. Davenport, Leandro Dalle Mule & John Lucker, *Know What Your Customers Want Before They Do*, HARV. BUS. REV., Dec. 2011, at 84, 88; *see also* Gallup Healthways Well-Being Index, http://www.well-beingindex.com (last visited Sept. 15, 2013).

[36] Katie Lobosco, *Facebook Friends Could Change Your Credit Score*, CNNMONEY, Aug. 27, 2013, *available at* http://money.cnn.com/2013/08/26/technology/social/facebook-credit-score/index.html.

[37] Omer Tene & Jules Polonetsky, *To Track or "Do Not Track": Advancing Transparency and Individual Control in Online Behavioral Advertising*, 13 MINN. J.L. SCI. & TECH. 281, 282-306 (2012).

[38] Andrea Peterson & Hayley Tsukayama, *Fingerprint Scanner for iPhone 5s Raises Privacy, Security Concerns*, WASH. POST, Sept. 20, 2013, *available at* http://www.washingtonpost.com/business/technology/fingerprint-scanner-for-iphone-5s-raises-privacy-security-concerns/2013/09/20/0992cbee-222f-11e3-966c-9c4293c47ebe_story.html; Amazon.com Search for "fingerprint scanner," Sept. 15, 2013, http://www.amazon.com/s/ref=nb_sb_noss_1?url=search-alias%3Daps&field-keywords=fingerprint%20scanner (returning 534 results, including laptops, time clocks, and locks).

[39] Karl Ricanek, Jr. & Chris Boehnen, *Facial Analytics: From Big Data to Law Enforcement*, IEEE COMPUTER, Sept. 2012, at 95; *see also* Evgeny Morozov, *Requiem for Our Wonderfully Inefficient World*, SLATE, Apr. 26, 2013, http://www.slate.com/articles/technology/future_tense/2013/04/senor_based_dynamic_pricing_may_be_efficient_but_it_could_create_inequality.html (describing vending machines that adjusted prices based on outside temperature and an in-store kiosk that recommended products based on optimal determination of the shopper's sex and age). Morozov's understandable embrace of certain "inefficiencies" of a "dumb" world nonetheless implicitly gives up half the argument: If costs and benefits are correctly measured within appropriate system boundaries, desirable outcomes are by definition efficient.

[40] Many researchers use Kinect in their research. *See, e.g.*, Alex Teichman, Stephen Miller & Sebastian Thrun, *Unsupervised intrinsic calibration of depth sensors via SLAM* (Robotics: Science and Systems (RSS), June 2013).

[41] Ryan Gallagher, *German Official: Xbox One Spying Capabilities a "Twisted*

Strikingly, the data that are actually collected about individuals are often unavailable to those same individuals.[43] One journalist astutely noted that her cellular service provider, electrical utility, and health club all keep detailed records of her behavior, records that she can only access with a subpoena, in summary form, and once a year, respectively.[44] In contrast, Intel's "data economy" project "encourage[s] companies to think of consumers as participants in the information economy, and not just as data-harvesting opportunities."[45]

The relational function of so-called "big data"[46] extends into relational contracting.[47] Companies rely on information they collect about and from users for managing their brands, retaining their customers, preventing legal claims, and developing products.[48] Implicit in many of these activities is a long-term view of customer relationships that is not reducible to discrete transactions governed wholly by distinct formal contracts.

Nonetheless, formal contracts of adhesion remain a perennial feature of the consumer experience. End-user license agreements (EULAs) were first used by software companies to "impose conditions on the licensee (the purchaser) that [were] not otherwise permissible under federal copyright law."[49] These shrinkwrap licenses migrated online to become the browsewrap licenses[50] to which web users routinely consent. Violation of these online terms of use can arguably and disturbingly constitute a criminal offense.[51] But web users might be forgiven for failing to read all the fine

---

Nightmare," SLATE, May 28, 2013, http://www.slate.com/blogs/future_tense/2013/05/28/germany_privacy_chief_peter_schaar_calls_xbox_one_a_twisted_nightmare_for.html.

[42] *Id.*

[43] Natasha Singer, *If My Data Is an Open Book, Why Can't I Read It*, N.Y. TIMES, May 25, 2013, http://www.nytimes.com/2013/05/26/technology/for-consumers-an-open-data-society-is-a-misnomer.html.

[44] *Id.*

[45] *Id.* (referencing wethedata.com).

[46] Karen E.C. Levy, *Relational Big Data*, 66 STAN. L. REV. ONLINE 73 (2013), http://www.stanfordlawreview.org/online/privacy-and-big-data/relational-big-data (arguing that "data now mediate our day-to-day social relationships to an unprecedented degree").

[47] *Cf.* Herbert Hovenkamp, *The Law of Vertical Integration and the Business Firm: 1880-1960*, 95 IOWA L. REV. 863, 892 (2010) ("A 'relational' contract is one that is open-ended in the sense that it contemplates an ongoing relationship among the parties, with adjustments in price, quantity, or other terms that must be made from time to time.").

[48] *See, e.g.*, Steven Rosenbush & Michael Totty, *How Big Data Is Changing the Whole Equation for Business*, W.S.J., Mar. 8, 2013, *available at* http://online.wsj.com/article/SB10001424127887324178904578340071261396666.html.

[49] Lloyd L. Rich, *Mass Market Software and the Shrinkwrap License*, 23 COLO. LAW. 1321, 1321 (1994).

[50] Mark A. Lemley, *Terms of Use*, 91 MINN. L. REV. 459, 459-60 (2006).

[51] *See, e.g.*, Orin S. Kerr, *Vagueness Challenges to the Computer Fraud and Abuse Act*, 94 MINN. L. REV. 1561 (2010).

print they encounter: In a 2008 article, two scholars estimated that reading just the privacy policies of the websites that an average web user visited in a year would require 244 hours.[52]

As the phrase "terms of use" suggests, these contractual tools expand proximity not just to the user, but also to the use, which is the third and final aspect considered.

2.3 Proximity to the Use

For many of the reasons discussed in the previous two sections, companies may also have information about, access to, and control over the post-sale uses of their products. In the words of one scholar, these "tethered appliances" are "contingent: rented instead of owned, even if one pays up front for them, since they are subject to instantaneous revision."[53] Digital rights management, well-known in intellectual property law, extends a kind of control to sellers or licensors of these products that is unfettered by the practical limitations of copyright and contract.[54]

Equally striking is the complementary embrace of service-based models that attempt to capture revenue from the ongoing use, rather than (merely) from the sale, of a product. A robust business literature exists on this putative growth[55] in "product service systems" and "servitization," and yet no indexed law review article has ever used these terms. This may be forgivable, since even the scholars who deploy the terms most frequently do not entirely agree on what they mean.[56] The literature on these service-oriented models contemplates both supplementing product sales with

---

[52] Aleecia M. McDonald & Lorrie Faith Cranor, *The Cost of Reading Privacy Policies*, 4 I/S: J. OF L. & POL'Y 540, 560 (2008).

[53] JONATHAN L. ZITTRAIN, THE FUTURE OF THE INTERNET AND HOW TO STOP IT, ch. 5, *Tethered Appliances, Software as Service, and Perfect Enforcement*, para. 6 (2008) (Italics omitted).

[54] *See, e.g.*, Jay P. Kesan & Rajiv C. Shah, *Setting Software Defaults: Perspectives from Law, Computer Science and Behavioral Economics*, 82 NOTRE DAME L. REV. 583, 614 (2006); Michael J. Madison, *Law As Design: Objects, Concepts, and Digital Things*, 56 CASE W. RES. L. REV. 381, 397-98 (2005); Douglas Lichtman, *How the Law Responds to Self-Help*, 1 J.L. ECON. & POL'Y 215, 238 (2005).

[55] Vertical integration is by no means new, *cf. infra* notes 318-321 and accompanying text, and historical comparison is difficult.

[56] *See generally* Emmanouil Alvizos & Jannis Angelis, *What is Servitization Anyway?* (Production and Operations Management Society 21st Annual Conference, May 2010); *see also* Frank Tietze, Tim Schiederig & Cornelius Herstatt, *Firms' Transition Towards Green Product Service Innovators* 1-2 (R&D Management Conference 2011, Accepted Paper, June 2011) (reviewing definitions for product service systems); Arman Avadikyan & Stephane Lhuillery, *Technological Innovation, Organizational Change and Product Related Services* 2 (Univ. of Strasbourg Bureau of Econ. Theory & Application, Working Paper, Oct. 2012). In fairness, lack of clarity is occasionally a problem in law as well.

related services[57] and supplanting product sales with replacement services,[58] a distinction that may be helpful even though it is muddled by the consideration of time.[59] The crane industry provides a useful example:[60] Crane manufacturers might, through vertical integration, complement their sales with inspection services, ongoing maintenance, equipment upgrades, training, and consultation.[61] Alternately, rather than sell their cranes at all, they might lease these products to construction firms or simply provide hoisting services directly to customers.

Whatever servitization is precisely, "[e]mpirical evidence suggests that globally one-third of manufacturing firms" are now doing it, "a figure that rises to almost 60 percent in the United States."[62] Microsoft's shift to a subscription model for its latest version of Office also reflects this stronger preference for service over product.[63] "Instead of boxed copies that connect to cloud services," the company appears to be embracing "a future where users and IT departments buy subscriptions to cloud services, and get desktop software as part of the package."[64]

---

[57] *See, e.g.*, Ivanka Visnjic, Andy Neely, & Frank Wiengarten, *Another Performance Paradox? A Refined View on the Performance Impact of Servitization* 3 (ESADE, Working Paper No. 231, July 2012).

[58] *See, e.g.*, Tietze, Schiederig & Herstatt, *supra* note 56, at 2; Frank Tietze & Erik G. Hansen, *To Own or Use? How Product Service Systems Facilitate Eco-Innovation Behavior* (2013 Academy of Management Conference, Working Paper, Apr. 2013).

[59] *Cf.* Ivanka Visnjic, Bart Van Looy & Andy Neely, *Steering Manufacturing Organizations towards Open Service Innovation: The Role of the Integrated Performance Management System* 15 (ESADE, Working Paper No. 232, July 2012) (noting, for example, that the primary objective of maintenance, a service, "is to postpone the purchase of subsequent products").

[60] Largely because it has already been analyzed. *See* Atanu Chaudhuri & Aravintham G, *Capability-Maturity Model for Servitization and Future Research Directions: Perspectives from the Crane Manufacturing Industry* (19th EUROMA and 4th POMS World Conference, Working Paper, July 2012).

[61] *Id.* at 4-5.

[62] Visnjic, Neely & Wiengarten, *supra* note 57, at 4 (citing a 2008 paper by Neely).

[63] Adobe is taking a similar approach. Simon Bisson, *Shifting Subscriptions: Microsoft's Bet-the-Company Strategy for the Future of Software*, ZDNET, July 30, 2012, http://www.zdnet.com/shifting-subscriptions-microsofts-bet-the-company-strategy-for-the-future-of-software-7000001802/.

[64] *Id.* Two features of this strategy are noteworthy. First, Microsoft has encouraged its resellers to market these subscriptions by permitting these resellers to directly bill customers for subscription purchases. Id. Second, whereas users of older boxed versions of Office could generally "reassign [their] license to a different device any number of times," the end-user license agreement for the newest boxed version now "permanently assign[s]" the license to the computer on which it is first installed. Gregg Keizer, *Office 2013 Retail Licensing Change Ties Suite to Specific PC Forever*, COMPUTERWORLD, Feb. 13, 2013, http://www.computerworld.com/s/article/9236818/Office_2013_retail_licensing_change_ties_suite_to_specific_PC_forever (quoting Microsoft's end-user license agreement for

A shift in focus from sale to use extends the seller's relationship to the user and to the product. Before turning to the legal implications of this ongoing relationship, this paper develops a specific product example, namely the motor vehicles of today and tomorrow.

2.4 Motor Vehicles Today

Motor vehicles exemplify the ongoing evolution of complex durable goods. They are also one of the most culturally, socially, economically, and legally significant products of the last hundred years.[65] Motor vehicles have literally and metaphorically reshaped the American landscape. The average American spends 15 days in her car each year.[66] Motor vehicle crashes in the US alone kill more than 30,000 people and injure more than a million every year,[67] with a social cost of some $300 billion.[68] Over half of the cases in state and municipal trial courts are for traffic violations,[69] and roughly a third of all state court civil trials are related to automotive crashes.[70] A wide variety of court cases have directly involved motor

---

Office Home & Student 2010). Licenses can be reassigned no more than once every 90 days except in the case of hardware failure. *Id.*

[65] *See generally, e.g.*, JEAN-PIERRE BARDOU, THE AUTOMOBILE REVOLUTION: THE IMPACT OF AN INDUSTRY, (James M. Laux, trans., Univ. of N.C. Press 1982); Transfers: Interdisciplinary Journal of Mobility Studies (every article); ROBERT A. CARO, THE POWER BROKER: ROBERT MOSES AND THE FALL OF NEW YORK, (Vintage Books 1975); RALPH NADER, UNSAFE AT ANY SPEED, (Knightsbridge Publ'g Co. Mass.1965); THAD WILLIAMSON, SPRAWL, JUSTICE, AND CITIZENSHIP: THE CIVIC COSTS OF THE AMERICAN WAY OF LIFE, (Oxford Univ. Press 2010); Jonathan Simon, *Driving Governmentality: Automobile Accidents, Insurance, and the Challenge to Social Order in the Inter-War Years, 1919 to 1941*, 4 CONN. INS. L.J. 521, 522 (1998); Roger I. Roots, J.D., Ph.D., *The Orphaned Right: The Right to Travel by Automobile, 1890-1950*, 30 OKLA. CITY U. L. REV. 245, 247 (2005); Sally H. Clarke, *Unmanageable Risks: MacPherson v. Buick and the Emergence of A Mass Consumer Market*, 23 LAW & HIST. REV. 1, 5 (2005); Jerry L. Mashaw & David L. Harfst, *Regulation and Legal Culture: The Case of Motor Vehicle Safety*, 4 YALE J. ON REG. 257 (1987).

[66] Bryant Walker Smith, *Managing Autonomous Transportation Demand*, 52 SANTA CLARA L. REV. 1401, 1411 (2012); *see also* NAT'L HOUSEHOLD TRAVEL SURVEY, SUMMARY OF TRAVEL TRENDS 30-33, http://nhts.ornl.gov/2009/pub/stt.pdf.

[67] National Highway Traffic Safety Administration, Fatality Analysis Reporting System, http://www-fars.nhtsa.dot.gov/Main/index.aspx (last visited Sept. 9, 2013).

[68] CAMBRIDGE SYSTEMATICS, INC. PREPARED FOR AAA, CRASHES VS. CONGESTION – WHAT'S THE COST TO SOCIETY? (2011), http://newsroom.aaa.com/wp-content/uploads/2011/11/2011_AAA_CrashvCongUpd.pdf.

[69] ROBERT LAFOUNTAIN, RICHARD SCHAUFFLER, SHAUNA STRICKLAND, SARAH GIBSON, & ASHLEY MASON, NAT'L CTR. FOR STATE COURTS, EXAMINING THE WORK OF STATE COURTS: AN ANALYSIS OF 2009 STATE COURT CASELOADS 3, 35 (2011), http://www.courtstatistics.org/flashmicrosites/csp/images/csp2009.pdf.

[70] BUREAU OF STATISTICS, U.S. DEP'T OF JUSTICE, CIVIL BENCH AND JURY TRIALS IN STATE COURTS, 2005 (2008), http://www.bjs.gov/content/pub/pdf/cbjtsc05.pdf. Non-

vehicles.[71] Even a cursory catalogue of the impacts of this invention would require hundreds of experts and thousands of pages.

Today's vehicles are highly complex computers on wheels[72] with electronics that account for up to half of production costs.[73] A luxury car manufactured in 2009 "probably contains close to 100 million lines of software code" running on a network comprising up to 100 electronic control units.[74] This network may include externally oriented sensors—often some combination of camera, radar, lidar, ultrasound, and GPS—that detect objects and determine position.[75]

---

asbestos products liability claims, which are reported separately not broken out by type, account for only one percent of state court trials. *Id.* at 2.

[71] *E.g.*, *MacPherson v. Buick Motor Co.*, 217 N.Y. 382, 111 N.E. 1050 (N.Y. 1916); *Dodge v. Ford Motor Company*, 204 Mich. 459, 170 N.W. 668. (Mich. 1919); *Morgan v. Virginia*, 328 U.S. 373 (1946); *Henningsen v. Bloomfield Motors, Inc.*, 32 N.J. 358, 161 A.2d 69 (N.J. 1960); *Citizens to Preserve Overton Park v. Volpe*, 401 U.S. 402 (1971); *World-Wide Volkswagen Corp v. Woodson*, 444 U.S. 286 (1980); *Grimshaw v. Ford Motor Co.*, 119 Cal.App.3d 757 (Cal. Ct. App. 1981); *Mitsubishi Motors Corp. v. Soler Chrysler-Plymouth, Inc.*, 473 U.S. 614 (1985); *United States v. Jones*, 132 S.Ct. 945 (2012).

[72] Jim Motavalli, *The Dozens of Computers That Make Modern Cars Go (and Stop)*, N.Y. TIMES, Feb. 4, 2010, *available at* http://www.nytimes.com/2010/02/05/technology/05electronics.html. Indeed, "[m]ost interesting products that you don't eat come with software," Randal C. Picker, *Rewinding Sony: The Evolving Product, Phoning Home and the Duty of Ongoing Design*, 55 CASE W. RES. L. REV. 749, 750 (2005), and automobiles are not particularly edible (with some troubling exceptions, *see, e.g.*, Posting of vicked.vicky to http://forum.xcitefun.net/edible-cars-the-tasty-test-drive-t58988.html (Mar. 7, 2011)).

[73] Robert N. Charette, *This Car Runs on Code*, IEEE SPECTRUM, Feb. 1, 2009, *available at* http://spectrum.ieee.org/green-tech/advanced-cars/this-car-runs-on-code. In 2005, electronics accounted for roughly 15 percent of the total cost (excluding final assembly) for a conventional vehicle and roughly 45 percent for a hybrid, which use particularly complex engine control. *Id.* These shares were expected to increase considerably. *Id.* Notably, the cost just for electronics-related warranty claims in 2002 was roughly $150 per vehicle. SHARON ARTHUR, NANCY BREED & CLAUDIA SCHMITT-LUEHMANN, IBM INST. FOR BUS. VALUE, SHIFTING CAR MAKEUP SHAKES UP OEM STATUS QUO: SOFTWARE STRENGTH IS CRITICAL (2002), http://www-935.ibm.com/services/id/igs/pdf/g510-1692-00-shifting-car-makeup-shakes-up-oem-status-quo.pdf; SCOTT HEBNER, IBM, SMARTER PRODUCTS: THE BUILDING BLOCKS FOR A SMARTER PLANET (2009), ftp://public.dhe.ibm.com/software/emea/de/rational/neu/Smarter_products_The_building_blocks_for_a_smarter_planet_EN_2009.pdf.

[74] Charette, *supra* note 73. Lines of code is at best an order-of-magnitude proxy for software complexity. *See, e.g.*, David Auerbach, SLATE, *5 Million Lines of Obfuscation*, Oct. 22, 2013, http://www.slate.com/articles/technology/bitwise/2013/10/healthcare_gov_problems_what_5_million_lines_of_code_really_means.html (criticizing this metric).

[75] Sven A. Beiker, *Legal Aspects of Autonomous Driving*, 52 SANTA CLARA L. REV. 1145, 1147 (2012). Just as radar stands for "radio detection and ranging," lidar stands for "light detection and ranging." *Lidar*, Oxford English Dictionary, 2013.

These systems contribute to nearly every aspect of a vehicle's functionality, including engine control, active safety, comfort, infotainment, and on-board diagnostics.[76] Electronic stability control is now federally required.[77] More advanced driver assistance systems—including adaptive cruise control (which automatically adjusts speed to maintain a desired following distance), brake assist (which increases braking pressure in emergencies), automatic emergency braking (which applies the brakes to avoid or mitigate a collision), blind spot warning, lane departure warning, collision warning, pedestrian detection, and automated parallel parking—are already available on some models.[78]

In 2012, Tesla became the first established automaker to provide over-the-air updates (OTA) of in-vehicle software,[79] and others are following.[80] Tesla's first update made slight changes to the car's dashboard display, radio, and other aspects of the user experience.[81] In contrast, a subsequent update enabled the electric car to mimic its gasoline-powered rivals by creeping ahead when the driver removes her foot from the accelerator[82]—a much more substantial change related to the physical movement of the automobile.

Even vehicles that are not remotely updatable are increasingly communicating with the outside world.[83] Following the launch of OnStar by

---

[76] *Id.*

[77] 49 C.F.R. § 571.126 (2012).

[78] *See, e.g.*, Beiker, *supra* note 75, at 1147-48.

[79] Damon Lavrinc, *In Automotive First, Tesla Pushes Over-the-Air Software Patch*, WIRED, Sept. 24, 2012, *available at* http://www.wired.com/autopia/2012/09/tesla-over-the-air/. The same year, Ford mailed some 300,000 USB drives containing software updates to users of its infotainment system. David Zax, *A Software Update for Your Car?*, MIT TECHNOLOGY REVIEW, Mar. 6, 2012, *available at* http://www.technologyreview.com/view/427153/a-software-update-for-your-car/.

[80] Doug Newcomb, *Spring Connects With the 2013 Ram Pickup, Dodge Viper*, WIRED, Aug. 10, 2012, *available at* http://www.wired.com/autopia/2012/08/sprint-dodge-ram-uconnect/; Mike Barton, *Mercedes Revs mbrace2 With Cloud Updates*, WIRED, Apr. 9, 2012, *available at* http://www.wired.com/insights/2012/04/mercedes-mbrace2/; Posting of Wayne Cunningham to The Car Tech Blog, *Audi Tells You Where to Park It*, http://reviews.cnet.com/8301-13746_7-57587472-48/audi-tells-you-where-to-park-it/ (June 4, 2013, 21:01 PDT); Dennis K. Nilsson & Ulf E. Larson, *Secure Firmware Updates over the Air in Intelligent Vehicles*, (IEEE International Conference on Communications Workshops, 2008, ICC Workshops '08, May 2008).

[81] Lavrinc, *supra* note 79.

[82] Mark Rechtin, *Tesla Nimbly Updates Model S Over the Air*, AUTOMOTIVE NEWS, Jan. 16, 2013, http://www.autonews.com/article/20130116/OEM06/130119843/tesla-nimbly-updates-model-s-over-the-air.

[83] Chan, *supra* note 13; *see also* Francesca Svarcas, *Turning a New LEAF: A Privacy Analysis of CARWINGS Electric Vehicle Data Collection and Transmission*, 29 SANTA CLARA COMPUTER & HIGH TECH. L.J. 165 (2012). For a list of connectivity systems as of 2011, *see* Hiro Onishi, *Paradigm Change of Vehicle Cyber Security* (2012 4th Int'l Conf.

General Motors in 1996,[84] many other automakers and their affiliates introduced similar cellular-based in-vehicle telematics systems.[85] Current offerings include "[e]mergency assistance, such as roadside services and crash notification," "[m]aintenance services, such as remote diagnostics and service notifications," "[s]ecurity and safety services, such as remote access, lock, start, and vehicle locator and tracking," "[i]nfotainment, such as internet radio, RSS feed reader, TV and video streaming," and [n]avigation services, such as dynamic point of interests and real time traffic."[86]

The information generated by all of these systems can total some 15 gigabytes per hour,[87] of which only a tiny portion is stored or transmitted. Event data recorders[88] (and possibly other on-board electronic components[89]) retain five or more seconds of certain airbag, seatbelt, speed, roll, engine, occupant, and other crash-relevant data.[90] Increasingly,

---

on Cyber Conflict, June 2012).

[84] For a history of OnStar from 1996 to 2002, see William McCormack & Richard R. Johnson, case UVA-M-0659, Univ. of Va. Darden Sch. of Bus. (2002).

[85] Chan, *supra* note 83.

[86] *Id.* at 3. This cellular connectivity should be distinguished from dedicated short-range communication (DSRC) in the 5.9 GHz band. Unlike the technologies and applications discussed in this section, DSRC has yet to be commercially deployed and, at this point, appears to hinge largely on regulatory action by the Department of Transportation, and, arguably, inaction by the Federal Communications Commission. ITS America, *The Real "Car Talk" - Vehicles that Can Communicate with Each Other*, http://www.itsa.org/industryforums/connectedvehicle (last visited Sept. 15, 2013). Its widespread adoption could one day foster the kinds of safety-critical applications that require low latency communication. Chan, *supra* note 61, at 1-2; Dorothy J. Glancy, *Privacy in Autonomous Vehicles*, 52 SANTA CLARA L. REV. 1171, 1178 (2012). However, conflating connected vehicles and DSRC obscures the rapidly increasing connectivity of today's fleet.

[87] Posting of Frank Markus to Motor Trend Blogs, *Your Car's Contribution to the "Big Data" Cloud*, http://blogs.motortrend.com/your-cars-contribution-to-the-big-data-cloud-29837.html (Jul. 25, 2013, 03:00 PDT).

[88] Chris Woodyard & Jayne O'Donnell, *Your Car May Be Invading Your Privacy*, USA TODAY, March 24, 2013, *available at* http://www.usatoday.com/story/money/cars/2013/03/24/car-spying-edr-data-privacy/1991751/.

[89] *See, e.g.*, NISSAN, NISSAN LEAF CUSTOMER DISCLOSURE FORM 3, (3rd ver. 2012) https://owners.nissanusa.com/content/techpub/ManualsAndGuides/NissanLEAF/2013/2013-NissanLEAF-Customer-Disclosure-Form.pdf; *cf. also* Joe T. Correia, Ken A. Iliadis, Ed S. McCarron & Mario A. Smolej, *Utilizing Data from Automotive Event Data Recorders* 4 (Proceedings of the Can. Multidisciplinary Rd. Safety Conference XII, June 2001).

[90] Event Data Recorders, 77 Fed. Reg. 47552, 47552, 47557 (Aug. 9, 2012). EDRs may soon be required in all new cars. Federal Motor Vehicle Safety Standards; Event Data Recorders, 77 Fed. Reg. 74144 (Dec. 13, 2012). Currently, manufacturers of light vehicles may choose to install EDRs, which must nonetheless meet specific requirements. Event Data Recorders: Application, 49 C.F.R. § 563.3; *see generally* Event Data Recorders, 49 CFR pt. 563; Event Data Recorders, 77 FR 47552, 47552-47557 (Aug. 9, 2012); *see also, e.g.*, Andrew Askland, *The Double Edged Sword That Is the Event Data Recorder*, 25

manufacturers and others[91] are also collecting these data, sometimes in real time. For example, Tesla's "telematics services subscription agreement," which is strikingly similar to Nissan's,[92] explains that the company may obtain, without limitation:

> (x) information about the vehicle and its operation, including without limitation, vehicle identification number, location information, speed and distance information, battery use management information, battery charging history, battery deterioration information, electrical system functions, software version information, and other data to assist in identifying and analyzing the performance of your Tesla EV; (y) information about your use of the Services; and (z) data about accidents involving your Tesla EV (for example, the deployment of air bags).[93]

The customer "owns" these data[94] but "grant[s] to Tesla a worldwide, royalty-free, fully paid, transferable, assignable, sublicensable (through multiple tiers), perpetual license to collect, analyze and use" them.[95] These data may help the company to check, maintain, analyze the performance of, and help in the maintenance of the vehicle; "research, evaluate and improve" its technology; "comply with the law and any and all legal requirements," including valid enforcement requests and orders; "protect the rights, property, or safety of" the company, the customer, or others; and "perform market research for Tesla's own purposes," a list that "is not meant to be exhaustive."[96]

TEMP. J. SCI. TECH. & ENVTL. L. 1 (2006); Aleecia M. McDonald & Lorrie Faith Cranor, *How Technology Drives Vehicular Privacy*, 2 I/S: J.L. & POL'Y 981, 985-91 (2006).

[91] *See, e.g.*, Leslie Scism, *State Farm Is There: As You Drive, Auto Insurers Adopt Telemetrics*, W.S.J., Aug. 5, 2013, *available at* http://online.wsj.com/article/SB10001424127887323420604578647950497541958.html.

[92] *See generally* Francesca Svarcas, *Turning a New LEAF: A Privacy Analysis of CARWINGS Electric Vehicle Data Collection and Transmission*, 29 SANTA CLARA COMPUTER & HIGH TECH. L.J. 165 (2012).

[93] TESLA TELEMATICS SERVICES SUBSCRIPTION AGREEMENT GENERAL SERVICES TERMS AND CONDITIONS, graciously provided by Steven Maifert, Tesla customer (Aug. 29, 2013), ¶ 8 (on file with author).

[94] *Id.* ¶ 11. Some states already specify the owner of certain vehicle data. National Conference of State Legislatures, Privacy of Data from Event Data Recorders: State Statutes, http://www.ncsl.org/issues-research/telecom/privacy-of-data-from-event-data-recorders.aspx (last visited Sept. 15, 2013).

[95] *Id.*

[96] *Id.* ¶ 9. It is, however, somewhat exhausting. Tesla also used these data in an effort to rebut a negative review in the N.Y. Times. Posting of Elon Musk to Tesla Blog, *A Most Peculiar Test Drive*, http://www.teslamotors.com/blog/most-peculiar-test-drive (Feb. 13, 2013).

The broader manufacturer-user relationship, which has long included data collection,[97] is complex. By law and practice, consumer sales of new automobiles in the United States typically occur through independent dealers. When this model emerged in the early 1900s, it enabled the nascent automotive industry to expand rapidly and to shift certain risks,[98] particularly since lack of privity between plaintiff and defendant could still defeat a product defect claim.[99] The dealer model outlived the privity requirement and, by the 1950s, had been codified in law.[100]

Manufacturers nonetheless play a significant role in putting their vehicles in the hands of consumers. Some automakers have their own financing arms, such as Ford Motor Credit and Toyota Financial Services, that provide loans to consumers and dealers.[101] Vehicle leases accounted for about 20 percent of new vehicle transactions in the last decade,[102] and

---

[97] Sally H. Clarke, *Unmanageable Risks: MacPherson v. Buick and the Emergence of a Mass Consumer Market*, 23 LAW & HIST. REV. 1, 20 (2005) ("Testifying in MacPherson's trial, Alanson P. Brush, a GM engineer, was asked how he determined a part's durability. 'The most satisfactory information that we can have, in fact the only means to the designer,' he stated, 'is to use the customers, that is to go over the complaint correspondence. That is the most satisfactory information a designer can have.'").

[98] BILL CANIS & MICHAELA D. PLATZER, CONG. RESEARCH SERV., R40712, U.S. MOTOR VEHICLE INDUSTRY RESTRUCTURING AND DEALERSHIP TERMINATIONS 2 (2009), *available at* http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1672&context=key_workplace.

[99] Clarke, *supra* note 97, at 20-21 (arguing that, in contrast to other high-tech manufacturers that had opted to vertically integrate sales and distribution, automakers "placed concerns about liability for defects ahead of gains in efficiency" by selling through dealers). This early history is not entirely clear. *Cf.* Kyle Graham, *Of Frightened Horses and Autonomous Vehicles: Tort Law and its Assimilation of Innovation*, 52 SANTA CLARA L. REV. 1241, 1245 (2012) *with* Lane Kenworthy, Stewart Macaulay, & Joel Rogers, *"The More Things Change...": Business Litigation and Governance in the American Automobile Industry*, 21 LAW & SOC. INQUIRY 631, 657-58 (1996).

[100] Canis & Platzer, *supra* 98, at 15-18; Kenworthy, Macaulay & Rogers, *supra 99*, at 657-665; J. Patrick Martin, *The Judicial Treatment of the Automobile Dealer Franchise Act*, 62 MICH. L. REV. 310, 310-325 (1963); Craig Trudell & Christie Smythe, *U.S. Dealer Group Seeks Tesla Meeting on Retail Plans*, BLOOMBERG, Oct. 24, 2012, http://www.bloomberg.com/news/2012-10-23/dealer-group-leaving-tesla-retail-challenge-to-states.html; Thomas B. Leary, *State Auto Dealer Regulation: One Man's Preliminary View*, Federal Trade Commission, http://www.ftc.gov/speeches/leary/learystateautodealer.shtm (last modified June 25, 2007). Proponents of these laws argued that, in contrast with large automakers, "local dealers might have greater sensitivity to local consumer preferences and provide better overall service." Leary, *supra*.

[101] Canis & Platzer, *supra* 98, at 13. GMAC, however, is now largely independent of General Motors, *id.*, and called Ally Financial, Our History, http://www.ally.com/about/company-structure/history (last visited Sept. 15, 2013).

[102] BUREAU OF TRANSP. STATISTICS, U.S. DEP'T OF TRANSP. NATIONAL TRANSPORTATION STATISTICS tbl. 1-17 (2012), http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_

automakers, through their subsidiaries, held nearly half of that market as of 2000.[103]

Tesla has challenged the dealer model by selling its cars directly to consumers on the web and through company-owned showrooms.[104] It has been denied dealership licenses in at least two states because of its status as a manufacturer,[105] lobbied for or against several pertinent state bills,[106] and (successfully) faced a court challenge in New York.[107]

Daimler, which makes Mercedes-Benz vehicles, has gone further by launching Car2Go, a carsharing service that rents cars by the minute for one-way, point-to-point trips.[108] The involvement of automakers in the rental industry is not entirely novel; Ford, for example, controlled Hertz from 1987 to 2005.[109] However, companies like Car2Go and its rival ZipCar "offer[] the functional value of urban mobility to their users"[110] in a way that competes more directly with a model of individual automobile ownership.

---

statistics/html/table_01_17.html; *see also* Thomas B. Hudson & Daniel J. Laudicina, *Recent Developments in Motor Vehicle Leasing and Litigation*, 59 BUS. LAW. 1145 (2004).

[103] J. Lamar Pierce, *Manufacturer Lease Pricing and Adverse Selection* 5 (Wash. Univ. St. Louis John M. Olin Sch. of Bus., Working Paper, Oct. 2007). Tesla recently instituted a functionally similar buyback program for its vehicles. Matthew Yglesias, *Tesla's New Buyback Scheme—A Lease with Tax Arbitrage*, SLATE, Apr. 2, 2013, http://www.slate.com/blogs/moneybox/2013/04/02/tesla_buyback_scheme_it_s_like_a_lease_but_with_tax_arbitrage.html.

[104] *See, e.g.*, Tesla Motors, Buy, http://www.teslamotors.com/buy/buyshowroom.php (last visited Sept. 15, 2013; Tesla Motors Online Store, http://www.teslamotors.com/models/design (last visited Sept. 15, 2013); Tesla Stores & Service Centers, http://www.teslamotors.com/findus (last visited Sept. 15, 2013).

[105] Ken Yeung, *Tesla Motors Denied Virginia Dealership License, but Sees Hope in Battle with Texas to Sell in State*, TNW, Apr. 24, 2013, http://thenextweb.com/insider/2013/04/24/tesla-motors-denied-virginia-dealership-license-but-sees-hope-in-battle-with-texas-to-sell-in-state/.

[106] Amy Wilson, *Tesla Loses its Battle to Sell Directly in Texas*, AUTOMOTIVE NEWS, June 3, 2013, http://www.autonews.com/article/20130603/RETAIL07/306039966/tesla-loses-its-battle-to-sell-directly-in-texas.

[107] *See, e.g.*, *Greater New York Auto. Dealers Ass'n v. Dep't of Motor Vehicles*, 969 N.Y.S.2d 721 (N.Y. Sup. Ct. 2013) (dismissing the action for lack of standing).

[108] Stephanie Steinberg & Bill Vlasic, *Car-Sharing Services Grow, and Expand Options*, N.Y. TIMES, Jan. 25, 2013, http://www.nytimes.com/2013/01/26/business/car-sharing-services-grow-and-expand-options.html.

[109] About Hertz, http://www.hertz.com/rentacar/abouthertz/index.jsp?targetPage=CorporateProfile.jsp&c=aboutHertzHistoryView (last visited Sept. 10, 2013).

[110] Frank Tietze, Tim Schiederig & Cornelius Herstatt, *Firms' Transition Towards Green Product Service Innovators* 6 (R&D Management Conference 2011, Accepted Paper, June 2011).

2.5 Motor Vehicles Tomorrow

Vehicle automation is likely to increase dramatically over the coming decade. Automated research vehicles are already being regularly tested and demonstrated on public roads around the world, and several companies have declared their intention to bring some kind of "autonomous" or "self-driving" automobile to market by 2020.[111] Three states plus the District of Columbia have enacted autonomous driving laws,[112] and the National Highway Traffic Safety Administration has released a preliminary research and policy statement.[113]

The technologies that emerge in the coming years will fall along a spectrum of automation.[114] Automakers are likely to continue building on the advanced driver assistance systems already found in some vehicles today.[115] In contrast to these all-purpose cars, specialty vehicles—such as low-speed, low-mass, geographically restricted shuttles that circulate on a public or private campus—may become truly "driverless" much more quickly. Pilot projects involving these vehicles may also blur the statutory[116] line between research and development testing and general operation.

Automated vehicles will generate and require more data than today's cars produce or consume. Like the production vehicles described above,[117] today's research systems use some combination of external sensors. Many of these systems also rely on detailed and up-to-date roadway maps to assist in navigation. Others, particularly vehicles that are arranged in closely

---

[111] *E.g.*, GM Says Almost-Driverless Cars Coming by 2020, Aug. 31, 2013, http://detroit.cbslocal.com/2013/08/31/gm-says-almost-driverless-cars-coming-by-2020/; Nissan, Nissan Announces Unprecedented Autonomous Drive Benchmarks, Press Release, Aug. 27, 2013, http://nissannews.com/en-US/nissan/usa/releases/nissan-announces-unprecedented-autonomous-drive-benchmarks; Joseph B. White, *Mercedes Makes Driverless Ride*, W.S.J., Sept. 10, 2013, http://online.wsj.com/article/SB10001424127887324549004579065541926070378.html.

[112] *See* Bryant Walker Smith, Automated Driving: Legislative and Regulatory Action Wiki, http://cyberlaw.stanford.edu/wiki/index.php/Automated_Driving:_Legislative_and_Regulatory_Action (last visited Sept. 15, 2013); *see also* SMITH, *supra* note 12, at 77-85 (Center for Internet and Society, 2012), 1 TEX. A&M L. REV. (forthcoming 2014).

[113] NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, PRELIMINARY STATEMENT OF POLICY CONCERNING AUTOMATED VEHICLES (2013), *available at* http://www.nhtsa.gov/staticfiles/rulemaking/pdf/Automated_Vehicles_Policy.pdf.

[114] *See, e.g.*, *id.*; Summary of SAE International's Draft Levels of Automation for On-Road Vehicles (July 2013), http://www.vehicleautomation.org/program/agenda; SMITH, *supra* note 12, at 9-13.

[115] *See* discussion *supra* Part 2.4.

[116] SMITH, *supra* note 12, at 87-95.

[117] *See* discussion *supra* Part 2.4.

spaced and tightly coordinated platoons,[118] use low-latency wireless technologies for communication among nearby vehicles.[119] Integration of these vehicle-to-vehicle (V2V) or even vehicle-to-infrastructure (V2I) communication technologies into the broader fleet could significantly increase the data transmitted to and from motor vehicles.[120]

This increased connectivity could potentially "open[] a currently untapped treasure chest of new profit pools, and completely new service and pricing options for automotive manufacturers."[121] It may also facilitate new opportunities (and challenges) for insurers, including highly personalized or pay-as-you-drive insurance.[122] The combination of automation and connectivity could ultimately produce all kinds of new products and services, from rental cars that reposition themselves to robotic taxis and trucks to on-demand shuttles extending the reach of mass transit.[123]

2.6 Other Emerging Products

While important,[124] motor vehicles are not wholly unique, and automation and connectivity may revolutionize many other products and services as well. Robots have long been present in industrial applications[125] and are making inroads into institutions like hospitals.[126] Personal service systems, exoskeletons,[127] and medical devices may extend robotics even

---

[118] Tom Robinson and Eric Chan, *Operating Platoons on Public Motorways: An Introduction to the SARTRE Platooning Programme*, http://www.sartreproject.eu/en/publications/Documents/SARTRE_Overview_Final_Paper_ITS_World_Congress_2010.pdf.

[119] *Id*.

[120] *See supra* note 86.

[121] Andreas Mai & Dirk Schlesinger, *Connected Vehicles: From Building Cars to Selling Personal Time Well-Spent* 5 (Cisco Internet Business Solutions Group, April 2011).

[122] Posting of Quentin Hardy to The New York Times Bits, *Car Insurance by the Mile*, http://bits.blogs.nytimes.com/2012/12/05/car-insurance-gets-personal/ (Dec. 5, 2012, 09:00 EST).

[123] *E.g.*, Autonomous Taxi, http://autonomos.inf.fu-berlin.de/technology/made-germany/autonomous-taxi (last visited Sept. 15, 2013). This is a different "last-mile problem" than the one noted below. *See infra* note 209.

[124] *See* discussion *supra* Part 2.4.

[125] Stephen S. Wu, *Risk Management in Commercializing Robots*, April 3, 2013, at 1, http://blogs.law.stanford.edu/werobot/files/2013/04/Risk-Management-in-Commercializing-Robotics.pdf.

[126] Scott Martin, Paging R2-D2 to the hospital ICU, USA Today, May 23, 2013, *available at* http://www.usatoday.com/story/tech/2013/05/23/paging-r2-d2-to-the-hospital-icu/2155381/.

[127] National Institute of Advanced Industrial Science and Technology, http://www.aist.go.jp/aist_j/press_release/pr2013/pr20130904/pr20130904.html (last visited Sept. 15, 2013).

further into the home, which itself may become smarter and more connected.[128] Smart devices like phones, watches, and glasses will increasingly assist humans in making split-second decisions that are more important and immediate than simply which highway exit to take. Commercial aircraft are already sophisticated computers, and civilian drone technologies are advancing.[129] Even basic goods may one day be linked to each other and to the wider world.[130]

In short, increasing proximity could characterize an increasing number of products that touch an increasing swath of ordinary life. The next part considers how this proximity could affect liability for these products.

3 PROXIMITY AS A DRIVER OF LIABILITY

This part argues that the increasingly proximate seller may find that its duties expand along with its information, access, and control. After examining duty generally and relationally, this part analyzes the impact of proximity on five potential substantive bases for liability: the implied warranty of fitness for a particular purpose, design and warning defects, post-sale warnings, post-sale updates, and negligent enabling.

3.1 Duty Generally

This article uses the term "duty" to broadly describe "who owes whom what."[131] The "who" in this formulation is the seller, who may have obligations grounded in negligence, warranty, or strict products liability. The "whom" is the person or class of persons to whom that seller owes those obligations and with whom the question of "relational duty" is concerned. The "what" is the content of those obligations. In grossly generalized terms, a seller has substantive duties:

---

[128] *See* Bassi, Europe & Horn, *supra* note 19.

[129] Nova, Rise of the Drones, Jan. 23, 2013, http://www.pbs.org/wgbh/nova/military/rise-of-the-drones.html.

[130] *See* discussion *supra* Part 2.1.

[131] This formulation is adapted from a description of duty as a "bifurcated element" comprising both a "duty to whom" and a "duty to do what." Alan Golanski, *Paradigm Shifts in Products Liability and Negligence*, 71 U. PITT. L. REV. 673, 684 (2010). Since different duties attach to different actors, I have also expressly specified the "duty of whom." This addition comports with Professor Golanski's argument that the distinction between regular and intermittent sellers, Restatement (Third) of Torts: Prod. Liab. §§ 1, 20 (1998), belongs under duty rather than proximate cause. Alan Golanski, *A New Look at Duty in Tort Law: Rehabilitating Foreseeability and Related Themes*, 75 ALB. L. REV. 227, 265 (2012).

- to market only products that conform to specifications, representations, and warranties;[132]
- to market only products that are as safe as reasonably possible for foreseeable uses and that include reasonable warnings and instructions as to their proper use;[133] and
- to reasonably facilitate the reasonably safe use of its products.[134]

My discussion of substantive duty necessarily turns to the meaning of reasonableness. The boundary between the existence of a duty and the breach of that duty is nebulous, and some notion of reasonableness guides judges in determining duty as much as it guides juries in determining breach.[135] For judges, "whether a duty exists is a question of fairness that involves a weighing of the nature of the risk, the magnitude of the burden of guarding against the risk, and the public interest in the proposed solution."[136] For juries, whether that duty has been breached is similarly (assumed to be) a question about "how a person who bore both the costs and benefits of care would have behaved."[137] In this way, by reducing the burdens of protective action, proximity lowers the barriers to affirmative determinations of both duty and breach.

The largely steadfast refusal of courts to recognize an affirmative "duty to rescue" between strangers is perhaps the relational exception that proves the rule: No matter how easy or morally advisable it would be, a person has no legal obligation to save the life of a stranger whom she has not imperiled.[138] But as the next section argues, proximity may shorten if not topple the hurdle of relational duty.

---

[132] U.C.C. § 2-313; Restatement (Third) of Torts: Prod. Liab. §§ 1-2 (1998).

[133] Restatement (Third) of Torts: Prod. Liab. § 9 (1998).

[134] *Cf.* Restatement (Third) of Torts: Prod: Liab. §§ 10-11 (1998); Restatement (Third) of Torts: Phys. & Emot. Harm §§ 6, 19 (2010).

[135] *See, e.g.*, W. Jonathan Cardi, *Purging Foreseeability the New Vision of Duty and Judicial Power in the Proposed Restatement (Third) of Torts*, 58 VAND. L. REV. 739, 743-67 (2005) (discussing the role of foreseeability in duty, breach, and proximate cause).

[136] *Doe v. Grosvenor Properties (Hawaii) Ltd.*, 73 Haw. 158, 162, 829 P.2d 512, 515 (Haw. 1992); *see also, e.g.*, *Goldberg v. Hous. Auth. of City of Newark*, 38 N.J. 578, 583, 186 A.2d 291, 293 (N.J. 1962) ("Whether a Duty exists is ultimately a question of fairness. The inquiry involves a weighing of the relationship of the parties, the nature of the risk, and the public interest in the proposed solution.").

[137] Stephen G. Gilles, *The Invisible Hand Formula*, 80 VIRG. L. REV. 1015, 1019 (1994) (analyzing the discrepancy between this black letter law and typical jury instructions).

[138] *See generally, e.g.*, Marin Roger Scordato, *Understanding the Absence of a Duty to Reasonably Rescue in American Tort Law*, 82 TUL. L. REV. 1447 (2008). *But see, e.g.*, *Tarasoff v. Regents of the Univ. of Cal.*, 551 P.2d 334 (Cal. 1976).

3.2 Relational Duty

The position of the current Restatement (Third) of Torts that "[a]n actor ordinarily has a duty to exercise reasonable care when the actor's conduct creates a risk of physical harm"[139] is consistent with an arguable "default duty of care" that some scholars believe was, until the Industrial Revolution, "always presumed to exist" and "never explicitly discussed or challenged when tort liability was imposed."[140] In what may have been an effort to promote industry, 19th Century courts began to expressly limit liability through formal no-duty rules like the privity requirement, most famously in *Winterbottom v. Wright.*[141] This particular requirement, which was subject to exceptions[142] and had dubious application to manufacturing defects,[143] was eventually abolished at least for bodily injury,[144] but the relational conception of duty survived as a limit on liability.[145] Indeed, Judge Cardozo authored both *MacPherson v. Buick*,[146] repudiating the privity requirement, and *Palsgraf v. LIRR*, restricting duty of care to foreseeable victims.[147] Given the longstanding dominance of Cardozo's view,[148] the new Restatement's embrace of a more universal concept of duty has led to vigorous debate focused on foreseeability[149]—and a fresh round of regrettable war metaphors.[150]

---

[139] Restatement (Third) of Torts: Phys. & Emot. Harm § 7(a) (2010).

[140] W. Jonathan Cardi & Michael D. Green, *Duty Wars*, 81 S. CAL. L. REV. 671, 699 (2008). *But see, e.g.*, John C.P. Goldberg & Benjamin C. Zipursky, *The Moral of MacPherson*, 146 U. PA. L. REV. 1733, 1761 n.104 (1998).

[141] Cardi & Green, *supra* note 140, at 699; David G. Owen, *The Evolution of Products Liability Law*, 26 REV. LITIG. 955, 960 (2007).

[142] Owen, *supra* note 141, at 960.

[143] Kyle Graham, *Of Frightened Horses and Autonomous Vehicles: Tort Law and its Assimilation of Innovations*, 52 SANTA CLARA L. REV. 1241, 1245-46 (2012).

[144] *E.g.*, *MacPherson v. Buick Motor Co.*, 217 N.Y. 382, 111 N.E. 1050 (N.Y. 1916); *Donoghue v. Stevenson, 1932 WL 27658 (HL 1932); Henningsen v. Bloomfield Motors, Inc.*, 32 N.J. 358, 161 A.2d 69 (N.J. 1960); *Adams v. Buffalo Forge Co.*, 443 A.2d 932 (Me. 1982); *see also* David F. Tavella, *Is Privity Dead? Should It Be?*, 8 N.Y.U. J. L. & BUS. 505 (2012).

[145] *E.g.*, Restatement (Third) of Torts: Phys. & Emot. Harm §§ 6 cmt. a, 7(b) (2010); Joseph W. Little, *Palsgraf Revisited (Again)*, 6 PIERCE L. REV. 75, 86-87 (2007).

[146] *MacPherson v. Buick Motor Co.*, 217 N.Y. 382, 111 N.E. 1050 (N.Y. 1916).

[147] *Palsgraf v. Long Island R. Co.*, 248 N.Y. 339, 162 N.E. 99 (N.Y. 1928).

[148] Little, *supra* note 145, at 81. Wisconsin, however, "continually states that it has adopted [Judge Andrew's] 'duty-to-one, duty-to-all the world' view." *Id.* at 81-82.

[149] *See, e.g.*, Cardi & Green, *supra* note 140; Little, *supra* note 145, at 84-88; *see generally* Golanski, *supra* note 131.

[150] Dean Prosser launched the original barrage, *see* William L. Prosser, *The Assault Upon the Citadel (Strict Liability to the Consumer)*, 69 YALE L.J. 1099 (1960); William L. Prosser, *The Fall of the Citadel (Strict Liability to the Consumer)*, 50 MINN. L. REV. 791 (1966); Christopher J. Robinette, *The Prosser Notebook: Classroom As Biography and*

Even in the formal law of warranty, foreseeability is now more central than privity. The Uniform Commercial Code offers three alternative rules regarding third parties "who may reasonably be expected to use, consume or be affected by" a product that is subject to an express or implied warranty.[151] Two of these alternatives wholly dispense with any privity requirement in cases of physical injury, and although the third, which has been adopted by a majority of states,[152] textually extends only to the product buyer's family and guests,[153] some courts have interpreted it to include even employees or bystanders.[154]

The implications of increasing proximity, itself a relational concept, for relational duty are twofold. First, more victims and classes of victims will be foreseeable. On an expansive view of foreseeability, "unexpected consequences of new science and technology may be viewed in a sense as more and more foreseeable, not less."[155] But even on a specific level, increased flow of information, perhaps in real-time, will render wholly expectable much of what was previously unexpected, if not at the time of system design then at least before the pertinent transaction or injurious incident. An aerial drone manufacturer might know from GPS data that one of its planes regularly passes over a school. An online retailer might suspect from sales data that the customer buying paint thinner is in the midst of a

---

Intellectual History, 2010 U. ILL. L. REV. 577, 587 n.101, 596 ("Prosser, extending the analogy that torts is a 'battlefield of social theory,' stated that one can cover a war from afar, discussing the moves of both sides, or as a war correspondent attached to one army only.") (2010), but he was not alone in the tort trenches, *see, e.g.*, Laurence H. Eldredge, Book Review, *Cases and Materials on Torts by Young B. Smith and William L. Prosser*, 53 COLUM. L. REV. 588 (1953) (referring to "the senior teachers of torts" as "the experienced old war-horses"). More recent correspondents have moved beyond mere forts and fields. *See, e.g.*, Benjamin C. Zipursky, *Richard Epstein and the Cold War in Torts*, 3 J. TORT L. 5 (2010); Ellen Wertheimer, *Unknowable Dangers and the Death of Strict Products Liability: The Empire Strikes Back*, 60 U. CIN. L. REV. 1183 (1992); Cardi & Green, *Duty Wars*, *supra* note 140; Golanski, *supra* note 131, at 228 (same). Fortunately, "Call of Duty," "Breaching the Front Lines of Reasonable Care," and "Foreseeability in the Fog of the Tort War" have yet to be commandeered as titles for law review articles.

[151] U.C.C. § 2-318.

[152] Jennifer Camero, *Two Too Many: Third Party Beneficiaries of Warranties Under the Uniform Commercial Code*, 86 ST. JOHN'S L. REV. 1, 10 (2012).

[153] U.C.C. § 2-318. *But compare id.* § 2-318 cmt. 3 ("[T]he section in this form is neutral and is not intended to enlarge or restrict the developing case law….") *with id.* § 1-103 cmt. 2 ("[W]hile principles of common law and equity may supplement provisions of the Uniform Commercial Code, they may not be used to supplant its provisions, or the purposes and policies those provisions reflect….").

[154] Camero, *supra* note 152, at 21-23.

[155] David G. Owen, *Bending Nature, Bending Law*, 62 FLA. L. REV. 569, 609 (2010) ("The Paradox of Foreseeable Unforeseeability"). I would add one note of caution to this fine article, namely that a century of polluting our environments and bodies demonstrates that the introduction of poorly understood risk is hardly a new phenomenon.

complicated pregnancy. The supplier of digital maps for automated vehicles may be able to discern from those very maps that children on one block have constructed a zipline at truck level over the street.

Second, proximity will give rise to the kinds of special relationships that continue to matter in law. Subscription plans, end-user license agreements, and online terms and conditions will create a new privity between customers and particular companies upstream. Networked systems that rely in part on the integrity of individual agents—vehicle-to-vehicle communication of safety-critical messages or crowdsourced correction of roadway maps, for example—will create new dependencies among previously autonomous actors. Some companies may find they have become common carriers in the eyes of the law[156] or that the actions of their autonomous systems, while not necessarily tortious, have nonetheless created affirmative duties to others.[157] One might even ask whether a company that profits from the data it collects from its customers has any reciprocal obligation to use those data to mitigate imminent harms to those customers that only it can predict.[158] To put the question in the extreme: To whom does duty extend in a world with no true strangers?

Even the persistent bystander might find some recourse in the special relationships of others.[159] As an initial matter, the reasons for abolishing a privity requirement would also tend to support a broad duty to bystanders, who are the least able to make decisions about or benefit from the product ultimately involved in their injury.[160] Accordingly, the justification for permitting a seller to disclaim even implied warranties with respect to third parties is not entirely straightforward. Similarly, implicitly asking a consumer to decide what level of safety to afford to strangers is somewhat perverse, especially in contexts like car sales, where the interests of the car buyer may diverge from those of the bicyclist with whom she shares the road. Moreover, a company that knowingly facilitates misconduct by its customers may have a duty to those who are harmed by that

---

[156] *See* Restatement (Third) of Torts: Phys. & Emot. Harm § 40 (2012).

[157] *Id.* § 39.

[158] *Cf.* Volokh, *supra* note 33.

[159] The notion that the special relationship of two parties creates a duty to a third is not new. *See, e.g.*, Robert L. Rabin, *Enabling Torts*, 49 DEPAUL L. REV. 435, 442 (1999) (discussing *Tarasoff v. Regents of the Univ. of Cal.*, 551 P.2d 334 (Cal. 1976), "in which a therapist was held to have owed a duty to warn a victim of his patient's violence—violence based on intentions that had been revealed to the therapist").

[160] *Cf.* A. Mitchell Polinsky & Steven Shavell, *The Uneasy Case for Product Liability*, 123 HARV. L. REV. 1437, 1491 (2010) ("Both because of the ineffectiveness of market forces in creating safety and because of the need for product prices to reflect risk when victims are strangers, the rationale for liability is stronger in that case than when victims are customers.").

misconduct[161]—though it may also have potentially conflicting obligations to its customers with respect to their data.[162]

In other words, the combination of a legal pull toward a "duty to all" and a technological push through "data on all" means that an inquiry into the relationships among parties is increasingly likely to have an expansive rather than restrictive effect on relational duty. The next section considers the substantive content of this broader relational duty.

3.3 Implied Warranty of Fitness for a Particular Purpose

As the Uniform Commercial Code provides, "[w]here the seller at the time of contracting has reason to know any particular purpose for which the goods are required and that the buyer is relying on the seller's skill or judgment to select or furnish suitable goods, there is unless [properly] excluded or modified … an implied warranty that the goods shall be fit for such purpose."[163] This implied warranty of fitness for a particular purpose can usually, though not always, be easily disclaimed.[164] When it is not, an injured buyer's success depends in part on what the seller knows or should know—and as the preceding discussion suggests, some sellers now know a great deal about their customers.[165]

Consider three grocery shoppers, each of whom has a child with celiac disease. The first shopper anonymously and without explanation picks up canned soup from her local supermarket. The second shopper also goes to the supermarket but requests a manager, explains that she needs gluten-free food, and buys the canned soup that the manager recommends. The third shopper visits an online retailer, searches for "gluten-free soup," and buys the first product listed. In each case the soup turns out to contain gluten that sickens the child. A claim under the implied warranty of fitness for a particular purpose is not available to the first family, but it may be to the

---

[161] Restatement (Third) of Torts: Phys. & Emot. Harm § 19 cmt. e (2010). *But see* John C.P. Goldberg & Benjamin C. Zipursky, *Intervening Wrongdoing in Tort: The Restatement (Third)'s Unfortunate Embrace of Negligent Enabling*, 44 WAKE FOREST L. REV. 1211 (2009) (arguing that the Restatement (Third)'s characterization is broader than actual practice); *see generally* discussion *infra* Part 3.7.

[162] Danielle Keats Citron, *Mainstreaming Privacy Torts*, 98 CAL. L. REV. 1805, 1838 (information); Volokh, *supra* note 33; *cf. Tarasoff v. Regents of the Univ. of Cal.*, 551 P.2d 334 (Cal. 1976).

[163] U.C.C. § 2-315 (2002); *see also, e.g.*, *Gold Ridge Min. Co. v. Tallmadge*, 44 Or. 34, 37, 74 P. 325, 326 (Or. 1903); *Compagnia Italiana Trasporto Olii Minerali v. Sun Oil Co.*, 43 F.2d 683, 684 (2d Cir. 1930).

[164] Arlie R. Nogay, *Enforcing the Rights of Remote Sellers Under the UCC: Warranty Disclaimers, the Implied Warranty of Fitness for a Particular Purpose and the Notice Requirement in the Nonprivity Context*, 47 U. PITT. L. REV. 873, 898-99 (1986).

[165] *See* discussion *supra* Part 2.2.

second provided preparation for a celiac is not an ordinary purpose for soup.[166] What about the third?

In this scenario, the online retailer arguably has "reason to know" both that a celiac will consume the soup and that the shopper will rely on the retailer's algorithms to return appropriate products. This argument may become more persuasive as the online retailer collects more information about the customer. Perhaps the shopper reached the retailer's website from a paid link on a gluten-free website. Or perhaps in the past she had purchased books on celiac disease from the retailer's website or complained in its comments section after inadvertently buying other products with gluten.

More broadly, this implied warranty demonstrates that courts have long viewed a seller's special knowledge as a source of liability: For companies, there can be a downside to data collection. Since a product use or misuse that should be known to the seller is likely to be foreseeable, this information can also expand the content of other duties. The next section considers this foreseeability with respect to defects of design and information.

3.4 Design and Informational Defects

A seller who can, does, or should know more about the products it sells may be expected to foresee a wider range of product-related uses, misuses, and harms. This section considers the meaning of reasonable design given this potential increase in foreseeability.

At the outset, though nearly half a century of scholarship amply demonstrates that design and informational defect actions do not fall under strict liability in its purest sense,[167] simply casting these theories onto the

---

[166] *Compare In re McDonald's French Fries Litig.*, 503 F. Supp. 2d 953, 957 (N.D. Ill. 2007) (rejecting a similar claim because it did not consider consumption of the food at issue to be a "particular, non-ordinary use of the product.") *with Feldman v. Lederle Laboratories*, 97 N.J. 429, 448, 479 A.2d 374, 384 n.6 (N.J. 1984) (noting in dicta that a "seller may be liable for an allergic response to a product when there is an implied warranty under the Uniform Commercial Code that the product is reasonably fit for the purpose for which it was acquired"). For early consideration of this question, see generally *Allergy and the Implied Warranty of Fitness for a Particular Purpose*, 25 FORDHAM L. REV. 306 (1956). "A 'particular purpose' differs from the ordinary purpose for which the goods are used in that it envisages a specific use by the buyer which is peculiar to the nature of his business whereas the ordinary purposes for which goods are used are those envisaged in the concept of merchantability and go to uses which are customarily made of the goods in question. For example, shoes are generally used for the purpose of walking upon ordinary ground, but a seller may know that a particular pair was selected to be used for climbing mountains." U.C.C. § 2-315 (2002), Official Comment, cmt. 2.

[167] Strict liability in this sense is similar to enterprise liability. *See, e.g.*, G. Edward White, *The Unexpected Persistence of Negligence, 1980-2000*, 54 VAND. L. REV. 1337,

shore of negligence is also misleading for at least two reasons. The most straightforward case for the distinction's survival is the liability of sellers downstream of the manufacturer for certain "dangerous propensit[ies]"[168] of a product even when those sellers, having not manufactured the product, were reasonably unaware of those propensities. But even for the actual manufacturer, the necessary analysis retains some traces of strict liability.

While the existence of a design defect would generally imply negligence on the principle that "proper design is a matter of reasonable fitness,"[169] such an equivalence of negligence and design defect deserves some qualification—and social reflection. Reasonable inputs do not always result in perfect outputs: Just as a reasonable production process may occasionally produce a dangerously imperfect product,[170] a reasonable design process may occasionally result in a dangerously imperfect design.[171] Indeed, "[i]t is often literally impossible or commercially unreasonable to guarantee that software of any complexity contains no errors that might cause unexpected behavior or intermittent malfunctions, so-called 'bugs.' The presence of minor errors is fully within common expectations."[172] One scholar has even called software an "unavoidably unsafe product" in the language of the Restatement (Second) of Torts[173]—at least to the extent that it is actually a product.[174]

This tension between reasonableness of input and output raises the question of whether a manufacturer is liable for harm caused by software flaws that are broadly foreseeable as a class but neither reasonably preventable nor reasonably discoverable in their individual instance. Under

---

1348 (2000).

[168] *Feldman v. Lederle Laboratories*, 97 N.J. 429, 450-55, 479 A.2d 374, 385-87 (1984), *quoted in* Conk, *supra* note 30, at 828.

[169] WILLIAM L. PROSSER, HANDBOOK OF THE LAW OF TORTS 659 n.72 (4th ed. West Pub. Co. 1971), *quoted in Feldman v. Lederle Laboratories*, 97 N.J. 429, 451 (1984), *quoted in* Conk, *supra* note 30, at 828; Wertheimer, *supra* note 111, at 1192.

[170] Restatement (Third) of Torts: Prod: Liab. § 2 cmt. a ("The rule for manufacturing defects … imposes liability whether or not the manufacturer's quality control efforts satisfy standards of reasonableness."). However, advances in manufacturing and quality control could conceivably lead to the conclusion that a manufacturing defect does imply an unreasonable process.

[171] Note how helpful English is in distinguishing among "production," "produce," and "product" and how utterly unhelpful it is in distinguishing among the corresponding uses of the word "design."

[172] Uniform Computer and Information Technology Act (UCITA) § 403 cmt. 3(a) (2002). UCITA has not been eagerly embraced by the state governments for which it was intended. Nim Razook, *The Politics and Promise of UCITA*, 36 CREIGHTON L. REV. 643, 644 (2003).

[173] Seldon J. Childers, *Don't Stop the Music: No Strict Products Liability for Embedded Software*, 19 U. FLA. J.L. & PUB. POL'Y 125, 167-68 (2008).

[174] *Id.*; *see* discussion *infra* Part 4.4.

the pure strict liability standard applicable only to manufacturing defects, a manufacturer would be liable even if "its quality control efforts satisfy standards of reasonableness."[175] In contrast, under a pure negligence standard, a manufacturer would not, at least in theory, be liable for such harm.

Under the design defects analysis of the Restatement (Third), liability depends on what knowledge is imputed to the manufacturer.[176] The maker of a "mechanical product"—a potentially anachronistic term in an increasingly robotic world—is generally assumed to "have known of the risks that would materialize from" a foreseeable use of its product.[177] Assuming this knowledge, however, removes the cost of acquiring it from the retrospective cost-benefit analysis favored by the Restatement.[178] This means that a jury might be tasked with deciding whether a realized risk of injury justified the cost of the software change posited as the reasonable alternative design, not whether the risk of injury justified the potentially larger cost of actually identifying the need for that change.[179]

This conceptually untenable position might be resolved in favor of a more robust form of either negligence or strict liability. The amorphous concept of foreseeability,[180] which is already quite broad,[181] may contract or expand to achieve a similar result. The state-of-the-art defense may rely more explicitly on process-oriented functional safety standards developed by industry.[182] Technological change in a broader sense may drive much of this evolution.[183]

Increasing proximity, for its part, will likely reduce the legal and practical significance of the seller's initial knowledge, whether actual or constructed. As that seller learns more about post-sale use of its product,

---

[175] Restatement (Third) of Torts: Prod. Liab. § 2 cmt. a (1998).

[176] *See* Wertheimer, *supra* note 111, at 1195 ("In other words, the imputation of knowledge necessarily affects the result only where the plaintiff could not show that the manufacturer was negligent in failing to discover the danger at issue.").

[177] Restatement (Third) of Torts: Prod: Liab. § 2 cmt. m, reporters' note 1.

[178] *Id.* § 2 cmt. a. Jurisdictions vary widely in the definition and application of cost-benefit analysis. Mark A. Geistfeld, *Legal Ambiguity, Liability Insurance, and Tort Reform*, 60 DEPAUL L. REV. 539, 547-48 (2011).

[179] *E.g.*, N.Y. Pattern Jury Instr.--Civil 2:120 (3d ed. 2013) ("It is not necessary to find that defendant CD knew or should have known of the product's potential for causing injury in order for you to determine that it was not reasonably safe. It is sufficient that a reasonable person who did in fact know of the product's potential for causing injury would have concluded that the product should not have been marketed in that condition.").

[180] Owen, *supra* note 155.

[181] Richard L. Cupp, Jr., *Proximate Cause, the Proposed Basic Principles Restatement, and Products Liability*, 53 S.C. L. REV. 1085, 1094 (2002).

[182] *E.g.*, ISO 26262.

[183] Owen, *supra* note 155, at 609.

more risks will be foreseeable and foreseen, even when no harm results. An automaker that receives real-time notification of system errors or unusual braking patterns, for example, may be able to ascertain latent issues or novel misuses. These new risks would be relevant to a claim of design or informational defect in any unit of the product that is subsequently marketed: The seller may not have known prior to the first sale, the argument would go, but it should have learned quickly thereafter.[184] Similarly, rapid advances in technology could render some products obsolete on their way from the factory to the warehouse.

Rapidly increasing foreseeability and capability could mean that a bystander injured by a product sold one year has a classic design or informational defect claim that a similarly situated bystander later injured by an identical product sold the previous year does not—a disparity that actually does comport with a foreseeability-based approach to products liability. And yet a proximity-driven expansion in post-sale duties, discussed in the next two sections, could offer an alternate route to recovery for both victims.

3.5 Post-Sale Duty to Warn

Proximity could deteriorate remaining rationales for limiting a post-sale duty to warn. This post-sale duty is distinct from the point-of-sale duty to warn that underlies the common[185] claim of informational defect.[186] Both duties, however, are premised in part on an informational disparity between the commercial seller and the downstream party.[187]

---

[184] For a discussion of corporate knowledge, see discussion *infra* Part 3.7 (enabling torts).

[185] Hildy Bowbeer, Wendy F. Lumish & Jeffrey A. Cohen, *Warning! Failure to Read This Article May Be Hazardous to Your Failure to Warn Defense*, 27 WM. MITCHELL L. REV. 439, 439-40 (2000); *see also* Michael A. Pittenger, *Reformulating the Strict Liability Failure to Warn*, 49 WASH. & LEE L. REV. 1509, 1515 (1992); James Forrest McKell Jr., Comment, *Chatter, Clatter, and Blinks: Defective Car Alerts and the Role of Techological Advances in Design Defect/Failure to Warn Cases*, DUKE L. & TECH. REV. (August 25, 2010); M. Stuart Madden, *The Duty to Warn in Products Liability: Contours and Criticism*, 89 W. VA. L. REV. 221 (1987). These claims are as academically contentious as they are common. *E.g.*, Madden, *supra*; James A. Henderson, Jr. & Aaron D. Twerski, *Doctrinal Collapse in Products Liability: The Empty Shell of Failure to Warn*, 65 N.Y.U. L. REV. 265 (1990); Alani Golanski, *Paradigm Shifts in Products Liability and Negligence*, 71 U. PITT. L. REV. 673 (2010); J. Scott Dutcher, *Caution: This Superman Suit Will Not Enable You to Fly-Are Consumer Product Warning Labels Out of Control?*, 38 ARIZ. ST. L.J. 633 (2006); Bernard W. Bell, *The Manufacturer's Duty to Notify of Subsequent Safety Improvements*, 33 STAN. L. REV. 1087 (1981); Victor E. Schwartz, *The Post-Sale Duty to Warn: Two Unfortunate Forks in the Road to a Reasonable Doctrine*, 58 N.Y.U. L. REV. 892 (1983).

[186] *See* discussion *supra* 3.4 (design and informational defects).

[187] *See* Restatement (Third) of Torts: Prod. Liab. § 10(b)(1)-(2) (1998); Madden, *supra*

Unlike its predecessor (and, arguably, persistent competitor), the Restatement (Third) of Products Liability contemplates liability for a seller or distributor's failure to provide an appropriate warning *after* the sale of a product.[188] Section 10 provides in part that "[o]ne engaged in the business of selling or otherwise distributing products is subject to liability for harm to persons or property caused by the seller's failure to provide a warning after the time of sale or distribution of a product if a reasonable person in the seller's position would provide such a warning."[189]

Although a uniform and consistent post-sale duty did not and does not exist among the states,[190] the Restatement (Third)'s provision has "received a mixed but generally favorable reception in the law since 1998,"[191] and "more than thirty states have [since] adopted various versions of duties arising after the sale of a product."[192] Plaintiffs presumably welcome this duty: In addition to presenting an additional basis for recovery, a post-sale duty to warn might also offer certain "strategic advantages"[193] like "avoid[ing] a statute of repose" or "a defense based on a user's substantial modification of a product," "negat[ing] a state-of-the-art defense," and "allow[ing] before a jury otherwise inadmissible evidence."[194]

In order to limit what its reporters described as "the most expansive area in the law of products liability,"[195] the Restatement (Third) explains that:

> A reasonable person in the seller's position would provide a warning after the time of sale if:

---

note 185, at 234.

[188] Restatement (Third) of Torts: Prod. Liab. § 10 (1998); Kenneth Ross, *Post-Sale Duty to Warn: A Critical Cause of Action*, 27 WM. MITCHELL L. REV. 339 (2000); Kenneth Ross & J. David Prince, *Post-Sale Duties: The Most Expansive Theory in Products Liability*, 74 BROOK. L. REV. 963 (2009); Kevin Reynolds & Richard J. Kirschman, *The Ten Myths of Product Liability*, 27 WM. MITCHELL L. REV. 551 (2000); David A. Warren, *Car Trouble: Some Help for the Uninformed Buyer*, 66 OHIO ST. L.J. 441, 455 (2005); Golanski, *supra* note 185, at 704; Tom Stilwell, *Warning: You May Possess Continuing Duties After the Sale of Your Product! (an Evaluation of the Restatement (Third) of Torts: Products Liability's Treatment of Post-Sale Duties)*, 26 REV. LITIG. 1035 (2007).

[189] Restatement (Third) of Torts: Prod. Liab. § 10 (1998).

[190] Ross & Prince, *supra* note 188, at 963-64.

[191] *Id.* at 984.

[192] Stilwell, *supra* note 188, at 1036.

[193] Douglas R. Richmond, *Expanding Products Liability: Manufacturers' Post-Sale Duties to Warn, Retrofit, and Recall*, 36 IDAHO L. REV. 7, 10 (1999).

[194] *Id. But see* Frank E. Kulbaski III, *Statutes of Repose and the Post-Sale Duty to Warn: Time for a New Interpretation*, 32 CONN. L. REV. 1027 (2000) (discussing statutes of repose).

[195] Ross & Prince, *supra* note 188, at 965 (quoting JAMES A. HENDERSON & AARON D. TWERSKI, TEACHER'S MANUAL FOR PRODUCTS LIABILITY: PROBLEMS AND PROCESS 159 (Aspen Publishers, Inc. 6th ed. 2008)).

> (1) the seller knows or reasonably should know that the product poses a substantial risk of harm to persons or property; and
>
> (2) those to whom a warning might be provided can be identified and can reasonably be assumed to be unaware of the risk of harm; and
>
> (3) a warning can be effectively communicated to and acted on by those to whom a warning might be provided; and
>
> (4) the risk of harm is sufficiently great to justify the burden of providing a warning.[196]

Proximity represents a dramatic and often deliberate expansion of a seller's knowledge of when, where, how, why, by whom, and for what its products are used. This expansion tends to undermine each of the limitations identified by the Restatement.[197]

The Restatement's observation that "constantly monitoring product performance in the field is usually too burdensome"[198] might be empirically refuted by the increasing incidence of such monitoring, at least for particular product types. Furthermore, greater opportunities for customer communication, including social media, will increase the likelihood that risks are independently "brought to the attention of sellers."[199] Unlike the ongoing research and testing often discussed in the context of pharmaceuticals,[200] this accidental knowledge may take effort to avoid acquiring.[201]

This same proximity increases the likelihood that "those to whom a warning might be provided can be identified." As one scholar notes, "[t]his obstacle may easily be overcome where … the manufacturer has a continuing relationship with product users."[202] Leases, service contracts, loyalty programs, customer marketing, and even end-user license agreements are forms of an ongoing relationship, even with users other than the original buyers.

---

[196] Restatement (Third) of Torts: Prod. Liab. § 10 (1998).

[197] Some courts have considered additional factors as well. *See* Richmond, *supra* note 193, at 42-46 (discussing eight factors considered: nature of the market, nature of the harm, frequency of the harm, intended life of the product, number of units sold, time between sale and injury, continuing relationship with the user, and continued involvement in the industry).

[198] *Id*.

[199] *Id*.

[200] *See supra* note 30.

[201] *Cf.* discussion *infra* Part 3.7.

[202] Richmond, *supra* note 193, at 30.

Many of these relationships, in turn, may enable efficient communication with users.[203] Here too the Restatement remains understandably grounded in a past where "original customer sales records indicat[ing] which individuals are probably using and consuming the product in question" might enable "direct communication of a warning."[204] Marketable consumer data from Google searches, Facebook likes, and Instagram photos[205] may well facilitate far more effective communication, even in cases where users are nominally anonymous. And some products may simply notify the user directly.

This increasingly efficient communication can reduce "the burden of providing a warning"[206]—at least to the extent that broader impacts on consumer privacy are not cognizable as relevant burdens.[207] The Restatement again asserts that "post-sale warnings are invariably costly to provide,"[208] but while reaching every last person exposed to risk from a particular product might remain costly, warning the majority may not be. This is reasonable care as an individualized imperative.

This "last-mile problem" could nonetheless produce different approaches among jurisdictions.[209] "Whether a post-sale duty to warn exists is a question of law for the trial court, not a question of fact for the jury. Once a court determines that a post-sale duty to warn exists, however, the general rule is that the breach of that duty is a fact question for the jury."[210] Under a broad construction of duty, the jury may determine whether the seller's outreach was reasonable with respect to the particular plaintiff—outreach that could be directed at that plaintiff or at the product user whose actions contributed to her injury. Under a narrower construction, however, the judge may decide whether such a duty, in a specific relational sense, exists with respect to the particular plaintiff. Regardless, greater proximity could expand conceptions of relational duty[211] as well as reasonability.

Return briefly to the point-of-sale duty differentiated from the post-sale duty at the beginning of this section. "The primary difference between the two types of claims is that when the manufacturer discovers the danger after the product's sale, the manufacturer no longer controls the product."[212] To

---

[203] The Restatement (Third)'s formulation is broader than "'users," but users are more likely to be reachable.

[204] Restatement (Third) of Torts: Prod. Liab. § 10 cmt. g (1998).

[205] I expect any future readers to laugh at these references as terribly quaint.

[206] Restatement (Third) of Torts: Prod. Liab. § 10 (1998).

[207] Volokh, *supra* note 33.

[208] Restatement (Third) of Torts: Prod. Liab. § 10 cmt. d.

[209] Stilwell, *supra* note 188, at 1055-56.

[210] Richmond, *supra* note 193, at 48 (internal footnote removed).

[211] *See* discussion *supra* Part 3.2.

[212] Michael L. Matula, *Manufacturers' Post-Sale Duties in the 1990s*, 32 TORT & INS.

the extent that proximity implies control over product or user, this difference is increasingly illusory. This notion of control could also drive recognition and expansion of another post-sale duty with even greater consequences—a duty which this article considers next.

3.6 Post-Sale Duty to Update

I turn now to a "rare"[213] duty that noted scholars have vigorously rejected[214] and that courts have "repeatedly refused to recognize,"[215] with the exceptions purportedly amounting in some cases to "intellectually vacant aberrations."[216] It is the post-sale duty to update, which I mean to encompass both recall and retrofit. As one skeptical court cautioned, "imposing upon manufacturers an extra-statutory duty to recall and retrofit used products to incorporate post-sale state of the art designs would be the equivalent of mandating that manufacturers insure that their products will always comply with current safety standards."[217] But here, too, proximity is poised to produce a different outcome for two reasons: The initial sale may be eclipsed by subsequent sales, or it may be subsumed under continuing relationships.

The first reason—that subscription-based services, over-the-air updates, and relational contracting arguably effect recurring product sales—belies the very term "post-sale." Consider, for example, software to run a home security system that is automatically updated a year after the system is first purchased. The year of initial purchase may remain relevant for some claims of defect, particularly those concerning hardware. However, for changes made during the update—and possibly related changes that were not made but could have been—the later year may be dispositive. This also means that what the seller did or could know and do would be measured at the time of the last transaction rather than the first. In other words, some allegations that new software-based hazards were either introduced or

---

L.J. 87, 92 (1996); *see also* Richmond, *supra* note 193, at 18.

[213] Kevin R. Boyle, *The Expanding Post-Sale Duty of a Manufacturer: Does a Manufacturer Have a Duty to Retrofit its Products?*, 38 ARIZ. L. REV. 1033, 1041 (1996).

[214] *See, e.g.*, Richmond, *supra* note 193; Richard A. Epstein, *Commentary, Symposium: The Passage of Time: The Implications for Product Liability*, 58 N.Y.U. L. REV. 930 (1983).

[215] Richmond, *supra* note 193, at 56-57. Although courts frequently reject this duty, they do not necessarily foreclose it entirely. *Id.* at 56; *see, e.g.*, *Gregory v. Cincinnati Inc.*, 450 Mich. 1, 36, 538 N.W.2d 325, 340 (Mich. 1995) ("In either case, absent some assumption of a duty or some controlling relationship, we elect not to impose such an onerous duty on manufacturers.").

[216] *Id.* at 60.

[217] *Modelski v. Navistar Int'l Transp. Corp.*, 302 Ill. App. 3d 879, 889, 707 N.E.2d 239, 247 (Ill. App. 1999).

uncorrected years after the initial sale may be more properly cognizable as classic design defect claims.[218]

Alternatively, to the extent that an over-the-air update operates as a "virtual recall,"[219] then the seller may have a duty to reasonably conduct that update.[220] The Restatement (Third) recognizes this duty on the principle that a manufacturer should not be subject to a lesser obligation if it avoids an inevitable regulatory recall by voluntarily acting.[221] Although this rationale suggests that not every update is a recall, it is consistent with an obligation of reasonableness in a broader class of cases.

The same considerations of information, access, and control underlying a post-sale duty to warn provide a second route to a post-sale duty to update.[222] It is notable that "the three seminal cases" recognizing this duty come from aviation.[223] One scholar attributes this to the significant "potential for human injury in aviation."[224] An equally important consideration, however, appears to be the close and continuing relationship between an aircraft maker and its customers: As part of their "normal practice," these manufacturers continue to provide advice on the maintenance, operation, and overhaul of their aircraft.[225]

One scholar, while arguing against the imposition of a duty to update, nonetheless discerns three absolute requisites from relevant case law.[226] The first, that "the danger the product poses must be so extraordinary, pronounced, or special that a post-sale warning will not protect consumers,"[227] describes the perception or reality of many increasingly sophisticated physical products.[228] The others, that "the manufacturer must

---

[218] *Cf.* H.R. REP. 103-525(II) (noting that aircraft are frequently updated).

[219] *E.g.*, Bryant Walker Smith, *Autolaw 3.0*, Transportation Research Board 2012 Workshop on Road Vehicle Automation, http://onlinepubs.trb.org/onlinepubs/conferences/2012/Automation/presentations/WalkerSmith.pdf.

[220] Stilwell, *supra* note 188, at 1045.

[221] Restatement (Third) of Torts: Prod. Liab. § 11 cmt. a (1998).

[222] These two duties are expressly linked by a rarely recognized duty to warn of improvements.

[223] Boyle, *supra* note 213, at 1036 (discussing *Noel v. United Aircraft Corp.*, 342 F.2d 232 (3d Cir. 1964), *Braniff Airways, Inc. v. Curtis-Wright Corp.*, 411 F.2d 451 (2d Cir. 1969), and *Bell Helicopter v. Bradshaw*, 594 S.W.2d 519 (Tex. Civ. App. 1979)); *see generally id.* at 1035-36.

[224] *Id.* at 1036.

[225] *Noel v. United Aircraft Corp.*, 342 F.2d 232, 241 (1964). Although post-sale warnings are a form of continuing advice, the existence of a post-sale duty to warn does not imply a post-sale duty to update. *E.g.*, *Patton v. Hutchinson Wil-Rich Mfg. Co.*, 253 Kan. 741, 762-63, 861 P.2d 1299, 1315 (Kan. 1993) (considering a post-sale duty to warn but categorically rejecting a post-sale duty to update).

[226] Richmond, *supra* note 193, at 60.

[227] *Id.*

[228] Motor vehicles certainly pose special dangers, and the fully automated variety may

be able to identify and locate product owners or users"[229] and "regain control of the product,"[230] relate directly to proximity. In cases recognizing this duty, "the manufacturer has typically regained control of the product after learning of a way to improve its safety, or has retained the ability to force an owner or operator to make the necessary improvements."[231] This ability may arise "where the manufacturer maintains a special or controlling post-sale relationship with the owner of the product."[232]

This continued control over the product or the user is a hallmark of proximity.[233] Increasing connectivity may give manufacturers the technical ability to remotely update or disable certain product functions. At the same time, a new contractual privity comprising leases, end-user license agreements, and terms of use may give them legal means to retain or assert control over how their products are used and disposed.

Some courts may continue to broadly reject a duty to update on policy grounds. Proximity does not change the argument that legislatures or administrative agencies are better suited to recognize new obligations, and ongoing obligations may still create perverse incentives. Because some updates may require costly research, development, and testing, the duty to update might discourage manufacturers from marketing remotely updatable products[234]—though ultimately a lack of remote updatability may itself constitute a design defect arising at the point of sale.[235] Post-sale duties may

---

not even have users in the classic sense who can be warned.

[229] Richmond, *supra* note 193, at 60. Richmond emphasizes without further explanation that merely "alleg[ing] that a manufacturer ought to be able to identify owners or users of a particular product" should be insufficient. *Id.*

[230] *Id.*

[231] *Id.* at 49.

[232] Boyle, *supra* note 213, at 1041 (citing *Gregory v. Cincinnati Inc.*, 450 Mich. 1, 26, 538 N.W.2d 325, 335-36 (Mich. 1995)); *see also* Jeffrey A. Lamken, *Efficient Accident Prevention As A Continuing Obligation: The Duty to Recall Defective Products*, 42 STAN. L. REV. 103, 110 (1989).

[233] The continuation of manufacturer control may address Professor Epstein's argument that "a recurrent weakness of product liability law is that it always takes the obligation to maintain product safety away from the party in possession of the product and imposes it on someone further up the chain of distribution, who often has less control over product safety." Epstein, *supra* note 214, at 933.

[234] *Cf.* Randal C. Picker, *Rewinding Sony: The Evolving Product, Phoning Home and the Duty of Ongoing Design*, 55 CASE W. RES. L. REV. 749 (2005). This burden analysis may be relevant both to a court determining whether to recognize a duty to update and to a jury deciding whether such a duty had been breached.

[235] *Cf. id.* at 761 ("We need to regard the choice about how and whether a product evolves as being one of the central decisions that arises in product design."), 767-68 (proposing a test for copyright infringement that distinguishes between updatable and nonupdatable products); *cf. also infra* Part 3.7 (willful blindness).

also discourage manufacturers from making their products last longer.[236] But in the curious case of technological innovation in physical products, durability may actually be undesirable: To the extent that today's cars, refrigerators, and other machines are safer than those of the past (and excluding broader costs of rapid consumption), quickly disposing of or upgrading old products may produce safety gains.

Companies that can control their products post-sale may also be able to control the uses of those products. That capability is central to the final substantive basis that this part considers.

3.7 Negligent Enabling

Proximity drives the set of so-called "enabling torts"[237] that lie at the edge of current tort law.[238] This set of established and emerging theories are directed at "a remote actor whose wrong consists of setting the stage for a second wrongdoer who inflicts injury on a victim,"[239] often by providing dangerous instrumentalities[240] like cars, guns, cigarettes, unguarded buildings, or even information.[241] These theories assert a substantive duty to reasonably mitigate conditions that render dangerous a particular instrumentality, user, or use.[242]

Curiously, two scholars who reject enabling torts as a singular concept[243] nonetheless identify a strong basis for expanding the content of such a duty. With respect to the most established of these torts, negligent entrustment,[244] the "lynchpin of liability is the possessor's continuing dominion over the property: his power to permit or prohibit use of the dangerous item."[245] Channeling Voltaire, these scholars explain that "the

---

[236] *cf.* Kulbaski, *supra* 194, at 1033 (discussing statutes of repose).

[237] Rabin, *supra* note 159, at 436. *But see generally* Goldberg & Zipursky, *supra* note 161 (rejecting a singular category or theory of enabling torts).

[238] *See* Rabin, *supra* note 159; *see also* Richard C. Ausness, *Tort Liability for the Sale of Non-Defective Products: An Analysis and Critique of the Concept of Negligent Marketing*, 53 S.C. L. REV. 907 (2002).

[239] Goldberg & Zipursky, *supra* note 161, at 1211.

[240] Rabin, *supra* note 159, at 450; Goldberg & Zipursky, *supra* note 161.

[241] Danielle Keats Citron, *Mainstreaming Privacy Torts*, 98 CAL. L. REV. 1805, 1838 (2010) (information).

[242] Rabin, *supra* note 159; Restatement (Third) of Torts: Phys. & Emot. Harm § 19 (2010).

[243] Goldberg & Zipursky, *supra* note 161.

[244] Negligent entrustment is based on the principle that a person who "exercises control over," *id.* at 1219 n.34, a "dangerous instrumentality—almost always a car or gun—is obligated to others who might foreseeably be harmed by the property's misuse not to permit its use by someone whom the possessor knows (or in some jurisdictions, has reason to know) is incompetent to handle it," *id.* at 1219-20.

[245] *Id.* at 1220. Professor Rabin criticizes the notion of "control" as applied to unknown

right of control" implies "an attendant responsibility to be prudent in granting others access to the item."[246] In contrast to bailments,[247] outright sales or donations are less likely to qualify as entrustments[248] precisely because such transactions are explicit repudiations of continuing control.

Except, however, when they aren't. The very purpose of an end-user license agreement is to extend the seller's control beyond the point of sale by contractually specifying the terms under which the product may be used or disposed, and the function of a subscription plan is to condition continued use on continued payment. In these cases, a company's ongoing control over a product could imply a commensurate responsibility to restrict, by contractual or technological means, access by those clearly incompetent to handle it.

Information, access, and control are all relative concepts with inchoate forms.[249] One court, while conditioning a psychiatrist's duty to the public on a legal and factual ability to control the patient,[250] nonetheless noted that "in certain circumstances a doctor [may be] under a duty to establish control."[251] Similarly, information might be acquirable but not actually acquired, or it might be processable but not actually processed. The Department of Defense even believes that not all acquisition is collection.[252] As the remainder of this section discusses, knowledge may range from actual and individualized to constructive and collective.

Actual knowledge is likely to be one of the central issues in the expansion of enabling torts. Some jurisdictions require knowledge of

---

tortfeasors, Rabin, *supra* note 159, at 440. A broader conception that also includes control over real and personal property, however, encompasses more of the cases he identifies.

[246] Goldberg & Zipursky, *supra* note 161, at 1220.

[247] Arthur Cholodofsky, *Torts: Does the Negligent Entrustment Doctrine Apply to Sellers?*, 39 U. FLA. L. REV. 925, 946-50 (1987) (distinguishing between sales and bailments).

[248] Goldberg & Zipursky, *supra* note 161, at 1220. But see Cholodofsky, *supra* note 247, at 929-35 (discussing "negligent sale" doctrine in California); *W. v. E. Tenn. Pioneer Oil Co.*, 172 S.W.3d 545, 555 (Tenn. 2005) (distinguishing vicarious liability and negligent entrustment) ("Control therefore need only exist at the time of the entrustment for a prima facie case of negligent entrustment.").

[249] *Cf.* SMITH, *supra* note 12, at 24-27, 68-69 (discussing control).

[250] *Hasenei v. United States*, 541 F. Supp. 999, 1011-12 (D. Md. 1982); see also Robert F. Schopp, *The Psychotherapist's Duty to Protect the Public: The Appropriate Standard and the Foundation in Legal Theory and Empirical Premises*, 70 NEB. L. REV. 327, 335 (1991). Foreseeability links control and information. *See Hasenei*, *supra* note 250, at 1012.

[251] *Hasenei*, *supra* note 250, at 1012 n.23.

[252] UNDER SECRETARY OF DEFENSE FOR POLICY, DEPARTMENT OF DEFENSE, DOD 5240.1-R, PROCEDURES GOVERNING THE ACTIVITIES OF DOD INTELLIGENCE COMPONENTS THAT AFFECT UNITED STATES PERSONS 15 (Dec. 1982), *available at* http://www.fas.org/irp/doddir/dod/d5240_1_r.pdf.

incompetence in negligent entrustment cases, while others do not.[253] The question of "whether 'prior incidents' are a prerequisite to establishing a duty of precautionary conduct" is one "that has plagued courts around the country" in landlord cases.[254] And while the Restatement (Third) of Torts suggests a distinction between the duties of relatives and retailers,[255] actual knowledge may be the more appropriate distinction. Indeed, a relative "would almost certainly have knowledge of [a car] buyer's unsuitability,"[256] and there is "a strong case for" the liability of a commercial gun seller who "actually knows of the evidently dangerous characteristics of the buyer."[257]

A seller's role as an "information hub" about not only its products,[258] but also the uses and users of those products, is therefore relevant. The more personal information a company or a network of companies collects, analyzes, and shares, the more it starts to resemble the defendant who finances her nephew's car purchase despite knowing him to be an alcoholic who cannot lawfully drive[259] or the service station whose employees pump gas for a visibly intoxicated driver.[260] In both these examples, the facilitating party was held to have a duty of reasonable care to the third-party victim who was subsequently injured in a vehicle crash.[261]

Actual knowledge is a difficult concept when applied to corporate entities. Consider a credit card company[262] that approves a fuel purchase at a gas station with which it is affiliated[263] even though the cardholder has charged $60 ten minutes prior at a tavern, makes regular payments on the same card to an alcohol abuse center, entered the wrong ZIP code three times, and just posted a series of incoherent driving-related messages from a

---

[253] Goldberg & Zipursky, *supra* note 161, at 1219-20.

[254] Rabin, *supra* note 159, at 445.

[255] Restatement (Third) of Torts: Phys. & Emot. Harm § 19 Reporters' Note cmt. h (2010); *see also* Restatement (Second) of Torts § 390 cmt. b (1965).

[256] Restatement (Third) of Torts: Phys. & Emot. Harm § 19 Reporters' Note cmt. h (2010).

[257] *Id.* (citing *Kitchen v. K-Mart Corp.*, 697 So.2d 1200 (Fla. 1997)).

[258] This is the context in which the phrase "information hub" was presciently used in Epstein, *supra* note 214, at 931.

[259] *Cf. Vince v. Wilson*, 151 Vt. 425, 561 A.2d 103, 104, 106 (Vt. 1989) (finding that the defendant liable to the plaintiff for the injuries caused by the grandnephew), *discussed in* Rabin, *supra* note 159, at 438-39.

[260] *W. v. E. Tenn. Pioneer Oil Co.*, 172 S.W.3d 545 (Tenn. 2005); *see also* Carmel Sileo, *Gas Company May Be Liable for Station's Sale of Fuel to Drunk Driver*, TRIAL, Nov. 1, 2004, at 100 (describing the appellate court's holding).

[261] *Vince*, 561 A.2d at 106; *E. Tenn. Pioneer Oil Co.*, 172 S.W.3d at 552.

[262] For an argument that credit cards are products, see Adam Goldstein, *Why "It Pays" to "Leave Home Without It": Examining the Legal Culpability of Credit Card Issuers Under Tort Principles of Products Liability*, 2006 U. ILL. L. REV. 827 (2006).

[263] *Cf.* ExxonMobil Credit Cards, http://creditcards.citicards.com/usc/rpg/exxonmobil/microsite/ (last visited Sept. 10, 2013).

Twitter account that the company is "following." A natural person presented with these facts might conclude the cardholder to be driving drunk; a company that analyzed them might reach the same conclusion with at least as much confidence. But the relationship among acquisition, analysis, and knowledge is not entirely clear.

In criminal law, the doctrine of "collective knowledge" provides that, "in certain circumstances, [a] corporation can be convicted on the basis of its employees' collective knowledge and intent," "even if no single employee has the intent necessary to commit a crime."[264] In a prosecution of a bank under the Currency Transaction Reporting Act, for example, the jury was instructed "to look at the bank as an institution. As such, its knowledge is the sum of the knowledge of all of the employees … within the scope of their employment. So, if Employee A knows one facet of the currency reporting requirement, B knows another facet of it, and C a third facet of it, the bank knows them all…."[265]

The Supreme Court has imported a related[266] doctrine, willful blindness, from criminal law into patent law.[267] After concluding that the pertinent statutory provision requires actual knowledge of patent infringement,[268] the court held that willful blindness meets this standard while reckless indifference does not.[269] "Given the long history of willful blindness and its wide acceptance in the Federal Judiciary," the majority saw "no reason why the doctrine should not apply in civil lawsuits for induced patent infringement under 35 U.S.C. § 271(b)."[270] Although collective knowledge is not nearly as established as willful blindness,[271] this explanation at least suggests its potential application to tort law.

---

[264] Patricia S. Abril & Ann Morales Olazabal, *The Locus of Corporate Scienter*, 2006 COLUM. BUS. L. REV. 81, 115 (2006). This is also called "collective knowledge, composite knowledge, collective intent, piecemeal attribution, attribution of knowledge, and aggregate corporate knowledge, among other terms." *Id.* (internal citations and quotations omitted).

[265] *United States v. Bank of New England, N.A.*, 821 F.2d 844, 844 (1st Cir. 1987) (quoting trial court's jury instructions), *quoted in* Abril & Olazabal, *supra* note 264, at 118. *But see* Thomas A. Hagemann & Joseph Grinstein, *The Mythology of Aggregate Corporate Knowledge: A Deconstruction*, 65 GEO. WASH. L. REV. 210 (1997) (characterizing that court's holding in terms of willful blindness rather than collective knowledge).

[266] Abril & Olazabal, *supra* note 264, at 121; Hagemann & Grinstein, *supra* note 265; William S. Duffey, Jr. & Phyllis B. Sumner, *Collective Knowledge and Willful Blindness—New Liability Under Old Law*, S.C. LAW., Jan./Feb. 1994, at 32.

[267] *Global-Tech Appliances, Inc. v. SEB S.A.*, 131 S. Ct. 2060 (2011).

[268] *Id.* at 2068.

[269] *Id.*

[270] *Id.* at 2069. *But see* Jacob S. Sherkow, *Patent Infringement as Criminal Conduct*, 19 MICH. TELECOMM. & TECH. L. REV. 1 (2012) (suggesting reasons).

[271] Hagemann & Grinstein, *supra* note 265.

Standing alone, willful blindness also has implications for proximity-driven liability. A seller that avoids acquiring or analyzing certain data might be acting in a way that is both reasonable and desirable.[272] If, however, this policy represents a "deliberate action to avoid confirming a [subjectively] high probability of wrongdoing,"[273] then the company might be said to have the actual knowledge upon which enabling torts are sometimes premised. An in-vehicle telematics system that gives the user the option to temporarily disable the reporting of speed, for example, may cross this line.

As this section has explored, a seller that knows its product is being abused and has the ability to prevent that abuse might face a claim for negligent enablement. But this situation could also evidence a foreseeable product risk that the seller failed to address in its initial design, failed to warn against at or after the sale, or even failed to correct in a subsequent update. Proximity could drive all these claims.

3.8 Reclaiming Proximity

As this part has discussed, the obligations of a defendant depend in part on its information about, access to, and control over the product, property, person, or activity at issue. This duty-driving conception of proximity contrasts with the duty-limiting function of proximate cause.[274] Indeed, requirements of privity[275] or control[276] have also been used by courts to limit tort liability.

In a sense, this article reclaims proximity as an affirmative source of liability. Information about a customer's specific needs can create an obligation to meet those needs,[277] and information about a product's actual performance can create an obligation to address newly foreseeable risks.[278] Information about a product in combination with access to its users can

---

[272] *See* Volokh, *supra* note 33.

[273] *Global-Tech*, 131. S. Ct. at 2070-71.

[274] *See* Cupp, *supra* note 181.

[275] *See* discussion *supra* Part 3.2 (relational duty).

[276] *See, e.g.*, Courtney Shaw, *Uncertain Justice: Liability of Multinationals Under the Alien Tort Claims Act*, 54 STAN. L. REV. 1359, 1375 (2002); Schopp, *supra* note 250, at 335-36; Peter Tipps, *Controlling the Lead Paint Debate: Why Control Is Not an Element of Public Nuisance*, 50 B.C. L. REV. 605, 628 (2009); David Potts, *Engler v. Gulf Interstate Engineering, Inc. and the Role of Control in Vicarious Liability*, 54 ARIZ. L. REV. 1157, 1166 (2012). If absolute control (or the lack thereof) explains the doctrines of contributory negligence and superseding cause, then relative control explains the shift to comparative negligence. *Cf.* Michael D. Green, *The Unanticipated Ripples of Comparative Negligence: Superseding Cause in Products Liability and Beyond*, 53 S.C. L. REV. 1103, 1123 (2002).

[277] *See* discussion *supra* Part 3.3 (noting that the seller must also have reason to know of the customer's reliance).

[278] *See* discussion *supra* Part 3.4.

create an ongoing obligation to warn those users of dangers associated with that product.[279] Finally, control over a product, its users, or its uses could conceivably create an ongoing obligation to update that product[280] or restrict those uses.[281]

These pressures arise from the application of current legal precedent to emerging business practice. However, as the next section argues, they may counterintuitively help drive that practice toward greater proximity.

4 LIABILITY AS A DRIVER OF PROXIMITY

The previous part argued that proximity could drive liability by expanding the obligations of sellers. There is, however, a more complex picture of the relationship between liability and proximity, one in which proximity is a response to as well as a source of liability. New technologies, including those that facilitate proximity, are increasing technical, legal, and reputational uncertainty. Companies may choose to manage this broader uncertainty through a variety of technical and contractual tools that fall roughly into three broad categories: private repose, dynamic risk management, and service models.

4.1 The Effect of Uncertainty

All else being the same, greater duty might imply greater liability. All else, however, will not be the same: In the future, products may be safer, practical obstacles to litigation may be greater, or business models may be different. More broadly, the world is evolving, and extrapolating only those variables of immediate interest while holding all others constant seems a poor approach for actually forecasting broader social, legal, and technological change.[282]

This change will contribute to uncertainty about the product-related risks borne directly and indirectly by individuals and companies. These risks relate in part to the technical performance of novel products,[283] to the

[279] *See* discussion *supra* Part 3.5.

[280] *See* discussion *supra* Part 3.6.

[281] *See* discussion *supra* Part 3.7.

[282] *See, e.g.*, The Jetsons, http://www2.warnerbros.com/warnervideo/classiccartoons/jetsons.html (last visited Sept. 13, 2013). This approach does, however, work fairly well for science fiction, which must balance the futuristic and the familiar.

[283] Advanced, particularly autonomous, technologies may be deployed without a perfect understanding of their real-world behavior. Designers of highly complex products cannot identify, much less test, every scenario that their products will encounter, even if those scenarios are in a broad sense entirely foreseeable. *Cf. supra* note 155 (describing the paradox of foreseeability). The glare of sun on the snow, for example, might confuse an automated vehicle's vision in ways that are generally but not specifically predictable. After

application of evolving legal rules and standards to those products,[284] and to the reputational effects on companies and even industries when those products actually or allegedly fail.[285] As risks become less certain—that is, less susceptible to reliable estimation—they become harder to price and insure.[286]

For this reason, companies often seek certainty.[287] A company that understands its risks can generally pass the costs of mitigation or insurance to its customers. In contrast, a company that cannot or does not accurately estimate these risks may make inefficient decisions about product deployment or pricing. To the extent that these decisions lead to the marketing of unsafe products or impede consumer adoption of safer products, the costs may in some cases be measured in lives lost.

Nonetheless, there are at least three reasons why providing legal certainty may not always be socially desirable. First, the flexibility present in a fair system of justice necessarily involves some uncertainty.[288] Second, uncertainty may help deter activities that have negative externalities.[289] Third, increasing certainty for one actor may mean shifting costs to another.[290]

---

all, every snowflake is different—at least in one sense. Daniel Engber, *Are Snowflakes Really Different?*, SLATE, July 20, 2006, http://www.slate.com/articles/news_and_politics/explainer/2006/07/are_snowflakes_really_different.html.

[284] *See* discussion *supra* Part 3.

[285] Consumers, shareholders, and the public at large can act capriciously, particularly when confronting the unknown. An immediate or continuing loss of sales can be disastrous for a manufacturer. Even blanket tort immunity cannot assuage, and might exacerbate, the anger or distrust of the company or industry associated with an alleged product failure. Indeed, reputation may influence a company's behavior more than liability. Polinsky & Shavell, *supra* note 160.

[286] Mark A. Geistfeld, *Legal Ambiguity, Liability Insurance, and Tort Reform*, 60 DEPAUL L. REV. 539, 540-41 (2011) (discussing "Frank Knight's renowned distinction between 'risk' and 'uncertainty'").

[287] *See, e.g.*, Geistfeld, *supra* note 286, at 541 ("The insurance industry embraces risk and abhors uncertainty."); Bryant Walker Smith, *Stakeholder Reaction to Emissions Trading in the United States, the European Union, and the Netherlands*, 25 J. LAND USE AND ENV. L., 137, 137 (2009) ("The broad conclusion, to which the remainder of the article provides context, is straightforward: Industry dislikes regulation. It strongly dislikes [regulatory] redundancy. It loathes uncertainty.").

[288] Geistfeld, *supra* note 286, at 570 ("Uncertainty per se is not an evil that must be avoided at all costs by the tort system. Liability rules that do not accommodate the factual uncertainty inherent in a world of limited information, for example, are unlikely to be fair or just. At least some uncertainty is also inherent in the exercise of legal judgment, including the jury's determination of reasonable care for important classes of cases.").

[289] However, if the status quo has greater externalities, such deterrence may not be desirable.

[290] Jeffrey O'Connell, *Balanced Proposals for Product Liability Reform*, 48 OHIO ST. L.J. 317, 318 (1987) ("The *least* appealing way to reform the tort system is to make it even

Two prominent federal products liability reforms illustrate the cost-shifting that can occur when Congress reactively shields industries from litigation over their products or practices. The Protection of Lawful Commerce in Arms Act of 2005[291] and the General Aviation Revitalization Act of 1994[292] unilaterally curtail legal remedies in both state and federal courts:[293] The 2005 measure prohibits certain civil actions against gun makers,[294] and the 1994 measure specifies an 18-year statute of repose[295] for certain claims against manufacturers of small aircraft.[296] These measures limit liability without addressing the performance of the products at issue, other risks faced by these companies, or the direct costs imposed on injured individuals.[297]

In contrast, the National Childhood Vaccine Injury Act of 1986 is a more expansive effort that combines procedural and substantive limitations on conventional tort remedies with an alternative compensation scheme for probable victims of covered vaccines.[298] Even the "essential health benefits" specified under the Patient Protection and Affordable Care Act of 2010 begin to resemble some of the most basic elements of an alternative compensation scheme.[299]

Proactive legislation enacted before a product reaches the market might provide greater certainty without disrupting the expectations of companies and consumers. To this end, one scholar has called on Congress to quickly

---

harder for injured parties to be paid."), *quoted in* Geistfeld, *supra* note 286, at 569.

[291] 15 U.S.C. §§ 7901-7903.

[292] 49 U.S.C. § 40101 note; *see generally, e.g.*, Victor E. Schwartz & Leah Lorber, *The General Aviation Revitalization Act: How Rational Civil Justice Reform Revitalized an Industry*, 67 J. AIR L. & COM. 1269 (2002); Robert F. Hedrick, *A Close and Critical Analysis of the New General Aviation Revitalization Act*, 62 J. AIR L. & COM. 385 (1996); Nathan J. Rice, *The General Aviation Revitalization Act of 1994: A Ten-Year Retrospective*, 2004 WIS. L. REV. 945 (2004).

[293] This is admittedly arguable with respect to the 2005 measure, which targeted claims that at that point had seen at most mixed success in the courts. Allen Rostron, *Lawyers, Guns, & Money: The Rise and Fall of Tort Litigation Against the Firearms Industry*, Book Review, 46 SANTA CLARA L. REV. 481, 484 (2006).

[294] 15 U.S.C. §§ 7901-02. The measure does not prohibit negligent entrustment claims against sellers. *Id.*

[295] For relevant discussion of statutes of repose, see Frank E. Kulbaski III, *Statutes of Repose and the Post-Sale Duty to Warn: Time for a New Interpretation*, 32 CONN. L. REV. 1027 (2000); Geistfeld, *supra* note 286, at 542, 567.

[296] 49 U.S.C. § 40101 nt. The measure does not apply to victims who were not in the airplane or to victims who were flying on "scheduled passenger-carrying operations." *Id.*

[297] This is not to suggest that a single bill must necessarily accomplish all of these aims, some of which may be better addressed under existing regulatory authorities or social programs.

[298] 42 U.S.C. §§ 300aa-1 - 300aa-34. It also includes a reporting requirement. *Id.*

[299] P.L. 111-148, 124 Stat. 120, § 1302 (March 23, 2010).

"shield manufacturers and distributors of open robotic platforms from suit for what consumers do with their personal robots."[300] But a proactive approach also has drawbacks: It presumes a problem that does not yet exist, it invites regulation of innovation, and it balances the well-aligned interests of buyers and sellers against those of individual victims who have yet to be identified. Regardless, the rapid pace of innovation may simply negate an opportunity for proactive legislative intervention.

Accordingly, rather than prescribe a public-sector solution, this article describes a set of potential private-sector strategies for achieving greater technical, legal, and reputational certainty. The next section turns to the first of these strategies, which aims to limit the duration of risk.

4.2 Private Repose

Some industries already have the contractual and technical tools needed to achieve what is in effect a private statute of repose. Limiting the life of a product can cut off the long tail of liability that attaches to a product; this may be particularly attractive when that life would arguably be excessive otherwise.[301] It may give companies more confidence to experiment by enabling them to assume risks for only a few years rather than a few decades. And it may facilitate the kind of perpetual pilot projects or continuous beta releases common in software development.[302]

The contractual tools of repose include leases and even end-user license agreements. Such agreements may permit repossession at the end of the term or may impose restrictions on where, when, how, by whom, and for what the product is used.[303] General Motors, for example, relied on leasing to introduce its first modern electric car to California consumers in the late 1990s, an approach that allowed it to subsequently repossess and crush many of these cars when it declined to pursue broader commercialization.[304]

The addition of telematics could facilitate the effective private enforcement of these contractual rights. A manufacturer might closely monitor product use, disable functionality when a violation occurs, and remotely "brick" those products that are not returned at the end of the term.

---

[300] M. Ryan Calo, *Open Robotics*, 70 MD. L. REV. 571, 576 (2011).

[301] Schwartz & Lorber, supra note 292, at 1275.

[302] *E.g.*, Christopher Soghoian, *Caught in the Cloud: Privacy, Encryption, and Government Back Doors in the Web 2.0 Era*, 8 J. TELECOMM. & HIGH TECH. L. 359, 417 (2010); Andrew Chadwick, *Web 2.0: New Challenges for the Study of E-Democracy in an Era of Informational Exuberance*, 5 I/S: J.L. & POL'Y FOR INFO. SOC'Y 9, 22 (2009).

[303] Alarmingly, the Computer Fraud and Abuse Act may even criminalize a violation of those terms. *See, e.g.*, Kerr, *supra* note 51.

[304] WHO KILLED THE ELECTRIC CAR (Sony Pictures Classics 2006).

In contrast with this vision, the world today is largely one without privately enforced product retirement. The average age of cars in the United States now exceeds eleven years[305]—younger than Google[306] but older than Facebook.[307] More dramatically, the average age of the general aviation fleet in 2010 was 37 years,[308] the same as the median age of the US population[309] and a full third of the total time that has elapsed since humans achieved powered flight.[310]

The experiences of the automotive and general aviation industry suggest why companies that are now deploying a first generation of complex medical and consumer devices may not want these products in the world decades later. In mid-2013, the National Highway Traffic Safety Administration requested that Chrysler recall two million cars and SUVs, some of which were 20 years old.[311] The lengthier lifespans of small aircraft led in part to the General Aviation Revitalization Act of 1994.[312] "Tens of thousands" of these aircraft "had been sold in the 1940s, 1950s, 1960s and 1970s. But by the mid-1980s, fewer than a thousand planes were sold each year. The cost of those planes had to cover an ever-growing liability exposure that arose from planes sold in the distant and very distant past."[313]

---

[305] Press Release, Polk, Polk Finds Average Age of Light Vehicle Continues to Rise (Aug. 6, 2013), *available at* https://www.polk.com/company/news/polk_finds_average_age_of_light_vehicles_continues_to_rise. The report does not define "average." *Id.*

[306] About Google, http://www.google.com/about/company/ (last visited Sept. 15, 2013).

[307] About Facebook, https://www.facebook.com/facebook/info (last visited Sept. 15, 2013).

[308] GENERAL AVIATION MANUFACTURERS ASSOCIATION, 2012 GENERAL AVIATION STATISTICAL DATABOOK & INDUSTRY OUTLOOK (2012), *available at* http://www.gama.aero/files/GAMA7233_AR_FINAL_LOWRES.pdf. This report also does not define "average." *Id.* Significantly, "pursuant to FAA- and producer-prescribed periodic maintenance, aircraft are rebuilt on a periodic basis. Over the lifespan of a general aviation aircraft, almost every major component will be replaced." H.R. REP. 103-525(II). The same cannot quite be said of humans.

[309] Central Intelligence Agency, The World Factbook, https://www.cia.gov/library/publications/the-world-factbook/geos/us.html (last visited Sept. 15, 2013).

[310] Library of Congress, The Dream of Flight, http://www.loc.gov/exhibits/treasures/wb-timeline.html (last accessed Sept. 15, 2013).

[311] Gabe Nelson, *NHTSA vows aggressive stance on recalls*, Automotive News, July 15, 2013, http://www.autonews.com/article/20130715/OEM11/307159906/nhtsa-vows-aggressive-stance-on-recalls. In that article, NHTSA's administrator also describes the agency's "unreasonable risk" standard as an "evolving notion." *Id.*

[312] Schwartz & Lorber, *supra* note 301, at 1275. Even opponents of GARA appear to have acknowledged the impressive durability of these aircraft. *Id.* at 1277 ("[The American Association of Trial Lawyers] also said that the existing aircraft were of too high a quality, thus contributing to lengthy, durable and reliable service lives.").

[313] *Id.* at 1275.

This untenable reliance by general aviation manufacturers on a relatively small number of new sales to cover substantial legacy litigation points to a second way in which proximity may help manage risk—in this case, dynamically.

4.3 Dynamic Risk Management

As OnStar and other automotive telematics systems have demonstrated, subscriptions can complement product sales and leases.[314] In a world of increasing proximity, they may also be used to dynamically price reasonable risks and prevent unreasonable ones.

Consider, for example, one possible model for the deployment of advanced automation in motor vehicles: Although a customer might purchase or lease a vehicle complete with all of the hardware and at least some of the software needed for automated driving, she would then pay on a periodic or on-demand basis to actually use these features. A variety of services—from vehicle telematics to cellular phones to traditional utilities—already operate this way. Indeed, similar to pay-as-you-drive insurance, peak calling minutes, and smart meters, a company might even charge different prices for urban and rural, day and night, or summer and winter trips.

Such a model may facilitate more precise management of technical risk. An automaker might restrict advanced features to certain routes, times, or conditions, tailoring these restrictions as it learns more about the actual performance of its vehicles. And provision of the latest maps and algorithms might simply be part of the automation package to which the customer subscribes.

This model may also contribute to the management of financial risk. Simplistically,[315] a company that obtains all of its revenue from product sales must either build the cost of all future risk into the selling price of its product or, as with general aviation, rely on future sales to cover new expenses associated with past sales. In contrast, a company that supplements sales with subscriptions might look to future revenue associated with one product to cover future costs associated with that same product.

A commercial seller may not have complete discretion in discontinuing support or adjusting prices. The product-service combination can raise antitrust concerns.[316] It can also give rise to reliance. After the cellular

---

[314] See discussion *supra* Part 2.4.

[315] This distinction is not, for example, based on generally accepted accounting principles.

[316] *See, e.g.*, Thomas H. Au, *Anticompetitive Tying and Bundling Arrangements in the Smartphone Industry*, 16 STAN. TECH. L. REV. 188 (2012).

carriers with which OnStar contracts completed their transition from analog to digital service, for example, OnStar customers whose vehicles were equipped only with analog hardware sought recovery from the General Motors subsidiary for breach of contract, misrepresentation, and unfair trade practices.[317]

Although the kinds of dynamic risk management described in this section assume an underlying sale or lease, such a product-based transaction is not always necessary. The final section considers this alternative of pure service transactions.

4.4 Service Models

Finally, in lieu of making individual sales, manufacturers may opt to provide services to individual users. This section considers both indirect and direct service models.

First, a manufacturer might sell or lease exclusively to a limited number of major entities that use its products to provide services to a much larger set of customers. These service partners would maintain the products, train the users, and perhaps even indemnify the manufacturer. Partners might include utilities and other operators of significant facilities like airports, seaports, railways, highways, pipelines, mines, farms, factories, military bases, logistics centers, universities, resorts, retirement communities, and medical centers. In the case of automated vehicles, they may also include large fleet operators like governments, construction firms, and transportation companies.

A limited number of close relationships with financially stable entities may help regulate product use and facilitate recovery in the case of harm caused by misuse. They may also provide a means for manufacturers to cautiously introduce products into the market. The Department of Defense or US Postal Service, for example, may be able to provide assurances or adhere to restrictions that tens of thousands of individual customers could not.

Second, rather than rely on others to put its products to use, a manufacturer might provide the services itself. Although companies from Boeing[318] to Greyhound[319] to Daimler[320] have combined particular manufacturing and service operations in this way, risk management was

---

[317] *See, e.g., In re OnStar Contract Litig.*, 278 F.R.D. 352, 364 (E.D. Mich. 2011) (discontinuation of OnStar's analog service).

[318] The Boeing Logbook: 1927 – 1932, http://www.boeing.com/boeing/history/chronology/chron03.page (last visited Sept. 15, 2013).

[319] Greyhound Historical Timeline, http://www.greyhound.com/en/about/historicaltimeline.aspx (last visited Sept. 15, 2013).

[320] *See supra* part 2.3.

probably not a significant motivation. However, this vertical integration could provide a manufacturer greater control over the use and maintenance of its products.[321]

A shift from product to service has specific liability implications, since the Uniform Commercial Code[322] and strict products liability apply only to products.[323] Generally, however, this purely legal distinction is probably a poor basis for strategic business decisions,[324] particularly since a product sale is likely to take place at some point in a complex supply chain. Moreover, a product classification may not be categorically preferable to one side in a tort action. The language of negligence may or may not make a more favorable impression on a jury.[325] A product classification could also benefit a plaintiff attempting to invoke a UCC remedy,[326] or it could benefit a defendant seeking the benefit of legislatively crafted restrictions on product liability.[327]

5 CONCLUSION

This article posits a spiral of proximity and liability: Proximity may drive liability, and liability may drive proximity. This is not a closed system, and the spiral may spin far off the path that I have suggested. Regardless, the world in thirty years will undoubtedly look far different than it does now, and many products that are advanced today will be primitive tomorrow.

Accordingly, a critical question for companies, regulators, and the public is whether vestiges of an imminent generation of safety-critical products should remain without modification in the skies, on the roads, and in our homes for decades to come. Retrospectively answering in the negative will be ineffective, as traditional product recalls will not achieve perfect turnover.[328]

---

[321] Product users employed by the manufacturer may also fall under the worker compensation regime.

[322] Thomas M. Schehr, *Commercial Transactions and Contracts*, 46 WAYNE L. REV. 547, 554-55 (2000).

[323] Restatement (Third) of Torts: Prod. Liab. § 19 (1998).

[324] *See generally id.*; *cf.* Restatement (Third) of Torts: Prod. Liab. § 20 rep. nt. a (1998) ("When confronted with nonsale situations to which the logic of strict products liability applied, historically courts tended to stretch the word 'sell' to cover new situations [like commercial product leases].").

[325] Cupp *supra* note 181, at 1097-98.

[326] *See, e.g.*, Thomas M. Schehr, *Commercial Transactions and Contracts*, 46 WAYNE L. REV. 547, 554-55 (2000).

[327] Restatement (Third) of Torts: Prod. Liab. § 19 (1998).

[328] *See* Consumer Reports, *Only One-Fifth of Americans Are Aware They Purchased a*

The characteristics of proximity identified in this article—information about, access to, and control over products, users, and uses—provide some of the legal and technical tools to effectively revise and retire obsolete products. But these tools also have risks. This article has examined some of the legal challenges and opportunities that proximity presents for sellers. For individuals, these tools also raise concerns about privacy and autonomy as against companies, governments, and malicious actors.

For example, technical connectivity, especially over-the-air updates, can make products more robust, but it can also make them less secure. The troubling vulnerability of many current medical devices[329] demonstrates that careful design of product and network architectures is imperative. Legal regimes can support this design by clarifying rights and responsibilities with respect to information, access, and control.

Tort law, contract law, and the hybrid that is products liability will confront some of the failures of this design. As this article has argued, the result could be expanded duties for sellers. NBCUniversal runs a series of public service announcements under the ominously incomplete parallelism "The More You Know."[330] Sellers know more, they may do more, and law may require more.

Recalled Product, Jan. 4, 2011, http://pressroom.consumerreports.org/pressroom/2011/01/only-one-fifth-of-americans-are-aware-they-purchased-a-recalled-product.html; Consumer Reports, *Survey: Consumer Confusion Over Car Recalls*, May 21, 2010, http://www.consumerreports.org/cro/news/2010/05/survey-consumer-confusion-over-car-recalls/index.htm; Dan Koeppel, *Why Product Recalls Make You Less Safe*, Popular Mechanics, June 21, 2012, http://www.popularmechanics.com/technology/gadgets/news/why-product-recalls-make-you-less-safe-8347658.

[329] *See, e.g.*, *FDA Notice, Content of Premarket Submissions for Management of Cybersecurity in Medical Devices, Draft Guidance*, 78 FR 35940, June 14, 2013; Department of Homeland Security, National Cybersecurity and Communications Integration Center, *Attack Surface: Healthcare and Public Health Sector*, Bulletin 201205040900, May 4, 2012.

[330] Comcast NBCUniversal, The More You Know, http://www.themoreyouknow.com (last visited Sept. 15, 2013).