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Personal Property Servitudes on the Internet of Things

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PERSONAL PROPERTY SERVITUDES ON THE INTERNET OF THINGS

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TABLE OF CONTENTS

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I. INTRODUCTION

Software and internet connections once were largely confined to multi-purpose computers housed in rectangular boxes. No longer. More and more, small, sometimes mobile appliances such as thermostats, watches, jewelry, and eyewear are being made available with networking capability.[1] These networked objects make up the growing Internet of Things[2]—pieces of personal property that run software and connect to the global Internet.[3] Manufacturers typically require purchasers of these products to consent to terms of service (ToS) or end-user license agreements (EULAs) in order to use them, and these licenses purport to create restrictions on how the products can be used or transferred.[4]

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[1] For example, the product "Nest" allows one to control the temperature in one's home through one's phone, wherever the phone is, so long as it and the Nest thermostat are connected to the Internet. *See* Jim Smith, *Data Centers and the Internet of Things to Come*, WIRED, http://www.wired.com/insights/2014/03/data-centers-internet-things-come/ (last visited June 12, 2016). Google Glass and Samsung's Galaxy Gear add networking capability to eyewear and watches. *See* John Biggs, *Samsung Announces the Galaxy Gear 2 Smart Watch with Better Battery and Tizen OS, Coming in April*, TECHCRUNCH (Feb. 23, 2014), http://techcrunch.com/2014/02/23/samsung-announces-the-galaxy-gear-2-smart-watch-with-better-battery-and-tizen-os-coming-in-april/; Samuel Gibbs, *Samsung Gear 2 Beats Apple to Fitness-Tracking Smartwatch*, GUARDIAN (Feb. 23, 2014), http://www.theguardian.com/technology/2014/feb/23/galaxy-gear-2-samsung-beats-apple-wearable-fitness-tracking-smartwatch. Ringly is a company selling networked jewelry. Ringly, https://ringly.com/ (last visited June 12, 2016); *see* Liz Stinson, *This Jewelry Lights Up and Buzzes When Your Phone Needs You*, WIRED (June 10, 2014, 12:00 PM), http://www.wired.com/2014/06/launching-bluetooth-jewelry-that-helps-filter-your-phone-calls/.

[2] *See* Scott R. Peppet, *Regulating the Internet of Things: First Steps Toward Managing Discrimination, Privacy, Security, and Consent*, 93 TEX. L. REV. 85, 87–117 (2014) (giving examples of personal property that can connect to the Internet); Smith, *supra* note 1 (stating that the Internet of Things is about to go mainstream in a big way); Emily Adler, *Here's Why "The Internet of Things" Will Be Huge, and Drive Tremendous Value for People and Businesses*, BUS. INSIDER (Dec. 7, 2013, 9:38 PM), http://www.businessinsider.com/gro wth-in-the-internet-of-things-2013-10 (estimating that the Internet of Things will account for an increasingly large number of connections: 1.9 billion devices today and 9 billion by 2018).

[3] *See* Jacob Morgan, *A Simple Explanation of "the Internet of Things,"* FORBES (May 13, 2014, 12:05 AM), http://www.forbes.com/sites/jacobmorgan/2014/05/13/simple-explanation-internet-things-that-anyone-can-understand/#30e72e886828 (defining the "Internet of Things" as "the concept of basically connecting any device with an on and off switch to the Internet (and/or to each other)").

[4] *See, e.g.*, Apple WatchOS Software License Agreement, APPLE.COM (last visited June 12, 2016) ("By using your Apple Watch or downloading a software update, as applicable, you are agreeing to be bound by the terms of this license.").

Under the common law, these licenses would be verboten if the inside of the product consisted of gears rather than processing chips—if it were a mechanical Rolex watch rather than a Samsung Gear smartwatch.[5] But because the products that comprise the Internet of Things run copyrighted software, manufacturers are legally permitted to exert downstream control over the software's—and effectively the product's—usage.[6] Although personal property traditionally cannot be subjected to usage restrictions or servitudes,[7] judges have been comparatively comfortable recognizing restrictions on products that run software (software-embedded goods).[8] Named the "New Servitudes" by Molly Shaffer Van Houweling,[9] this flexibility to create usage and transfer restrictions on software-embedded products has allowed for Canon to claim it can prevent digital camera owners from lending their cameras to others,[10] for Google to forbid resale of its

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[5] *Compare* Rolex Watch Collection, http://www.rolex.com/watches.html (last visited June 12, 2016), *with* Samsung Wearable Technology, http://www.samsung.com/us/mobile/wearable-tech (last visited June 10, 2016).

[6] *See* Part III for a discussion of the legal mechanism that allows for greater downstream control of software-embedded products as compared with analog products.

[7] *See* Thomas W. Merrill & Henry E. Smith, *Optimal Standardization in the Law of Property: The* Numerus Clausus *Principle*, 110 YALE L.J. 1, 18 (2000) ("[A]lthough the case law is rather thin, it . . . appears that one cannot create servitudes in personal property."); Molly Shaffer Van Houweling, *Touching and Concerning Copyright: Real Property Reasoning in* MDY Industries, Inc. v. Blizzard Entertainment, Inc., 51 SANTA CLARA L. REV. 1063, 1068 (2011) ("While courts have increasingly accommodated land servitudes, the conventional wisdom under Anglo-American law has been that the types of servitudes that can be attached to land cannot be attached to chattels.").

[8] Dicta from a recent district court case renders less clear whether content owners can restrict resale of digital content that remains embedded in a particular piece of hardware. *See* Capitol Records, LLC v. ReDIGI Inc., 934 F. Supp. 2d 640, 656 (S.D.N.Y. 2013) ("Section 109(a) [of the Copyright Act] still protects a lawful owner's sale of her 'particular' phonorecord, be it a computer hard disk, iPod, or other memory device onto which the file was originally downloaded. While this limitation clearly presents obstacles to resale that are different from, and perhaps even more onerous than, those involved in the resale of CDs and cassettes, the limitation is hardly absurd. . . .").

[9] Molly Shaffer Van Houweling, *The New Servitudes*, 96 GEO. L.J. 885, 885–86 (2008).

[10] *See* Elizabeth I. Winston, *Why Sell What You Can License? Contracting Around Statutory Protection of Intellectual Property*, 14 GEO. MASON L. REV. 93, 97 n.13 (2006) (citing Canon EOS-1D Mark II N Firmware License Agreement Update Version 1.1.12, http://web.canon.jp/Imaging/eos1dm2n/eos1dmk2n_firmware-e.html).

new product, Google Glass,[11] and for Nest to require its thermostat only be used for personal, noncommercial purposes.[12]

Use and transfer restrictions on software-embedded goods and other articles protected by intellectual property laws alter one's relationship with property, a change reflected in the increasingly popular use of the locution "user" rather than "owner" of an article.[13] These usage restrictions give companies greater flexibility to price discriminate and unbundle features of their products.[14] However, those same restrictions also have significant drawbacks.

This Article primarily focuses on the potential costs presented by the licensing of networked objects and other intellectual-property-embedded goods, in part because the key claimed benefits of licensing—flexibility and price discrimination—have been discussed and critiqued elsewhere in the context of intellectual property law by many, including this author.[15] Although this

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[11] *See* David Kravets & Roberto Baldwin, *Google is Forbidding Users from Reselling, Loaning Glass Eyewear*, WIRED (Apr. 17, 2013, 3:00 PM) http://www.wired.com/gadgetlab/2013/04/google-glass-resales/ ("The company's terms of service on the limited-edition wearable computer specifically states 'you may not resell, loan, transfer, or give your device to any other person.' ").

[12] Nest End User License Agreement, NEST, https://nest.com/legal/eula/ (last visited June 12, 2016).

[13] *See* RICHARD RAYSMAN ET AL., INTELLECTUAL PROPERTY LICENSING 2–6 (2006) ("[T]he software industry traditionally positions its transfers [of its products to consumers] as licenses, not sales, of both the physical copy and the intellectual property. . . . enabl[ing] the rightsholder to restrict further transfers of the software." (footnote omitted)).

[14] *See* OFFICE OF THE PRESIDENT, BIG DATA AND DIFFERENTIAL PRICING 4, 5 (2015), https://www.whitehouse.gov/sites/default/files/docs/Big_Data_Report_Nonembargo_v2.pdf (defining price discrimination as "the practice of charging customers different prices for the same product" and stating that "versioning," a form of price discrimination in which firms produce multiple versions of a product at different prices, is common in the release of software).

[15] For instance, many scholarly articles have discussed price discrimination in the context of intellectual property law. For examples, see Herbert Hovenkamp, *Post-Sale Restraints and Competitive Harm: The First Sale Doctrine in Perspective*, 66 N.Y.U. ANN. SURV. AM. L. 487, 532 (2011); Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 HARV. L. REV. 1813, 1874–75 (1984); Glynn S. Lunney, Jr., *Copyright's Price Discrimination Panacea*, 21 HARV. J.L. & TECH. 387 (2008); Michael J. Meurer, *Copyright Law and Price Discrimination*, 23 CARDOZO L. REV. 55 (2001); Christina Mulligan, *A Numerus Clausus Principle for Intellectual Property*, 80 TENN. L. REV. 235, 285–89 (2013); Guy A. Rub, *Rebalancing Copyright Exhaustion*, 64 EMORY L.J. 741, 766 (2015); Christopher S. Yoo, *Copyright and Product Differentiation*, 79 N.Y.U. L. REV. 212, 270 (2004). *See generally* Julie E. Cohen, *Copyright and the Perfect Curve*, 53 VAND. L. REV. 1799 (2000); John P. Conley & Christopher

Article sets forth several bases for believing that idiosyncratic licensing creates economic and social harms, those harms must be understood alongside and weighed against possible benefits that arise from price discrimination and flexibility.

The harms of permitting extensive licensing of the Internet of Things are foreshadowed by scholarship about the structure of physical property forms. One school of thought, spearheaded by Thomas Merrill and Henry Smith, warns of the high information costs that accrue when the forms property interests can take are too varied.[16] Another perspective considers the social and cultural consequences that occur when the law recognizes particular types of property interests but not others.[17] This Article applies these analyses of traditional, physical property to software-embedded objects and argues that licensing physical objects may result in more economic and social costs than are worth bearing.

In the course of evaluating the information costs associated with licensing the Internet of Things, this Article makes a second, but equally significant, contribution to theories about physical property forms in Part II. In order to decide how much flexibility in licensing is appropriate for the Internet of Things, this Article revisits a near century-old, unanswered question: Why has the common law evolved to disfavor complex and nonpossessory personal property interests while allowing comparative flexibility in real property? By establishing a new framework for deciding when property interests should be flexible and when they should be standardized, this Article not only answers a longstanding question from property law but also renders the answer highly

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S. Yoo, *Nonrivalry and Price Discrimination in Copyright Economics*, 157 U. PA. L. REV. 1801 (2009); William W. Fisher III, *When Should We Permit Differential Pricing of Information?*, 55 UCLA L. REV. 1 (2007).

[16] *See generally* Merrill & Smith, *supra* note 7 (discussing how the level of standardization in property rights affects the information costs of relevant parties).

[17] *See* Hanoch Dagan, *The Craft of Property*, 91 CALIF. L. REV. 1517, 1559 (2003) (discussing how property law reflects underlying social realities and interactions); Joseph William Singer, *Democratic Estates: Property Law in a Free and Democratic Society*, 94 CORNELL L. REV. 1009, 1050 (2009) (noting the tension between the right for all property owners to exclude and the corresponding effect of disallowing the homeless from sleeping anywhere).

relevant to some of the most interesting and novel types of property we encounter today.

Drawing from the comparison between real and personal property, this Article argues that permitting servitudes or usage restrictions on software-embedded goods and other goods protected by intellectual property law has the potential to cause substantial economic and social harm. Part II of this Article will give a brief overview of prior discussions of tangible property standardization and will argue that information costs explain why different degrees of flexibility are optimal in real and tangible property law. Part III applies the discussion in Part II to intellectual-property-embedded goods. Finally, Part IV examines the social consequences of permitting flexible usage limitations on networked objects.

II. INFORMATION COSTS FOR LAND AND CHATTELS

This Part investigates potential reasons for the historic distinction in flexibility between real and personal property rights by exploring the differences between real and personal property and assessing why those differences might lead to preferring different degrees of flexibility depending on the nature of the property. By discovering the aspects of property that make greater flexibility or standardization desirable, claims can then be made about intellectual-property-embedded goods based on whether they possess qualities that invite flexibility or standardization.

In the past two hundred years, real property interests have evolved to include a great deal of flexibility. Equitable servitudes originated in the 1848 English decision *Tulk v. Moxhay*,[18] and over the past several decades, state legislatures have written statutes to permit the creation of property rights which had been forbidden under the common law, such as timeshares and condominiums.[19]

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[18] (1848) 41 Eng. Rep. 1143 (Ch).

[19] *See* Merrill & Smith, *supra* note 7, at 16 ("[C]ondominiums did not emerge until the 1960s when virtually all states adopted statutes expressly authorizing the creation of condominiums."). For a discussion of the economic utility of condominiums and timeshares,

The blossoming of timeshares, condominiums, and servitudes has dramatically increased variation in real property rights.[20] But as restrictions on real property forms have eased, personal property forms have remained—and, indeed, have always been—severely and comparatively limited.[21] For example, statutes authorizing the creation of time-shares do not extend to personal property.[22] And although there are a few odd cases to the contrary, as a general matter, chattels cannot be burdened with servitudes.[23] While it is well-established that one can create a life-estate in personal property, "there are few if any cases that address the question of whether more exotic interests, such as defeasible fees and executory interests, can be created in personal property."[24]

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see Michael A. Heller, *The Boundaries of Private Property*, 108 YALE L.J. 1163, 1183–85 (1999).

[20] *See* Merrill & Smith, *supra* note 7, at 15 ("In terms of creation of new concurrent interests, the most dramatic development has been the emergence of condominiums and time-shares."); *see also id.* at 16–17 ("In response to demand for a more flexible instrument that would allow the burden of promises to run in planned residential developments, the English Court of Chancery, in *Tulk v. Moxhay*, in effect created a new interest—the equitable servitude. This was pure judicial entrepreneurship, as the court was well aware. . . ." (footnotes omitted)).

[21] After *Tulk v. Moxhay* created equitable servitudes in England, the English Court of Chancery held that equitable servitudes could not be imposed on chattels. Zechariah Chafee, Jr., *Equitable Servitudes on Chattels*, 41 HARV. L. REV. 945, 977–80 (1928) [hereinafter Chafee 1928]; Merrill & Smith, *supra* note 7, at 18.

[22] Merrill & Smith, *supra* note 7, at 18.

[23] *Id.* ("[A]lthough the case law is rather thin, it . . . appears that one cannot create servitudes in personal property."); Van Houweling, *supra* note 7, at 1068 ("While courts have increasingly accommodated land servitudes, the conventional wisdom under Anglo-American law has long been that the types of servitudes that can be attached to land cannot be attached to chattels."). Some courts have anomalously recognized particular chattel servitudes, but those cases tend to be seen as rare exceptions to the general practice and belief. *See* Merrill & Smith, *supra* note 7, at 18–19 (noting that "American precedent is largely, if not quite exclusively, in accord" with English law establishing that servitudes could not be placed on chattels); Zechariah Chafee, Jr., *The Music Goes Round and Round: Equitable Servitudes and Chattels*, 69 HARV. L. REV. 1250, 1255–56 (1956) [hereinafter Chafee 1956] (discussing *Pratte v. Balatsos*, 113 A.2d 492 (N.H. 1955), which appeared to recognize a servitude on a jukebox, and noting that "[s]ince 1928 and until Pratte v. Balatsos, [the author had] found seven cases of attempts to bind personal property by restrictions unsanctioned by legislation, and only three of these were successful"); Glen O. Robinson, *Personal Property Servitudes*, 71 U. CHI. L. REV. 1449, 1455 (2004) (noting that the author "ha[d] discovered only a few cases decided since 1956 involving attempts to create common law servitudes").

[24] Merrill & Smith, *supra* note 7, at 17–18.

Although several scholars have discussed the disparate treatment of land and chattels at length,[25] little attempt has been made to justify or explain the difference in treatment of these two types of physical property. As a result, we live in a world that treats usage restrictions on real and personal property very differently, without really knowing why.

Historically, maintaining different types of interests and restrictions on land and chattels has been met with skepticism. For instance, Henry Smith has noted that the suspicion of servitudes on chattels has been undertheorized.[26] Glen Robinson, in particular, argued that the distinction fails to hold any water: "To the extent [particular] restraints [on usage] are valid for real property, they should be valid, pari passu, for personal property."[27] Molly Shaffer Van Houweling has suggested that appropriate notice could justify enforcing servitudes on personal as well as real property.[28] And while Lord Coke worried that downstream restrictions on chattels would limit their alienability,[29] he was equally concerned with restraints on the alienation of land.[30]

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[25] *See, e.g.*, Chafee 1928, *supra* note 21 (analyzing the doctrine of equitable servitudes restricting use rights on land and assessing the desirability of applying similar restrictions on the use of chattels); Chafee 1956, *supra* note 23 (exploring the contours of equitable servitudes in the context of *Pratte*, embracing such a restriction on the use of a juke box); Robinson, *supra* note 23, at 1449 (exploring "the lawfulness of servitudes on personal property in both common law and intellectual property regimes"). *See generally* Van Houweling, *supra* note 9 (developing a comprehensive account of the equitable servitude doctrine as applied to both land and personal property in order to evaluate modern use restrictions on intangible property).

[26] Henry E. Smith, *Institutions and Indirectness in Intellectual Property*, 157 U. PA. L. REV. 2083, 2122 (2009) ("The law has always been more suspicious of personal than real property servitudes, but this area of law has been undertheorized.").

[27] Robinson, *supra* note 23, at 1453.

[28] Van Houweling, *supra* note 9, at 907 ("[I]t is relatively easy for an item of personal property to travel with its terms attached directly to it . . . . [T]he availability of this type of express notice might justify applying the logic of *Tulk* to personal property, enforcing running restrictions upon a finding of actual notice." (footnotes omitted)).

[29] 1 E. COKE, INSTITUTES OF THE LAWS OF ENGLAND § 360, at 223 (1628). Coke's discussion of chattel servitudes was recently discussed by the Supreme Court in *Kirtsaeng v. John Wiley & Sons, Inc.*, 133 S. Ct. 1351, 1363 (2013).

[30] Chafee 1928, *supra* note 21, at 982 (citing COKE, *supra* note 29, § 360) ("The . . . passage from Coke . . . is preceded by an equally strong condemnation of similar conditions for the reverter of real estate. Coke says nothing to indicate that land may be restricted and chattels may not, or that there is any distinction for this purpose between them." (footnotes omitted)).

The reason for the difference in treatment between land and chattels is far from clear, and previous attempts to account for the absence of chattel servitudes from the law are varied. Henry Hansmann and Reinier Kraakman noted that courts' historic rejection of servitudes on chattels "was evidently motivated by considerations of competition policy that had nothing to do with the problems of notice that generally lie behind the law's unaccommodating approach to divided property rights."[31] Robinson argued there was simply no market demand for encumbered objects.[32] In a similar vein, Ariel Katz has postulated that it is "the need to coordinate land use over long periods of time that creates the need for enforceable use-restrictions" against future land owners.[33] Zechariah Chafee proposed two potential explanations: that servitudes would interfere with the quick transfer of chattels,[34] and that there would be "no possibility of affixing a reasonable termination to the life of the restriction [on a chattel] coextensive with the realization of [its] purpose."[35]

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[31] Henry Hansmann & Reinier Kraakman, *Property, Contract, and Verification: The* Numerus Clausus *Problem and the Divisibility of Rights*, 31 J. LEGAL STUD. 373, 417 (2002) (citing Chafee 1928, *supra* note 21).

[32] Robinson, *supra* note 23, at 1486. Robinson elaborates:

> [T]he principal constraint on the ability of property owners to carve out idiosyncratic property interests is not legal but economic. . . . [P]roperty law has neither the purpose nor the power to create a market for idiosyncratic property interests. . . . [C]ommon law personal property servitudes [a]re like a liger—a zoo curiosity that, being sterile, cannot reproduce. As with ligers so with watch time-shares: if the law allowed the creation of time-share interests in watches, it would have no more effect on the market for watches than releasing a sterile liger from the zoo into the wild would have on the gene pool of feline predators.

Id.

[33] Ariel Katz, *The First Sale Doctrine and the Economics of Post-Sale Restraints*, 2014 BYU L. REV. 55, 97.

[34] *See* Chafee 1928, *supra* note 21, at 985 ("Land remains in the same hands for comparatively long periods of time and is transferred after an elaborate investigation of the title, whereas chattels are ordinarily sold with rapidity, so that possible interferences with quick transfers are undesirable."); *see also* Robinson, *supra* note 23, at 1489 (discussing Chafee's suggestion).

[35] Chafee 1928, *supra* note 21, at 985. Chafee offered a contrast with the restrictions on land that "arise from the desire to protect a neighborhood as a rough unit." *Id.* He wrote, "The restrictions do not endure forever, but lapse when the preservation of the desired

Particular types of restrictions on chattels, such as resale price restrictions and tying arrangements, have been explicitly disfavored to prevent restraint of trade, but the reasoning of those cases is closely tied to the content of the restriction rather than to a general policy concerning personal property rights.[36]

The literature on the information costs associated with property use and transfer provides a more convincing explanation for the difference in treatment between land and chattels. Thomas Merrill and Henry Smith have written that limited forms of property rights—"the numerus clausus principle"—can be defended on the basis of the costs associated with investigating the scope of property rights,[37] particularly the costs borne by third parties who were not present when a property right was being crafted or negotiated.[38] Using or transferring property requires one to understand the scope of the property interest and any restrictions on how it can be used. Learning these facts can be costly, especially if it is difficult to locate and understand the relevant information. Merrill and Smith argue that these information or measurement costs are higher when property can be held in more varied ways because variety increases the cost of investigating and understanding the scope of one's property interests.[39] They specifically argue there is some optimal

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neighborhood standard can no longer be accomplished. In the case of chattels, it might be argued that there is nothing analogous to a neighborhood purpose. . . ." *Id.*

[36] *See* Katz, *supra* note 33, at 71 ("Early antitrust law . . . treated many agreements imposing vertical restraints, such as exclusive dealing, tying, and resale price maintenance, as per se illegal.").

[37] *See generally* Merrill & Smith, *supra* note 7.

[38] Merrill and Smith explain:

> A and B may have subjective reasons for creating [idiosyncratic] property rights . . . . But, the possible existence of such rights will cause information costs for others . . . to rise. Those considering whether to purchase property rights . . . will have more to investigate: They will have to assure themselves that they are getting all the [rights] that they want. Furthermore, they will have to worry about dimensions of division and elaboration that perhaps no one has yet thought of, making the acquisition of any [similar piece of property] more uncertain as well as riskier.

Id. at 32.

[39] *Id.* at 26–27 ("Parties who create new property rights will not take into account the full magnitude of the measurement costs they impose on strangers to the title."); *id.* at 45 ("The

standardization in property rights—enough flexibility that one can generally achieve one's goals, but not so much flexibility that the transaction costs of property use and transfer are too high.[40] However, Merrill and Smith don't provide a rubric for how to figure out what the right amount of standardization should be, nor do they discuss whether the "optimal standardization" would be different for different kinds of property. Instead, they state generally that "the *numerus clausus* strikes a rough balance between the extremes of complete regimentation and complete freedom of customization, and thus leads to a system of property rights that is closer to being optimal than that which would be produced by either of the extreme positions."[41] For Merrill and Smith, title recording systems and other forms of notice do not obviate the need for standardization, because the costs of understanding a property right still rise as the terms of the records get more lengthy, complicated, and difficult to understand.[42]

Merrill and Smith's information cost analysis leads to a useful clue as to why the law concerning land and chattels may have evolved differently. If the measurement costs for using and transferring chattels, as compared to land, rise more quickly as property standardization decreases, then the point of "optimal standardization" would be higher for chattels than for land.[43]

This Part will investigate the information costs associated with understanding the scope of real and personal property rights from three perspectives: the absolute cost of understanding a particular

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very existence of idiosyncratic, hard-to-process property rights makes information about property rights in general harder to process.").

[40] *Id.* at 38 ("From a social point of view, the objective should be to minimize the sum of measurement (and error) costs, frustration costs, and administrative costs. In other words, what we want is not maximal standardization—or no standardization—but optimal standardization.").

[41] *Id.* at 40.

[42] *See id.* at 43–45 (discussing how, even when notice is furnished, the costs of understanding property rights remain high where unstandardized lengthy idiosyncrasies must be processed in order to understand the property rights at issue).

[43] *See id.* at 33 (suggesting that the higher the costs of measurement in regards to property rights, the greater the need for more standardization in order to accurately process those property rights).

piece of property, the cost relative to potential losses from misuse or mistake, and the aggregate cost of understanding all the property one encounters. Information costs can consist of both discovery costs and processing costs. For the purpose of this Article, discovery costs are the costs of locating the information necessary to understand the scope of the property interest, such as the cost associated with finding a deed or matching a piece of property with a document describing a restriction or ownership structure.[44] Processing costs are the costs incurred by parties trying to understand the scope of a property interest once they have acquired all the relevant information.[45]

For simplification, this Part will presume that the information cost burdens associated with granting revocable, bare licenses[46] to use a chattel or walk on a piece of land are borne by a current property owner, rather than the bare licensee. As we find in our own practical experience, the bare licensee usually trusts the owner without engaging in a separate investigation of the owner's property rights and rarely suffers from good-faith incorrect usage of the property. Similarly, the acts of complying with duties of

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[44] Discovery costs are one of the types of transaction costs identified by Ronald Coase in *The Problem of Social Cost.* Coase explained:

> In order to carry out a market transaction *it is necessary to discover who it is that one wishes to deal with,* to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on. These operations are often extremely costly, sufficiently costly at any rate to prevent many transactions that would be carried out in a world in which the pricing system worked without cost.

R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 15 (1960) (emphasis added); *see also* Christina Mulligan & Timothy B. Lee, *Scaling the Patent System*, 68 N.Y.U. ANN. SURV. AM. L. 289, 291 (2012) (discussing the discovery costs associated with determining whether one's product infringes another's patent).

[45] *See* Henry Smith, *The Language of Property: Form, Context, and Audience*, 55 STAN. L. REV. 1105, 1108 (2003) (defining "processing costs" broadly as the costs incurred by one interpreting the information that has been communicated in a message).

[46] A bare license is a "license in which no property interest passes to the licensee, who is merely not a trespasser. It is revocable at will." BLACK'S LAW DICTIONARY 1002 (9th ed. 2009).

abstention or simple avoidance of property in which one does not have an interest are considered very low cost.[47]

A. ABSOLUTE INFORMATION COSTS

One possibility is that greater standardization in property forms is appropriate for chattels because the information costs associated with understanding the interests in the average piece of personal property are higher than for the average piece of land. Several qualities of chattels make this hypothesis appealing, specifically their size, mobility, and fungibility.

The largest pieces of personal property are objects like airplanes and trains. In one's private life, it is rare to buy, sell, or rent an object larger than a car or grand piano—both of which are easily smaller than most pieces of real property. Their size correlates with high potential for mobility. Most personal property, from pencils and cups to jewelry and fine art, can move with trivial effort from one location to another. Chattels are also frequently fungible, or at least challenging to differentiate.[48] Many mass-produced factory items are identical in all meaningful respects.[49] Even many unique items, such as gemstones and naturally-grown items, are difficult to distinguish between without learned expertise and detailed recordkeeping about defects and size, or the presence of unique identifiers like serial numbers.

Certainly, not all chattels are small, mobile, and fungible. The Hope Diamond[50] is small and mobile, but many nonexpert

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[47] *See* J.E. PENNER, THE IDEA OF PROPERTY IN LAW 27 (1997) ("[O]ur duty is not to trespass on the private property of others . . . it is a simple, single duty, and very easy to comply with."); Smith, *supra* note 45, at 1117 ("I know not to take a car parked on the street without knowing anything about its owner (other than it is not me)."); *see also* Henry Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691, 1703 (2012) ("[I]f a car is not mine, I do not need to know who owns it, whether it is subject to a security interest or lease, and so forth, in order to know not to take or damage it.").

[48] *See* Matt Corriel, Comment, *Up for Grabs: A Workable System for the Unilateral Acquisition of Chattels*, 161 U. PA. L. REV. 807, 839 (2013) ("Fungible chattels, or interchangeable chattels, make up the vast majority of objects in modern American life.").

[49] *See Design & Technology: Industrial Practices*, BBC, http://www.bbc.co.uk/schools/gcsebitesize/design/resistantmaterials/processindpracrev1.shtml (last visited June 16, 2016).

[50] DEP'T OF MINERAL SCIS., *The Hope Diamond*, SMITHSONIAN, http://www.si.edu/Encyclopedia_SI/nmnh/hope.htm (last visited June 15, 2016).

individuals could identify it from among other gems (excepting attempts at forgery). Passenger train cars rival the size of many Manhattan apartments, but are relatively mobile and fungible. And heavy sculptures involving complex engineering may be small and, at least theoretically, fungible, but are very difficult to move.

Nonetheless, most chattels possess all three qualities—pens, cufflinks, coffee mugs, toasters, desk chairs. Nearly all possess at least two. And these qualities each raise the information costs of property usage for a chattel. Consider an attempt to investigate whether there are any usage restrictions on a piece of land. Many locations now have organized, central record-keeping systems.[51] But even in the absence of a reputable record-keeper, a potential buyer of real property often does not have to go far to locate the apparent current owner and neighbors. Any documentation purporting to explain a restriction can easily identify the property by describing its physical location, address, or geographical coordinates. This is not to say that boundaries are never unclear or mistaken or that records are never lost.[52] But recording systems and private record-keeping can usually inform someone interested in interacting with a piece of property of how it is divided and how it can be used, with little concern that a record mistakenly refers to a different piece of property.

Chattels present a greater challenge. Consider the counterfactual universe where usage restrictions can run on chattels at the will of the manufacturer and where a manufacturer

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[51] *See* BARLOW BURKE, REAL ESTATE TRANSACTIONS: EXAMPLES AND EXPLANATIONS 167 (Vicki Been et al. eds., 4th ed. 2006) ("Every state has enacted a statute establishing the office . . . for the receipt and maintenance of documents relating to the transfer and ownership of titles to real property.").

[52] Adam Mossoff contests the assumption that the boundaries of land interests are easy to measure in his essay, *The Trespass Fallacy in Patent Law*, 65 FLA. L. REV. 1687 (2013). Mossoff stated that "there are no formal empirical studies of how trespass or other real estate boundaries function in litigation." *Id.* at 1692. Tun-Jen Chiang responded to Mossoff's essay by arguing that "based on our everyday experiences, the real property system seems to work reasonably well because we don't feel too uncertain about our real property rights and don't get into too many disputes with our neighbors. This is admittedly a loose intuition, but it is not an idealization . . . ." Tun-Jen Chiang, *The Trespass Fallacy in Patent Law*, PRAWFSBLAWG (Aug. 23, 2012, 11:27 PM), http://prawfsblawg.blogs.com/prawfsblawg/2012/08/the-trespass-fallacy-in-patent-law.html.

produces a line of crystal glassware that could only be used by certain licensed persons. Like most chattels, each glass is small, mobile, and fungible.[53] Fungibility raises the costs of using and conveying the property. There are many glasses; when the owner is trying to decide if she wants to hand a particular glass to a houseguest, she must try to remember whether *this* was the glass that was burdened with a usage restriction or whether it was some other, similar-looking glass in her cabinet. If she wants to give away or sell the glass, the successor in interest may similarly have difficulty establishing to his satisfaction whether some document that purports to describe the burdened glass actually referred to the particular glass under consideration.

The problem of fungibility is compounded by the size and mobility of chattels. Because real property is large and immobile, it is comparatively easy to identify based on where it is.[54] For similar reasons, it is easy to organize and locate records concerning property based on geographic location.[55] In comparison, determining *which* chattel is burdened by what legal instrument is more difficult, even if the chattel is actually unique. A chattel cannot be uniquely identified by location because it can move.[56] The glass in question, for instance, might have been burdened in New York and then moved to Los Angeles.[57] So it must either be described precisely, possess a unique identifier, or

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[53] *See supra* notes 48–50 and accompanying text (discussing the three key properties of chattels).

[54] *See* John Patrick Hunt, *Should the Mortgage Follow the Note?*, 75 OHIO ST. L.J. 155, 190 (2014) ("Property that is immobile can be identified by its location.").

[55] *See* Mulligan & Lee, *supra* note 44, at 296 ("Real property claims are indexable because they can be organized by their geographic location.").

[56] *See* Hunt, *supra* note 54, at 190 ("[F]iling systems are most appropriate for immobile property.").

[57] Further complicating the matter of usage restrictions on chattels is how choice of law issues will be resolved as mobile chattels move between states, which would undoubtedly develop some variation in their laws. The European Union is currently struggling with harmonization of its property law, as the numerus clausus principle in Europe varies among countries. *See generally* Bram Akkermans & Eveline Ramaekers, *Free Movement of Goods and Property Law*, 19 EUR. L.J. 237 (2013), http://ssrn.com/abstract=1617182; Sjef van Erp, *European Property Law: A Methodology for the Future*, *in* EUROPEAN PRIVATE LAW—CURRENT STATUS AND PERSPECTIVES (R. Schulze & Hans Schulte-Nölke eds., 2011), http://ssrn.com/abstract=1734633.

some combination of the two. Although it is conceivably possible to place unique identifiers on many chattels, identifiers can be removed, and some objects are too small to easily place a visible serial number on. It is also easy to imagine a frustrated owner scraping off an encumbered object's serial number and passing it off as a chattel held in fee simple. Unless all objects, or objects of a certain type, had unique identifiers, or every object were required to have a chain of title associated with it, obscuring the true identity of a chattel would be easy.

Theoretical matters aside, chattels are typically not labeled with unique identifiers. Limited run artwork is one common exception;[58] computers are another. But, while product packages are often manufactured with serial numbers, many small products cannot be labeled easily if separated from their packaging. Absent unique identifiers or physically-affixed notice, one would expect the discovery costs associated with understanding usage restrictions or divided interests on a chattel to be higher than a piece of land.

Alone, the higher "absolute" information costs associated with chattels are not necessarily a convincing justification for greater standardization in personal property rights. The mere fact that there is, on balance, a difference in the information costs of interacting with chattels and land does not tell us whether the information costs for transferring chattels are *higher enough* than the costs of transferring real property to justify different rules, especially when some land will be costly to investigate and some chattels will be comparatively inexpensive. But, there are additional reasons to draw a categorical distinction.

B. RELATIVE INFORMATION COSTS

In many cases, the significant difference between personal and real property is not the absolute information cost of investigating

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[58] *See* Bruce W. Burton, *In Search of John Constable's* The White Horse*: A Case Study in Tortured Provenance and Proposal for a Torrens-Like System of Title Registration for Artwork*, 59 FLA. L. REV. 531, 579 (2007) ("There are no public title records for artwork as there are for land, but there are repositories of needed information.").

potential property burdens but the information cost relative to the value of the good in question. Again consider the counterfactually burdened crystal glass worth $100 and an encumbered piece of land, which would be worth $100,000 when held in fee simple. If it costs a potential buyer $200 worth of expenditures and person-hours to discover and comprehend the property restrictions on the piece of land, he can spend that $200 to save a great deal more, namely the loss associated with mistakenly using the property incorrectly or overpayment from the mistaken belief that the interest was undivided or unencumbered. If the entire property interest would be worth $100,000, but there is an easement running across it, the buyer may decide that it is only worth $90,000 and offer a lower bid for the property, potentially saving himself $10,000—far more than the $200 information cost. Discovering a usage restriction after purchase would still be valuable if it prevents an owner from acting in a way that would cause over $200 in loss or damages. For example, if the owner was inclined to put a $1,000 statue on the property that would violate a servitude and discovers that he may not, he has saved himself $800 because he would no longer put up, and then be forced to remove, the statue.

The situation with comparatively inexpensive chattels can be different. It is simply not worth spending $200 to discover how one can use the $100 glassware. Even if the glass turns out to be worthless to the owner, or if he misuses or interferes with another's rights to the glass, it is likely that the owner will lose $100 or less due to the misuse of the property, or to make another interested party whole, absent punitive damages. It is not worth it to an owner to spend $200 to learn whether he can prevent the loss of $100.

Due to the low value of chattels, the information costs of learning about the property interests in a chattel will frequently be higher than the value of the chattel and any loss from incorrect usage. As a result, it will often be economically preferable to

ignore servitudes and complex interests on chattels because it will not be worth investigating what they are.[59]

This conclusion does not fully answer why the law *should* treat chattels differently than real property; it merely descriptively explains why it would typically not be economically beneficial to identify and respect complex personal property interests if they were permitted. Nonetheless, one goal of property law is to promote efficient uses of property,[60] and legal rules that encourage inefficient expenditures cut against that goal. While some people will coolly decide that it is not worth doing a record search on a cheap glass, others will feel a moral obligation to respect others' rights and follow the law, even at a significant economic loss to themselves.[61]

One might also consider the relative information costs associated with using and transferring property over time. Most

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[59] *See generally* Louis Kaplow, *A Model of the Optimal Complexity of Legal Rules*, 11 J.L. ECON. & ORG. 150 (1995) (arguing that rules will not affect behavior where they are complex enough that the costs of following them exceed liability for violations) (cited in Smith, *supra* note 45, at 1146); *see also* Robinson, *supra* note 23, at 1486 ("[T]he rational buyer will invest in information about a good (including information about the rights associated with it) only up to the point where marginal gains equal marginal cost. For low-valued goods this investment would be very low."); Smith, *supra* note 45, at 1146 ("Each dutyholder will engage in measurement up to the point where the added benefit in expected liability saved equals the additional cost of measurement. . . . If rights become too difficult to process, violation and liability might be the better choice." (footnotes omitted)).

[60] *See, e.g.*, DAVID M. DRIESEN, THE ECONOMIC DYNAMICS OF LAW 122 (2012) ("This emphasis on property as a mere adjunct to transactions leads to an emphasis on efficiency as property law's primary goal.").

[61] Merrill and Smith argue:

> Property can function as property only if the vast preponderance of persons recognize that property is a moral right, and this requirement has important consequences for the study of property. For property to serve as an in rem coordination device, the morality upon which it rests must be simple and accessible to all members of the community. . . . Pragmatism is too uncertain, and case-specific cost-benefit analysis is too demanding and error-prone, to supply the kind of robust and widely accepted moral understanding needed to sustain a system of property.

Thomas W. Merrill & Henry E. Smith, *The Morality of Property*, 48 WM. & MARY L. REV. 1849, 1850–51 (2007); *see also* Clarisa Long, *Information Costs in Patent and Copyright*, 90 VA. L. REV. 465, 516 (2004) ("When boundaries are difficult for observers to decipher . . . the chances are high that observers will inadvertently infringe or will spend inefficient amounts of time and cognitive resources attempting to determine the contours of the many facets of the propertarian relationship.").

pieces of personal property decline in value as they age.[62] As a result, the information costs that might accrue over several owners and alterations to the property interests are more likely to *become* greater than the value of the chattel, even if they were at one time less. In contrast, land and personal property like fine art are more likely to gain value over time,[63] and are better suited to bear the costs associated with fragmented or restricted interests as a result. Notably, fine art is frequently made subject to usage and transfer restrictions arranged by contract.[64] The change in value of depreciating assets also recalls Chafee's hypothesis that a motivation behind the prohibition on personal property servitudes was the need to eventually recycle or otherwise fundamentally alter tangible assets.[65] High information costs and low value undercut incentives to radically repurpose an obsolete good.

C. AGGREGATE INFORMATION COSTS

But perhaps the best explanation for highly standardized property rights in chattels is the difference in the aggregate information costs associated with interacting with land and chattels.

In terms of real property, the total cost of investigating every piece of property with which one interacts on a given day is low. There are properties one is interested in buying, selling, or using,

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[62] *See Depreciation Guide (Personal Property)*, CLAIMS PAGES, http://www.claimspages.com/documents/i777/depreciation-guide-(personal-property)/ (last visited June 16, 2016).

[63] *See, e.g.*, Matt Rand, *Art Appreciation*, FORBES (Mar. 12, 2004, 4:59 PM), http://www.forbes.com/2004/03/12/cz_mr_0315soapbox.html (stating that Andy Warhol's *Orange Marilyn* silkscreens appreciated in value from $2,400 in the 1960s to $17 million in the early 2000s).

[64] *See, e.g.*, Seth Siegelaub, *The Artist's Reserved Rights Transfer and Sale Agreement*, 6 LEONARDO 347, 347–50 (1973) (form contract binding a purchaser of art to a variety of terms, including non-destruction of the work, and requiring that the purchaser pay 15% of the work's appreciated value upon resale). Attempts to make the Artist's Reserved Rights Transfer & Sale Agreement bind future owners of the work may not be legally enforceable and would not be under the traditional common law of chattel property. *Cf.* Tiernan Morgan & Lauren Purje, *An Illustrated Guide to Artist Resale Royalties (aka 'Droit de Suite')*, HYPERALLERGIC (Oct. 24, 2014), http://hyperallergic.com/153681/an-illustrated-guide-to-artist-resale-royalties-aka-droit-de-suite/ ("The legality of ARRTSA remains questionable . . . .").

[65] *See* Chafee 1928, *supra* note 21, at 985 (discussing arguments for limiting equitable servitudes to real property).

and for everyone but the largest real estate tycoon, the number of such properties is very low. Because houses are expensive, and because they are rarely purchased and sold, it is not unreasonable to expect that every person thinking of buying or selling a piece of property, or using it in a meaningful way such as by farming or building on it, would be able to take the time and expend the cost to investigate the metes and bounds of their potential or actual interest. Considering one's total available time and resources, it is generally possible to investigate every real property interest one wants to make use of, buy, or sell.

In contrast, consider the number of chattels with which one interacts each day. If usage restrictions were allowed to run on all of them, the costs associated with understanding permitted usage would quickly balloon to consume more time than any person has and can reasonably devote to understanding the scope of one's property rights. Can you lend your younger sibling that shirt? Can the gemstone be cut out of its setting? Can it be irrevocably broken into pieces? Can those plants be resold? Can their seeds be planted? *Each* of these questions may not take much time to answer, but answering *all* of these questions may be impracticable for a person to complete. And, as Merrill and Smith point out, even if most chattels are held in fee simple, the fact that some are subject to usage restrictions and servitudes raises the cost of investigating all of them, because one does not know whether a particular chattel is held in fee simple until the scope of rights has already been investigated.[66]

Creating separate levels of standardization for land and chattels prevents the cost of investigating all potentially-burdened objects from getting too large. It is easy to identify whether

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[66] Merrill & Smith, *supra* note 7, at 26–27 ("Parties who create new property rights will not take into account the full magnitude of the measurement costs they impose on strangers to the title. . . . Given the awareness that someone has created a Monday-only right, anyone else buying a watch must now also investigate whether any particular watch does not include Monday rights. Thus, by allowing even one person to create an idiosyncratic property right, the information processing costs of all persons who have existing or potential interests in this type of property go up." (footnotes omitted)); *see also id.* at 47 ("[S]tandardization is imposed to control a negative externality created by the prospect that a few persons will deviate from popular forms.").

something is real or personal property. If it is personal property, the investigation about burdens can effectively end there. If it is real property, in-depth investigations can be necessary but manageable in the aggregate.

This observation does not prove that chattels should never be burdenable with servitudes or divided into complex interests. But it does indicate that, in order to keep the aggregate costs of property investigations manageable, the universe of potentially-burdenable property should be (1) readily identifiable as a burdenable type of thing, and (2) rarely encountered. Potentially burdenable property should be readily identifiable as such so that one does not mistakenly expend costs on objects that can only be subject to simple, easily-identifiable interests. And potentially burdenable property should be rarely encountered so that, in the aggregate, the costs of investigating those pieces of property remain low. Besides land, cars are a type of property that may be good candidates for complex interests. It is generally easy to distinguish cars from other types of property, and most people buy, sell, and use only a few cars over long periods of time.

In contrast, some classes of valuable chattels, such as large gemstones, would be poor candidates for complex interests because they would fail to be easily distinguishable from other chattels. The difference in value between large, valuable stones and small, commodity stones will exist on a spectrum and also be related to what kind of substance the stones are made of. Even if small stones were not burdenable, many might still expend unnecessary resources investigating the nature of the property rights associated with them by mistake, because the distinction between small, unburdenable and valuable, burdenable stones will not be clear. As a result, permitting complex interests for valuable jewelry could create unreasonably high aggregate measurement costs for those who buy, sell, and use other jewelry.

The upshot is, where measurement costs are concerned, there's nothing particularly exceptional about land. Creating flexibility in ownership in any class of physical object will create corresponding costs. The key is to allow enough flexibility for individuals to achieve their goals without bearing burdensome costs. Based on

how much cost a degree of flexibility creates, the degree of flexibility appropriate for a type of property will vary. Although there are a variety of reasonable ways the *numerus clausus* principle could have developed as applied to land and chattels,[67] the separation into two basic regimes turns out to be a good rough cut at permitting beneficial flexibility while keeping costs low enough.

III. APPLICATIONS OF INFORMATION COST THEORY

The previous Part of this Article was an exercise in explaining the status quo—significant flexibility for land, comparably extreme standardization for chattels. But the emergence and growing popularity of networked objects has raised new and increasingly pressing questions about how the law should approach use restrictions on intellectual-property-embedded goods. How does the information cost analysis apply to personal property that is patented or contains a copyrighted work?

Traditionally, intellectual-property-embedded goods have functioned under rules similar to chattel property. Unprotected personal property, particular copies of copyrighted works, and patented goods have all been subject to the "first sale doctrine," a principle which prohibits servitudes and other downstream control of a good by its manufacturer or prior owner after its initial distribution.[68] In patent law, the rule remains a judge-created doctrine, more commonly known as the doctrine of exhaustion.[69] Copyright's first sale doctrine was famously stated in the 1908

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[67] Indeed, the *numerus clausus* principle has developed in European countries in a variety of ways. *See generally* BRAM AKKERMANS, THE PRINCIPLE OF NUMERUS CLAUSUS IN EUROPEAN PROPERTY (2008).

[68] Hovenkamp, *supra* note 15, at 511.

[69] *See id.* (describing the first sale rule in the patent context); *see also* Adams v. Burke, 84 U.S. 453, 456–57 (1873) ("[W]e hold that in the class of machines or implements we have described, when they are once lawfully made and sold, there is no restriction on their *use* to be implied for the benefit of the patentee or his assignees or licensees."); Adams v. Burks, 1 F. Cas. 100, 1000 (C.C.D. Mass. 1871), *aff'd sub nom.* Adams v. Burke, 84 U.S. 453 (1873) ("When a patented product passes lawfully into the hands of a purchaser without condition or restriction, it is no longer within the monopoly or under the protection of the patent act, but outside of it.").

Supreme Court opinion, *Bobbs-Merrill Co. v. Straus*,[70] which held that books containing copyrighted works could not be subject to a requirement that they be sold at a particular price.[71] The result was later codified in the 1909 Copyright Act.[72]

In intellectual property law, the first sale doctrine plays the same role as it does in personal property law. By preventing manufacturers or previous owners from placing restrictions on how a good may be used after its initial distribution, it becomes inexpensive, from an information cost perspective, for an owner to allow it to be repurposed or transferred to someone else.

Two significant exceptions to the first sale doctrine have developed that allow for usage restrictions to run on some intellectual-property-embedded chattels. First, the Federal Circuit has allowed for patented goods to be sold subject to certain usage conditions, on the theory that if the patent holder does not have to grant any rights to a buyer, it may grant whatever combination of rights it chooses.[73] Although sales of a patented good would generally trigger exhaustion of the patent owner's rights and prevent any further downstream control of the good by the patent holder, the Federal Circuit has allowed restrictions to run on a patented chattel "even when the chattel is sold if notice is given of the restrictions, such restrictions are within the scope of the patent grant, and the patent rights have not yet been exhausted."[74]

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[70] 210 U.S. 339 (1908).

[71] *Id.* at 351.

[72] Section 41 of the Copyright Act of 1909 provided, "[N]othing in this Act shall be deemed to forbid, prevent, or restrict the transfer of any copy of a copyrighted work the possession of which has been lawfully obtained." Copyright Act of 1909, Pub. L. No. 60-349, § 41, 35 Stat. 1075 (1909).

[73] *See, e.g.*, Mallinckrodt, Inc. v. MediPart Inc., 976 F.2d 700, 703 (Fed. Cir. 1992) ("The enforceability of restrictions on the use of patented goods derives from the patent grant, which is in classical terms of property: the right to exclude . . . . This right to exclude may be waived in whole or in part.").

[74] Winston, *supra* note 10, at 108; *see also* B. Braun Med., Inc. v. Abbott Labs., 124 F.3d 1419, 1426–27 (Fed. Cir. 1997) (holding that patent exhaustion "does not apply to an expressly conditional sale or license"); *Mallinckrodt*, 976 F.2d at 709 (holding that a patentee could prevent reuse of a patented device if the device was labeled for a single use).

Second, courts' treatment of copyrighted software has evolved to allow for ongoing, downstream restrictions on how software can be used and when it can be transferred. The mechanism by which the first sale doctrine gets circumvented in the context of software is tied to how a computer running a software program works. In 1993, the Ninth Circuit held in *MAI Systems Corp. v. Peak Computer, Inc.*[75] that, because running a program created a temporary copy in a computer's Random Access Memory (RAM), running a software program constituted prima facie copyright infringement of a copyright owner's exclusive right to reproduce a copyrighted work.[76] Although *MAI Systems* was initially controversial, two years later, President Bill Clinton's Working Group on Intellectual Property released a White Paper expressing the view that *MAI Systems* was a correctly decided and routine application of the law.[77] The White Paper concluded that any use of a digital work constituted a prima facie copyright infringement because any copy of a work loaded into a computer's RAM constituted an actionable copy under the copyright statute.[78] As a

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[75] 991 F.2d 511 (9th Cir. 1993).

[76] *Id.* at 518; *see also* JESSICA LITMAN, DIGITAL COPYRIGHT 92 (2001) ("For all works encoded in digital form, any act of reading or viewing the work would require the use of a computer . . . and would, under this interpretation, involve an actionable reproduction."). Although 17 U.S.C. § 117(a)(1) permits an "owner of a copy of a computer program to make . . . another copy . . . of that computer program provided . . . that such a new copy . . . is created as an essential step in the utilization of the computer program in conjunction with a machine and that it is used in no other manner," this "essential step" exception does not apply to copying software that has been licensed but not sold. 17 U.S.C. § 117(a)(1) (2012).

[77] LITMAN, *supra* note 76, at 94–95.

[78] *See* BRUCE A. LEHMAN & RONALD H. BROWN, WORKING GRP. ON INTELLECTUAL PROP. RIGHTS, INTELLECTUAL PROPERTY AND THE NATIONAL INFORMATION INFRASTRUCTURE: THE REPORT OF THE WORKING GROUP ON INTELLECTUAL PROPERTY RIGHTS 65–66 (1995) [hereinafter *White Paper*], http://www.uspto.gov/web/offices/com/doc/ipnii/ipnii.pdf ("The 1976 Copyright Act . . . and repeated holdings by courts make it clear that in each of the instances set out below, one or more copies is made[:] When a work is placed into a computer, whether on a disk, diskette, ROM, or other storage device or in RAM for more than a very brief period, a copy is made." (footnotes omitted)). The prevailing interpretation of *MAI Systems* has, however, been called into question. In 2008, the Second Circuit held that while "loading a program into a computer's RAM *can* result in copying that program," it did not read *MAI Systems* as holding that, as a matter of law, "loading a program into a form of RAM *always* results in copying." Cartoon Network LP, LLLP v. CSC Holdings, Inc., 536 F.3d 121, 128 (2d Cir. 2008). *Cartoon Network* emphasized that a copy still needed to

result, the White Paper argued copyright owners had the right to control whether and how someone read, listened to, or viewed a digital work, even though the copyright statute did not allow copyright holders to exert the same control over the use of non-digital works.[79] While the copyright statute does grant *owners* of copyrighted software the right to make copies that are an "essential step" to using the program (e.g., making RAM copies),[80] this purported limitation on the rights of copyright owners does little work in practice. Most software copyright owners instead choose to license their software programs and reserve whatever rights they choose concerning how and when the program may be used.[81] The resulting "terms of use" or "end-user license agreements" that arrive with software programs are frequently pages long and as idiosyncratic as contracts.[82]

Despite these deviations, the similarities between unprotected goods and intellectual-property-embedded goods suggest that the exceptions to the first sale doctrine for conditionally-sold patented goods and software-embedded goods ought to be met with skepticism. Part II described how property that is best suited to bear high information costs and flexibility, such as land, is (1) easy to repeatedly identify and track, (2) highly valuable and likely to maintain or increase its value, (3) readily identifiable as the type of property that is burdenable, and (4) rarely encountered. In contrast, property best suited for inflexible standardization is (1) fungible, mobile, (2) low value and likely to decrease in value, (3) difficult to distinguish from unburdenable objects, and (4) frequently encountered. Pieces of personal property that

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be fixed for longer than a "transitory duration" to qualify as a potentially infringing copy under 17 U.S.C. § 101. *Id.* at 128–30. For an alternate theory of how digital copies should be treated under copyright law, *see generally* Aaron Perzanowski, *Fixing RAM Copies*, 104 NW. U. L. REV. 1067 (2010) (providing three considerations in determining the meaning of "transitory duration" that are easier to predict than the holding in *Cartoon Network*).

[79] LITMAN, *supra* note 76, at 94–95 (citing *White Paper*, *supra* note 78, at 19–130).

[80] 17 U.S.C. § 117(a)(1) (2012).

[81] *See* Michael J. Madison, *Reconstructing the Software License*, 35 LOY. U. CHI. L.J. 275, 276 (2003) ("For all intents and purposes, according to software licenses themselves, copies of computer programs are never sold outright. They are always licensed. . . . [T]he world of software is effectively governed by the very concept of the license.").

[82] *See supra* notes 4–6 and accompanying text.

incorporate an intellectual-property-protected element tend to possess the qualities of property best suited to standardization.[83] They are fungible, mobile, inexpensive, likely to become obsolete rather than collector's items, difficult to distinguish from other pieces of personal property, and they may be encountered with some frequency. But certainly, these statements are more and less true depending on what type of intellectual-property-embedded good one is considering.[84] This Part considers how information costs of use and transfer affect three kinds of intellectual-property-embedded goods: the software-embedded goods that comprise the Internet of Things, other static chattels that include copyrighted elements, and digital goods which need not be associated with a specific object or chassis.

A. THE INTERNET OF THINGS

For the past few decades, most licensed software was run on general-purpose computers, such as the typical desktop one might have in one's home or office.[85] Then it was easy to distinguish the act of using software from using other objects, and the information costs concerning use and transfer of software-embedded goods may have been effectively segregated from other types of personal property. By and large, most products that ran software looked like computers—grey, rectangular desktops or folding laptops.[86] Just as it is easy to distinguish cars and land from other types of physical property, computers were easy to distinguish from other types of objects and appliances as well. Placing restrictions on how software could be used didn't raise the aggregate information

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[83] *See* Rub, *supra* note 15, at 793 ("The main attribute that makes information costs significant in the context of copyrighted goods is that those goods are typically cheap and that they frequently and rapidly change hands. Indeed, information costs are less troubling the more expensive the product purchased." (footnotes omitted)).

[84] *See, e.g.*, *id.* at 795–816 (considering particular cases of exhaustion in depth).

[85] *See, e.g.*, *1998*, TIMELINE OF COMPUTER HISTORY, http://www.computerhistory.org/timeline/1998/ (last visited June 16, 2016) (discussing the introduction of the iMac desktop computer).

[86] *See, e.g.*, *1996*, TIMELINE OF COMPUTER HISTORY, http://www.computerhistory.org/timeline/1996/ (last visited June 16, 2016) (discussing the introduction of the Sony VAIO desktop computer).

costs of using and transferring other goods, because it was trivial to distinguish a computer from a refrigerator.

The ease of identifying computers is quickly diminishing. Now there are smart thermostats, smart watches, and smart fire detectors.[87] Cars run code.[88] Wearable devices help quantify one's exercise and physical habits.[89] Most of these devices come with a corresponding license agreement governing use of the software, but those licenses sometimes use language that blends any distinction between the copyrighted software and the physical device. For example, the June 2014 terms of use for Google Glass stated, "You may not commercially resell any [Google Glass] Device, but you may give the Device as a gift, unless otherwise set forth in [an additional agreement]. . . . [t]hese Terms will also apply to any gift recipient."[90] Google Glass's terms attempted to both limit how transfers of the device can happen, and to bind future owners of the device to the terms. While a pair of reading glasses could not generally be burdened this way without violating the first sale doctrine, the current trajectory of software licensing law is to accept these types of restrictions on how software and software-embedded devices can be used and alienated.

As software is incorporated more frequently into personal property, the information costs associated with using and transferring personal property will increase. Computers are

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[87] *See supra* note 1 (discussing the Nest thermostat and smart watches); Dann Albright, *6 Smart Detectors That Protect Your Family and Property from Harm*, MAKEUSEOF (June 5, 2015), http://www.makeuseof.com/tag/6-smart-detectors-protect-family-property-harm/.

[88] *See* Robert N. Charette, *This Car Runs on Code*, IEEE SPECTRUM (Feb. 1 2009, 5:00 GMT), http://spectrum.ieee.org/transportation/systems/this-car-runs-on-code (statement of Manfred Broy, professor of informatics at Technical University, Munich) ("[I]f you bought a premium-class automobile recently, 'it probably contains close to 100 million lines of software code,' . . . .").

[89] *See, e.g.*, Nathan Chandler, *How FitBit Works*, HOWSTUFFWORKS (May 2, 2012), http://electronics.howstuffworks.com/gadgets/fitness/fitbit.htm ("FitBit is a physical activity tracker. . . . FitBit logs a range of data about your activities, including the number of steps you take, distance traversed and calories burned.").

[90] *Google Glass Terms of Sale*, GOOGLE (June 26, 2014), http://www.googl e.com/glass/termsofuse/archive/20140624/.

getting smaller, cheaper, and faster.[91] Because almost anything can now be designed to run software, the amount of resources a person must expend to learn how to appropriately use the devices in their possession will increase, whether the objects in fact run software or not. If some watches run licensed software to keep time, the information costs associated with all watches will increase;[92] even the purchaser of an analog watch will have to make sure the watch is not digital and subject to a license agreement. Digital watch owners will need to take the time to read and understand the lengthy license agreement to determine what they are not permitted to do with their watches before beginning use or giving them away.

Both software-embedded goods and patented goods subject to conditional sales present the same problem: they allow for usage restrictions to run on chattels, raising the information costs associated with using not just these software-embedded or patented goods, but the costs of interacting with all chattels which may or may not be patented or contain software. As licenses on chattels become more common, people will come to expect their presence and be more likely to expend resources learning if a license exists and understanding its scope. Because distinguishing among software-embedded goods, patented goods, and other chattels will not always be easy, the information costs associated with using and transferring many chattels will rise as well because individuals will expend greater resources to discover

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[91] ORG. FOR ECON. CO-OPERATION & DEV., TRENDS SHAPING EDUCATION: 2008 EDITION 56 (2008) ("Information technology has developed very rapidly . . . with computers become smaller, faster, cheaper, and more powerful.").

[92] Merrill and Smith have elaborated on how allowing idiosyncratic interests in property raises the costs of all property investigation:

> A and B may have subjective reasons for creating [idiosyncratic] property rights . . . . [b]ut, the possible existence of such rights will cause information costs for others . . . to rise. Those considering whether to purchase property rights . . . will have more to investigate: They will have to assure themselves that they are getting all the . . . [rights] that they want. Furthermore, they will have to worry about dimensions of division and elaboration that perhaps no one has yet thought of, making the acquisition of any . . . [similar piece of property] more uncertain as well as riskier.

Merrill & Smith, *supra* note 7, at 32 (footnotes omitted).

whether "regular" pieces of personal property are subject to usage restrictions.

One appealing resolution is fairly straightforward: to rein in the flexibility that software license agreements have been given and bring software-embedded products back into the legal world inhabited by their non-patented and non-digital counterparts. Brian Carver, Aaron Perzanowski and Jason Schultz point to an existing section of the copyright statute that could limit when idiosyncratic usage restrictions may apply.[93] Section 106(3) grants copyright holders the exclusive right "to distribute copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending."[94] This language suggests that an authorized distribution of a copyrighted work, such as a piece of software, must either transfer ownership of the copy of the software, or more temporary rights.[95] Carver concludes that transfer of perpetual possession should be "the key factor" in determining when transfer of the title to a copy has taken place.[96] Perzanowski and Schultz reach a similar opinion, arguing that courts should consider three factors when determining whether a transfer is a sale: whether the duration of consumer possession or access is perpetual, whether access is contingent on a one-time payment or ongoing payments, and whether the transaction is characterized as a sale or purchase.[97] Perzanowski and Schultz acknowledge that there will be grey-area cases but anticipate that courts will be able to draw appropriate distinctions.[98]

Carver, Perzanowski and Schultz's position that perpetual possession of a copy should often render it sold has the potential to

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[93] Aaron Perzanowski & Jason Schultz, *Reconciling Intellectual and Personal Property*, 90 NOTRE DAME L. REV. 1211, 1251–52 (2015); Brian W. Carver, *Why License Agreements Do Not Control Copy Ownership: First Sales and Essential Copies*, 25 BERKELEY TECH. L.J. 1887, 1945–46 (2010).

[94] 17 U.S.C. § 106(3) (2012).

[95] Perzanowski & Schultz, *supra* note 93, at 1252; Carver, *supra* note 93, at 1945–46

[96] Carver, *supra* note 93, at 1954.

[97] Perzanowski & Schultz, *supra* note 93, at 1256.

[98] *See id.* at 1258 (explaining that if the factors were applied consistently, it would allow consumers to understand what they are buying and what they can do with it and it would allow rightsholders to structure transactions to avoid exhaustion).

work well in the context of the Internet of Things, particularly because treating software tied to a particular device as sold would be less likely to trigger many intellectual property owners' concerns over loss of control of their works. Copyrighted software is intricately tied to the corresponding device; the program that runs a toaster, for example, would be of little value on a general purpose computer. As a result, concerns about end-users making multiple copies or facilitating piracy are less worrisome. The combined package of a smart toaster's software and chassis constitutes a rivalrous, scarce resource, just like any other piece of personal property. When the information costs associated with using it are low, society benefits from the ease with which it can be used to serve different purposes for different people.

This is only one of several possible suggestions for how to minimize information costs associated with transfer of networked and software-embedded goods. But regardless of how the law in this area evolves, it is important to acknowledge that the information costs associated with transfer of intellectual-property-embedded objects are driven up for the same reasons, and likely at the same rate, as they are for personal property generally.

B. OTHER COPYRIGHTED WORKS

Courts have been exceptionally willing to enforce software licenses, while simultaneously holding unenforceable attempts to license other types of copyrighted works. Nonetheless, copyright owners who would presently benefit from greater control of their works, and who lack the incentives to worry about third-party information costs, have also been working to expand the end-user license agreement phenomenon to non-software and non-digital works as well. Currently, a popular home-workout DVD seller, Beachbody, insists that the DVDs it sells to customers are licensed, not sold, and threatens to sue those who try to resell its DVDs on eBay.[99] Regardless of whether Beachbody's suits would

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[99] *See id.* at 1236–37 (discussing Beachbody LLC's terms of use); *Beachbody and Team Beachbody Terms and Conditions of Use for Residents of the United States*, BEACHBODY (Feb. 10, 2016), http://www.beachbody.com/product/about_us/terms_of_use.do ("For any Beachbody

prevail in court, Amazon appears to have indulged the company by eliminating the option to buy "used" versions of the Beachbody DVDs from its site.[100] Other companies' exercise DVDs are generally available used.[101]

Recently, the Ninth Circuit considered two cases which together suggest "software exceptionalism"[102] is still the rule when it comes to licensing copies of copyright works. *UMG Recordings v. Augusto*[103] involved promotional music CDs that had originally been sent to music critics and disc jockeys.[104] Each CD had been marked with notice specifying that the CD was for promotional use only and was not transferable to parties other than the intended recipient.[105] The defendant, Augusto, acquired the CDs from

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Services which enable you to use any . . . any . . . content . . . owned or licensed by us . . . we grant you a limited, revocable, non-exclusive, non-sublicensable, non-transferable license to access the use of the specific Beachbody Services . . . for your personal, non-commercial use only." (emphasis omitted)).

[100] *See, e.g., FOCUS T25 Shaun T's NEW Workout DVD Program – Get It Done in 25 Minutes*, AMAZON, http://www.amazon.com/Shaun-FOCUS-T25-Base-Kit/dp/B00DDBS2JE/ref=sr_1_1?s=sporting-goods&ie=UTF8&qid=1404239886&sr=1-1 (last visited June 17, 2016) (selling Beachbody product, but lacking option to buy used versions). The absence of used DVD sales has caused some confusion among Amazon customers and potential resellers. *See, e.g., Does Amazon No Longer Allow Reselling Newer Beachbody DVDs?*, VIDEOFITNESS.COM, http://www.videofitness.com/~vfwnk/forum/showthread.php?t=197848 (last visited June 17, 2016); *Thread: Why Can't I List Insanity 60-day Exercise DVD Set?*, AMAZON SERVICES, https://sellercentral.amazon.com/forums/message.jspa?messageID=843863 (last visited June 17, 2016) (inquiring on Amazon seller forum why seller cannot list a used Beachbody DVD set for sale).

[101] *See, e.g., Jillian Michaels – 30 Day Shred*, AMAZON, http://www.amazon.com/Jillian-Michaels-30-Day-Shred/dp/B00127RAJY/ref=sr_1_11?s=movies-tv&ie=UTF8&qid=1404240066&sr=1-11&keywords=exercise (last visited June 17, 2016) (showing several used DVD copies available for sale); *Zumba Fitness Total Body Transformation DVD Set*, AMAZON, http://www.amazon.com/Zumba-Fitness-Total-Transformation-System/dp/B002HZ4XMC/ref=sr_1_26?s=movies-tv&ie=UTF8&qid=1404240095&sr=1-26&keywords=exercise (last visited June 17, 2016) (same).

[102] *See* Perzanowski & Schultz, *supra* note 93, at 1216 (defining software exceptionalism as "the notion that for a variety of reasons software should be treated differently").

[103] 628 F.3d 1175 (9th Cir. 2011).

[104] *Id.* at 1177.

[105] Some CDs stated,

> This CD is the property of the record company and is licensed to the intended recipient for personal use only. Acceptance of this CD shall constitute an agreement to comply with the terms of the license. Resale or transfer of possession is not allowed and may be punishable under federal and state laws.

various sources and then resold them on eBay.[106] UMG sued him on the theory that the CDs had been licensed, not sold, and that Augusto didn't own or have the right to transfer the CDs.[107] The Ninth Circuit held that UMG hadn't created a licensing agreement by sending the CDs affixed with notice to recipients and that the CD recipients had gained title to the CDs.[108]

The same panel of judges[109] that decided *UMG v. Augusto* also decided the software distribution case, *Vernor v. Autodesk*.[110] Similar to the facts in *Augusto*, Vernor resold on eBay CDs containing software which had purportedly been licensed.[111] The Court concluded that Vernor did not have the right to sell the CDs by looking to the Ninth Circuit's three-part test for determining whether software had been licensed or sold: first, "whether the copyright owner specifies that a user is granted a license"; second, "whether the copyright owner significantly restricts the user's ability to transfer the software"; and third, "whether the copyright owner imposes notable use restrictions" on the work.[112]

The holdings of *Vernor* and *Augusto* are difficult to reconcile. The most straightforward explanation for their opposite holdings is "software exceptionalism"—the notion that for some reason, licensing software is more acceptable than licensing copies of other works.[113] In *Vernor*, the Ninth Circuit explicitly uses a test that is specific to software.[114] In *Augusto*, it notes that "*[p]articularly with regard to computer software*, we have recognized that copyright owners may create licensing arrangements . . . ."[115]

Id. at 1177–78. Others simply were marked, "Promotional Use Only—Not for Sale." *Id.* at 1178.

[106] *Id.* at 1178.

[107] *Id.* at 1177.

[108] *Id.* at 1182.

[109] Perzanowski & Schultz, *supra* note 93, at 1227.

[110] 621 F.3d 1102 (9th Cir. 2010).

[111] *Id.* at 1103.

[112] *Id.* at 1111.

[113] *See* Perzanowski & Schultz, *supra* note 93, at 1227–31 ("[T]he rules that govern ownership of other copies and chattels generally . . . do not apply to the thoroughly modern stuff that is computer software.").

[114] 621 F.3d at 1111.

[115] *Augusto*, 628 F.3d at 1180 (emphasis added).

On the other hand, it is not necessarily true that the only plausible explanation for the holdings in *Augusto* and *Vernor* is that software may be easily licensed but other copyrighted works may not. The language of *Augusto* also suggests that a reason the first sale doctrine applies is because the initial recipients of the CDs did nothing to assent to the license. The court writes, for instance, "[o]ur conclusion that the recipients acquired ownership of the CDs is based largely on the nature of UMG's distribution."[116] UMG's original CD recipients were never in a position to decide whether to acquire the CDs with restrictions or not; the CDs simply showed up in their mail.[117] It's not certain that the Ninth Circuit would have come to the same result if the CDs were initially acquired in another manner. Although the factors that determine whether software has been licensed or sold, which were applied in *Vernor*, do not at all consider the actions of the software purchaser or recipient, one wonders if there is not an unstated, fourth factor in the test, under which the initial receiver of the software must take some action concerning or acknowledging the license agreement.[118]

However one reads *Augusto* and *Vernor*, it remains the case that courts are comparatively more comfortable enforcing licenses that apply to a digital environment rather than a physical. But commentators are beginning to point out that the licensing phenomenon as it has developed does not quite fit with existing property or contract jurisprudence. Mark Patterson has noted that courts frequently bend contract law beyond recognition to find "acceptance" in software licensing agreements, which would not suffice in other contexts.[119] Brian Carver describes attempts to

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[116] *Id.*

[117] *Id.* at 1177.

[118] *Cf.* Nguyen v. Barnes & Noble Inc., 763 F.3d 1171, 1178–79 (9th Cir. 2014) (holding that "where a website makes its terms of use available via a conspicuous hyperlink on every page of the website but otherwise provides no notice to users nor prompts them to take any affirmative action to demonstrate assent, even close proximity of the hyperlink to relevant buttons users must click on—without more—is insufficient to give rise to constructive notice").

[119] Mark R. Patterson, *Must Licenses Be Contracts? Consent and Notice in Intellectual Property*, 40 FLA. ST. U. L. REV. 105, 114 (2012) ("The Federal Circuit and courts following it have suggested that . . . the post-sale notice can create a contractual license restriction. To reach this result, the courts distort contract law beyond recognition." (footnotes omitted)).

transfer "perpetual possession of a copy [while] retaining title to the copy" as "incoherent and not found in the Copyright Act."[120] Christopher Newman argues that licenses are fundamentally creatures of property, and that conceptualizing them only as contracts often produces highly undesirable results.[121] From a different perspective, B.J. Ard argues that the fusion of supra-compensatory copyright damages with the idiosyncrasy of contract terms raises problems of fairness and notice.[122]

The inchoate status of licensing law creates the opportunity for change in many directions. This change can be positive and move in a direction that reduces the information costs associated with using protected works. Or, the change can be negative and create the opportunity for more variation in licensing and higher information costs for transactions within physical and intellectual property law. Just as with chattels that run software, permitting restrictive licensure of permanently-acquired goods has the potential to significantly raise the information costs associated with using and transferring personal property. Courts and private intermediaries should be reluctant to enforce or respect these attempts without considering the effects they have on property sale transaction costs as a whole.

C. DIGITAL GOODS AND DISEMBODIED SOFTWARE

Keeping the permissible property interests of software-embedded chattels aligned with other types of personal property makes sense from an information cost perspective. And because the software is inextricably connected to a particular, specialized device, one can see how a system governing "smart devices" will

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[120] *See* Carver, *supra* note 93, at 1954 ("Courts . . . [focus] on the wrong factors for determining ownership of the copy, unless they stay focused on the right of perpetual possession.").

[121] *See* Christopher M. Newman, *A License Is Not a "Contract Not To Sue": Disentangling Property and Contract in the Law of Copyright Licenses*, 98 IOWA L. REV. 1101, 1109–10 (2013) ("The concept of license, I argue, belongs fundamentally to property, not contract."); *see also id.* at 1103–05 (providing examples of where viewing a license as a "contract not to sue" a licensee would produce undesirable results).

[122] *See generally* B.J. Ard, *Notice and Remedies in Copyright Licensing*, 80 MO. L. REV. 313 (2015).

tend to work similarly to how personal property transfers have historically functioned.

A more complicated question is how to develop a sensible way to govern the transfer of disembodied digital works—software that runs on a general-purpose computer, including digital media such as ebooks, music and video files. Even if one eliminated the holding of *MAI Systems*, the core differences between physical and digital goods demand a more nuanced answer to the question of how digital objects should be treated under the law. Whereas previously, one might take a CD out of one's home entertainment system to use in a portable player or to lend to a friend, now moving an mp3 from a desktop to an mp3 player or to a friend's computer requires making a copy.[123] Courts have entertained the idea that digital works may be transferred when the device they are on is transferred as well, because no new copy is made in the process.[124] But the reality of how people use computers makes this an inapposite answer to the general question of whether copyrighted digital works can be sold or transferred. In the absence of appealing alternatives, courts look to license agreements to determine what rights an end-user has over a digital work. But just as with personal property, use restrictions on digital works have the potential to create problematically high information costs.

Previously, this author has suggested that licenses to digital works should be required to grant a minimum of a transferable personal use right to licensees.[125] Many others have argued that something akin to a digital first sale doctrine would generally be

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[123] *See* Mitch Bartlett, *Galaxy S6: Transfer Music Files from PC*, TECHNIPAGES (Apr. 11, 2015), http://www.technipages.com/galaxy-s6-transfer-music-files-from-pc (explaining how to transfer music from one device to another and using the word "copy" to describe the transferral process).

[124] *See* Capitol Records, LLC v. ReDIGI Inc., 934 F. Supp. 2d 640, 656 (S.D.N.Y. 2013) ("Section 109(a) still protects a lawful owner's sale of her 'particular' phonorecord, be it a computer hard disk, iPod, or other memory device onto which the file was originally downloaded. While this limitation clearly presents obstacles to resale that are different from, and perhaps even more onerous than, those involved in the resale of CDs and cassettes, the limitation is hardly absurd . . . .").

[125] *See* Mulligan, *supra* note 15, at 275–82.

beneficial.[126] The company ReDIGI attempted to create an experience analogous to reselling physical copies of works by designing a system that "resold" a digital work by sending the buyer a copy while deleting the seller's.[127] However, courts have not yet embraced ReDIGI's notion of digital resale.[128]

But while the status quo may seem overly restrictive of digital resale, some copyright holders fear that a "strong" digital first sale doctrine would create difficulties for copyright owners trying to extract payment from their works by making lending "too" efficient.[129] Whenever someone was not actively using a file, a robust first sale doctrine would permit it to be rented out or resold. Hundreds of people would be able to share the same incarnation of a work, so long as only one person was using it at a time.

Many would see the phenomenon of making more efficient libraries as socially beneficial, but copyright holders who worry such lending would prevent sufficient monetization of their works would prefer permitting restrictive licensure for digital works instead. It may be that information costs associated with digital

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[126] *See* Justin Graham, *Preserving the Aftermarket in Copyrighted Works: Adapting the First Sale Doctrine to the Emerging Technological Landscape*, 2002 STAN. TECH. L. REV. 1, 86 ("[A] strong first sale doctrine is necessary to preserve a free and robust aftermarket in copyrighted material."); Katz, *supra* note 33, at 133–41; Henry Sprott Long III, *Reconsidering the "Balance" of the "Digital First Sale" Debate: Re-Examining the Case for a Statutory Digital First Sale Doctrine to Facilitate Second-Hand Digital Media Markets*, 59 ALA. L. REV. 1183, 1185 (2008) ("[T]he need for a durable digital first sale doctrine is ever more apparent . . . ."); Aaron Perzanowski & Jason Schultz, *Digital Exhaustion*, 58 UCLA L. REV. 889, 889 (2011) ("[C]ourts have ample room to apply and continue to develop common law rules that preserve the many benefits of the first sale doctrine in the digital marketplace."); R. Anthony Reese, *The First Sale Doctrine in the Era of Digital Networks*, 44 B.C. L. REV. 577, 577 (2003) ("The article focuses on the affordability and availability effects of the [first sale] doctrine.").

[127] *See ReDIGI Inc.*, 934 F. Supp. 2d at 645–46 ("[U]sers . . . [can] sell their legally acquired digital music files, and buy used digital music from others at a fraction of the price currently available on iTunes."); *see also* REDIGI, https://www.redigi.co/ (last visited June 17, 2016) (stating that "ReDIGI is heading to appeal").

[128] *ReDigi Inc.*, 934 F. Supp. 2d at 644.

[129] *See* Jeff Roberts, *Should You Have a Right to Sell Your eBooks and Digital Music?*, GIGAOM (June 6, 2014, 5:39 AM), https://gigaom.com/2014/06/06/should-you-have-a-right-to-sell-your-ebooks-and-digital-music/ ("Copyright owners, wary of how easy it is to copy and share works online, have found a way to make sure that no one technically buys a book, music album or video in the first place . . . This means that there is no 'sale' in the legal sense of the word, and so the first sale rule doesn't apply.").

works would increase with licensure, but that it wouldn't matter much given the low marginal cost of copyright owners creating new digital copies. In other words, there may be little need to create ideal rules for allocating resources in the absence of scarcity. But despite the ease with which digital files can be copied, over time, even digital works become scarce when copyright owners cease to make them available and files degrade or are destroyed.[130]

Looking at property law and the law of how resources are allocated through an information cost lens helps one think about these challenges but does not yield a single solution. Property law makes an imperfect, rough cut at how resources may be allocated, sacrificing the ideal world for estimates which are good enough, towards the end of keeping information costs low enough that property allocation and use stays manageable.[131] There is, then, potentially more than one "good enough" way to delineate rights in disembodied digital objects. Trying to explore each possible way would take this Article on a long tangent. However, the values of keeping information costs low and facilitating the ongoing use of digital works should play a significant role in determining what those rights or structures should be.

IV. SOCIAL COSTS

The content of standard property forms and what rights the government will recognize is a choice that can reflect a variety of social values, as well as impact information costs.[132] Hanoch Dagan argues that the forms of property offer "a tentative suggestion to parse the social world into distinct categories of human interaction."[133] Joseph Singer writes that the existing system of estates in land reflects the "values that shape the

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[130] *See* Reese, *supra* note 126, at 592–610, 630–44 (discussing scenarios in which copyright owners can cease to make their works available).

[131] *See* Smith, *supra* note 47, at 1704 ("The architecture of property emerges from the process of solving the problem of how to serve use interests in a roughly cost-effective way.").

[132] *See generally* Nestor M. Davidson, *Standardization and Pluralism in Property Law*, 61 VAND. L. REV. 1597 (2008).

[133] Dagan, *supra* note 17, at 1559.

contours of the social relationships in a free and democratic society."[134] In short, the choices of how and how much to standardize property can and do speak to values besides economic efficiency. For example, permitting flexible licenses for the Internet of Things may encourage greater surveillance and remote control of networked objects in order to ease enforcement of the license restrictions. To the extent that surveillance and remote control harms users' privacy and autonomy interests, legal institutions may want to restrict flexible licenses in order to decrease the prevalence of socially undesirable side-effects.

Flexible licensure may encourage manufacturers to build self-monitoring products in order to decrease the information costs associated with the products' usage, employing bar code scanners, radio frequency identification (RFID) tags,[135] digital rights management (DRM) software,[136] and a host of other tools. Whereas humans once bore the full burden of figuring out what they could do with their property, new technologies may be able to lower and absorb those costs. But the prospect of lowering information costs requires greater surveillance of everyday life and home life, of how and where one uses objects, as well as who uses them. While technology may be able to decrease information costs so as to economically allow for the encumbrance of chattels, these and other social costs arise in the place of those information costs saved.

The problem of high information costs stems from the fact that humans bear the costs of compliance. Just as humans read and implement the text of wills specifying complicated inheritance rules, humans also bear the obligation of reading the dozen or more pages of EULAs and ToS and confining their behavior to that

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[134] Singer, *supra* note 17, at 1050.

[135] *See What is RFID?*, TECHNOVELGY.COM, http://www.technovelgy.com/ct/technology-article.asp (last visited June 18, 2016) (defining RFID as "small electronic devices that consist of a small chip and an antenna," which "serves the same purpose as a bar code or a magnetic strip" by "provid[ing] a unique identifier for that object").

[136] *See What is DRM?*, DEFECTIVEBYDESIGN.ORG, https://www.defectivebydesign.org/what_is_drm_digital_restrictions_management (last visited June 18, 2016) (defining DRM as "the practice of imposing technological restrictions that control what users can do with digital media").

which is permitted by the license.[137] But to varying degrees, technology may make it feasible to keep track of how objects are used or simply prevent a forbidden action from being taken entirely. For software-embedded goods, the product would refuse to function in a disallowed way. Other articles of tangible property could be tagged with an RFID chip or unique serial number. When certain events occurred, such as transferring ownership or relocating a chattel, the article could be scanned and a separate computer could analyze whether the proposed use or transfer were permitted.

These hypotheticals are less far-fetched than they first appear. In 2012, Microsoft filed for a patent titled "Content Distribution Regulation by Viewing User."[138] The patent envisioned a system where someone would, for example, purchase a license for a certain number of viewers to watch a movie through the Xbox 360 system.[139] The Xbox 360 Kinect, which is equipped with a camera, would then continuously monitor whether more people than

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[137] One major justification for refusing to enforce complex property interests or restrictive license agreements would be that, in the aggregate, they could not all be read and comprehended in a practical amount of time. Economists have estimated that individuals who read every privacy policy to which they agreed online would each spend about 244 hours per year, or 40 minutes a day, reading policies. Aleecia M. McDonald & Lorrie Faith Cranor, *The Cost of Reading Privacy Policies*, 4 I/S: J.L. & POL'Y FOR INFO. SOC'Y 543, 564 (2008); *see also* Dan L. Burk, *DNA Rules: Legal and Conceptual Implications of Biological "Lock-Out" Systems*, 92 CALIF. L. REV. 1553, 1584 (2004) ("The inability of the general public to track all the myriad permutations of mass market license is well illustrated by the frequent appearance of outrageous terms in such contracts. . . including provisions that forbid criticism of the product or . . . conferring . . . upon the publisher of web page design software a right in the web pages designed using the software purchased."). Lengthy licenses for software would similarly take an inordinate and unrealistic amount of time to read, particularly as the number of software-embedded goods increases. Even Supreme Court Chief Justice John Roberts admits he does not read EULAs. Mike Masnick, *Supreme Court Chief Justice Admits He Doesn't Read Online EULAs Or Other 'Fine Print,'* TECHDIRT (Oct. 22, 2010, 9:48 AM), http://www.techdirt.com/articles/20101021/02145811519/supreme-court-chief-justice-admits-he-doesn-t-read-online-eulas-or-other-fine-print.shtml; Debra Cassens Weiss, *Chief Justice Roberts Admits He Doesn't Read the Computer Fine Print*, ABA J. (Oct. 20, 2010, 12:17 PM), http://www.abajournal.com/news/article/chief_justice_roberts_admits_he_doesnt_read_the_computer_fine_print/.

[138] U.S. Patent Application No. 20,120,278,904 (filed Nov. 1, 2012); Tim Cushing, *Microsoft Patents TV That Watches Back, Counts Heads, Charges Admission*, TECHDIRT (Nov. 9, 2012, 11:45 AM), https://www.techdirt.com/articles/20121105/21564420943/microsoft-patents-tv-that-watches-back-counts-heads-charges-admission.shtml.

[139] '904 Patent Application, claim 27.

licensed were watching the film by counting the number of people in the room.[140] The '904 Patent Application explained, "if the number of user-views licensed is exceeded, remedial action may be taken."[141] Few products are more Orwellian than a television that watches you back. But the Microsoft '904 Patent Application is only the tip of the iceberg. Some cars are also being outfitted to include engine "shut-off devices," which automatically stop cars from running when car payments are late.[142] These devices communicate wirelessly to lenders or dealers. When a payment is late, the device warns the customer that a deadline is imminent and shuts off the car several days after a payment is due and missed.[143] The cars also include global positioning system (GPS) devices that can locate the car remotely, "to speed up the repossession of the vehicle, if necessary."[144] More positively for car owners, these types of devices can also be used to locate and shut down cars when they are stolen.[145]

The Microsoft '904 Patent Application and engine shut-off devices highlight two key values that would be undermined by encoding DRM on or tagging-and-tracking everything: allowing for unanticipated, necessary uses of property, and protecting privacy. Both are explored in the following section, along with concerns about the effectiveness of using DRM to automatically enforce usage restrictions on chattels.

A. NECESSITY AND EFFICIENT BREACH

Under the common law, one could invoke "necessity" as a defense to claims of trespass or conversion. In the case of public necessity, one has the privilege to trespass or convert chattels "if the act is or is reasonably believed to be necessary for the purpose

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[140] Cushing, *supra* note 138; '904 Patent Application, claims 8–9.

[141] '904 Patent Application, abstract.

[142] Gary Hoffman, *Pay Up or Your Car Engine Will Stop*, CNN.COM (Apr. 17, 2009), http://edition.cnn.com/2009/LIVING/wayoflife/04/17/aa.bills.shut.engine.down/index.html.

[143] *Id.*

[144] *Id.*

[145] *Id.*

of avoiding a public disaster."[146] One may also invoke a similar defense when private welfare is at risk—"if it is or is reasonably believed to be reasonable and necessary to protect the person or property of the actor, the other or a third person from serious harm . . . ."[147] When relying on a private necessity defense to protect anyone besides the relevant chattels' owner, the actor is liable for any harm caused, but not for nominal or punitive damages.[148] Variations on the necessity defense also appear in numerous states' laws and in the Model Penal Code.[149] The Model Penal Code provision is aptly titled "Choice of Evils" and provides that "[c]onduct that the actor believes to be necessary to avoid a harm or evil to himself or to another is justifiable, provided that . . . the harm or evil sought to be avoided by such conduct is greater than that sought to be prevented by the law defining the offense charged," among other requirements.[150]

Regardless of the precise contours of the necessity defense in civil and criminal scenarios, the purpose of these exceptions to generally applicable regulations of conduct is plain. Although individuals are likely to disagree about exactly under what circumstances law-breaking is "the lesser evil," most would agree that there are circumstances where it is preferable, or even morally requisite, to break a law in order to avoid a harmful result.[151] Adding DRM to real-world objects, such as cars, weapons, or computers in order to enforce ownership rights risks making rights-infringing, but necessary, decisions impossible. Hypotheticals are not difficult to spin out. One may need to drive

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[146] RESTATEMENT (SECOND) OF TORTS § 262 (1965); *see also id.* § 196 (describing a defense of public necessity for trespass to land).

[147] *Id.* § 263(1); *see also id.* § 197 (describing a defense of private necessity for trespass to land).

[148] *Id.* § 263(2); *id.* § 263 cmt. e (creating liability for only actual damages).

[149] *See* George C. Christie, *The Defense of Necessity Considered from the Legal and Moral Points of View*, 48 DUKE L.J. 975, 1025–31 (1999) (describing the defense under the Model Penal Code).

[150] Model Penal Code § 3.02(1) (1981).

[151] Discussing when precisely such law violations are and are not justified would go far beyond the scope of this paper, but works that engage in discussions of the topic include Christie, *supra* note 149, at 1026; JULES L. COLEMAN, RISKS AND WRONGS 282 (1992).

a car to avert an emergency, or need to alter a thermostat when the weather takes an unexpected, freezing turn.

Still other license violations do not implicate avoiding bodily harm but simply evoke the contract-law notion of efficient breach.[152] For example, maybe one simply needs to borrow another's Google Glass or smart watch at the last minute, in order to access certain information while engaging in a contentious business meeting. The borrower of the glasses or watch would be happy to pay for the entire product but simply did not have the opportunity to acquire one before she needed it. So she borrows another person's in violation of the license agreement. This is a case where actual damages to the licensor are virtually nonexistent, but the benefits to the borrower may be enormous. On balance, allowing parties to breach the license seems preferable to simply preventing the article from functioning ex ante. And if these licenses sound implausible, consider that the license for Microsoft Office: Home & Student Edition nominally forbids houseguests from sitting down at one's computer and using Word or Excel.[153]

Although the threshold at which violating licenses and servitudes become appealing will change based on the remedies available to a harmed party, the "end-user," or the person in possession of the chattel, should have the power to decide how to use it to a given situation. That the choice of how to use a chattel remains with its possessor, instead of a licensor who drafted rules about how it can be used months or years before, is valuable because the current possessor will have far better information about whatever situation she is in than the license drafter did. In effect, the relationship between a license drafter and end-user is somewhat analogous to the relationship between a central

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[152] *See* Barry E. Adler, *Efficient Breach Theory Through the Looking Glass*, 83 N.Y.U. L. REV. 1679, 1680–81 (2008) (defining efficient breach).

[153] *See Microsoft Software License Terms (MSLT) for Microsoft Office 2010* § 1(12), MICROSOFT.COM, https://www.microsoft.com/en-us/download/confirmation.aspx?id=13653 (last visited June 18, 2016) ("For software marked 'Home and Student' edition, you may install one copy of the software on up to three licensed devices in your household for use by people for whom that is their primary residence.").

economic planner and an individual.[154] A common argument against extensive centralized planning is that a small group of planners cannot realistically gather and process enough information to anticipate the situations and needs of the hundreds of thousands of individuals who will be affected by their decisions.[155] As a result, trying to anticipate exactly how many cars, chairs, coffee beans, and cherry pies to make available at any given place at any given time becomes an impossible task because of the number of variables that must be taken into account.

The licensor faces the same problem as the central planner, but lacks the incentives to try to reach an optimal result. While a central planner's stated goal is to justly and effectively allocate resources to the public, the licensor drafting a EULA writes with the manufacturer's or distributor's best interests in mind, not the end-user's.[156] The licensor will typically not care if a chattel occasionally will not let its possessor use it in a way that is very valuable to the possessor. The market will have some tempering effect on the strictness of these limitations if they are frequently a cause of frustration. But so long as the chattel does not stop working often, there likely will not be enough market pressure to alter how a particular device is permitted to function.

B. PRIVACY

Even assuming software can be written that correctly assesses whether a chattel's use or transfer is authorized, and which allows for unauthorized uses when necessary or efficient, outsourcing the information costs associated with authorized property uses will create concerns about privacy. Any system trying to answer the question of who can use what, when, where, and under what

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[154] *Cf.* F.A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519, 524 (1945) ("We need decentralization because only thus can we ensure that the knowledge of the particular circumstances of time and place will be promptly used.").

[155] *Id.* at 519–20.

[156] *Cf.* Katz, *supra* note 33, at 115 ("User innovation . . . implies that knowing who is best able to maximize the value of an asset at the time of transaction is unlikely. . . . [I]f we cannot tell ex ante who is in the best position to further innovate, rules allowing possessors of goods to innovate without restraints reduce transaction costs.").

circumstances will have to know where the object in question is, who is using it or to whom it is being transferred, and other details depending on how restrictions are designed.

Much has been written about the harms, real and potential, of massive data collection by private companies of personal information. Belief that the government reads individuals' internet search queries has been shown to chill the content of searches one does.[157] The notion that one's uses of various products are also being recorded by private parties would reasonably be expected to have similar effects. Moreover, losing privacy has the potential to impact many other aspects of one's life and personal development. Among other values, privacy promotes "autonomy, self-fulfillment, socialization, and . . . freedom from the abuse of power."[158] Julie Cohen makes the case that privacy "is an indispensable structural feature" of our political systems and that freedom from surveillance is "foundational to the capacity for innovation" and self-development.[159] Neil Richards warns that "surveillance of people when they are thinking, reading, and communicating with others . . . . is especially dangerous because it can cause people not to experiment with new, controversial, or deviant ideas."[160] These negative effects of loss of privacy exist even when someone has "nothing to hide."[161] Moreover, massive data collection on individuals presents the possibility that dossiers on individuals will be used in discriminatory or other objectionable ways.[162]

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[157] Alex Marthews & Catherine E. Tucker, Government Surveillance and Internet Search Behavior 27 (Apr. 29, 2015) (unpublished manuscript), http://ssrn.com/abstract=2412564.

[158] Woodrow Hartzog & Evan Selinger, *Obscurity: A Better Way to Think About Your Data Than 'Privacy,'* ATLANTIC (Jan. 17, 2013), http://www.theatlantic.com/technology/archive/2013/01/obscurity-a-better-way-to-think-about-your-data-than-privacy/267283/.

[159] Julie E. Cohen, *What Privacy is For*, 126 HARV. L. REV. 1904, 1905 (2013).

[160] Neil M. Richards, *The Dangers of Surveillance*, 126 HARV. L. REV. 1934, 1935 (2013).

[161] *See generally* DANIEL J. SOLOVE, NOTHING TO HIDE: THE FALSE TRADEOFF BETWEEN PRIVACY AND SECURITY (2011) (criticizing the argument that privacy is not necessary when one has "nothing to hide").

[162] *See* Peppet, *supra* note 2, at 117–33 (discussing the problems that the massive data collection relating to the Internet of Things will bring about); Richards, *supra* note 160, at 1952–58 (discussing the harms of surveillance). The further difficulty of correcting errors in individuals' dossiers has the potential to lead to Kafkaesque absurdity when one cannot see or alter the system that has led to one's being characterized a particular way. *See* DANIEL

Admittedly, self-monitoring products are a largely legal exercise in self-help by companies. Even in the absence of personal property servitudes or restrictive licenses, nothing currently prevents companies from making products which monitor and store sensitive data about users.[163] Yet, suggesting massive private surveillance as an alternative to property standardization will likely encourage further privacy intrusions which the benefits of property flexibility may not justify.

C. INEFFECTIVENESS

A final concern is that technology designed to govern transfer and use restrictions will not work effectively. DRM technology provides an example of how automated use and transfer restrictions can harm even well-intentioned users. Using DRM, software programs or digital content can be designed to only run with the proper password or other permission, or to only work for a fixed amount of time or for a certain number of uses.[164] But the failures of DRM are legion, particularly when the technology fails on its own terms and blocks people from accessing content they have a license to access. For example, several software companies have experimented with requiring computers running the software to always be connected to the internet by writing their software to continually "check in" with the companies' servers to establish that the software has been paid for.[165] Failures of these systems,

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J. SOLOVE, THE DIGITAL PERSON: TECHNOLOGY AND PRIVACY IN THE INFORMATION AGE 27–54 (2006).

[163] *See* Peppet, *supra* note 2, at 89–90 (describing how the privacy policy for the Breathometer provides that "blood-alcohol test results are being stored indefinitely in the cloud, cannot be deleted by the user, may be disclosed in a court proceeding if necessary, and may be used to tailor advertisements at the company's discretion").

[164] *Q&A: What is DRM?*, BBC NEWS (Apr. 2, 2007, 2:13 PM), http://news.bbc.co.uk/ 2/hi/technology/6337781.stm.

[165] For example, in 2010, the gaming company Ubisoft decided to set up its games so that the program would have to check in with Ubisoft over the internet before a user could play. If the player had a poor internet connection or had been kicked offline, the game would abort after failing to reach the company. Ben Kuchera, *Ubisoft's New DRM Solution: You Have Be Online to Play*, ARS TECHNICA (Jan. 27, 2010, 4:11 PM), http://arstechnica.com/gaming/news/2010/01/ubisofts-new-drm-solution-you-have-be-online-to-play.ars; Mike Masnick, *Ubisoft DRM Gets Worse And Worse: Kicks You Out of Game If You Have a Flakey WiFi Connection*, TECHDIRT

resulting in users being blocked from accessing the material for which they already paid, have inadvertently created incentives for users to make and find unauthorized, infringing copies of the software or content, stripped of the DRM.[166] Even when DRM works, it is often designed to prevent people from using the material in legal ways, such as making fair uses or other excepted reproductions under the Copyright Act.[167] Because the boundary between a fair use and an infringing use is not precisely defined and is indeed the frequent subject of hotly contested lawsuits, a well-meaning designer of DRM would be unable to include an exception for fair use because he could not encode a "judge on a chip."[168] While a protection measure could be designed to yield

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(Feb. 18, 2010, 5:46 PM), http://www.techdirt.com/articles/20100218/1514238229.html; Chris Pereira, *Assassin's Creed 2 on PC Requires a Constant Internet Connection*, 1UP.COM (Feb. 17, 2010), http://www.1up.com/news/assassin-creed-2-requires-constant. At one point, Ubisoft's servers crashed, preventing anyone from playing its *Assassin's Creed 2* game. Mike Masnick, *Ubisoft's 'You Must Be Connected To This Server' Annoying DRM Servers Go Down*, TECHDIRT (Mar. 8, 2010, 6:12 AM), http://www.techdirt.com/articles/20100308/0138388459.html; Griffin McElroy, *Ubisoft DRM Authentication Server Is Down, Assassin's Creed 2 Unplayable*, ENGADGET (Mar. 7, 2010), http://www.joystiq.com/2010/03/07/ubisoft-drm-authentification-server-is-down-assassins-creed-2. Problems with DRM technology have extended into other areas as well. The DRM on Blu-Ray copies of Avatar prevented many who purchased the film from watching it on their Blu-Ray players. Karl Bode, *Avatar Blu-Ray Customers Not Enjoying Their DRM-Crippled Discs*, TECHDIRT (Apr. 27, 2010, 12:32 AM), http://www.techdirt.com/articles/20100423/1012179155.html. At another time, a Blu-Ray firmware update temporarily rendered Warner Brothers and Universal films unwatchable. Richard Lawler, *Samsung Blu-ray Players Won't Play Warner, Universal Movies After Firmware Update, Require a Rollback*, ENGADGET (Aug. 22, 2010), http://www.engadget.com/2010/08/22/samsung-blu-ray-players-wont-play-warner-universal-movies-afte/; Mike Masnick, *DRM Strikes Again: Samsung Blu-ray Firmware Update Means No Warner or Universal Movies*, TECHDIRT (Aug. 23, 2010, 1:48 PM), http:// www.techdirt.com/articles/20100823/05113410739.html.

[166] For example, Ubisoft's system was "cracked" almost as soon as it was made available. Mike Masnick, *Ubisoft's Annoying New DRM Cracked Within Hours of Release*, TECHDIRT (Mar. 4, 2010, 7:59 PM), http://www.techdirt.com/articles/20100304/1302148421.html. Masnick noted: "Many people . . . [said] that while they would have bought the game otherwise, now they would just wait for a DRM-free cracked version to show up." *Id.*

[167] *See* Timothy K. Armstrong, *Digital Rights Management and the Process of Fair Use*, 20 HARV. J.L. TECH. 49, 50 (2006) (explaining how copyright holders may deploy DRM mechanisms that preclude consumers' lawful fair use of digital copyrighted works and proposing an alternative framework for protecting fair use in digital copyright).

[168] *See* C.J. Alice Chen & Aaron Burnstein, *Foreword to Symposium: The Law & Technology of Digital Rights Management*, 18 BERKELEY TECH. L.J. 487, 491 (2003) ("Unless DRM systems include a 'judge on a chip,' they will remain incapable of determining whether

access to any user who simply claims to have a legal reason to access it, this would undermine the goal of having an automated process (rather than a person) bear the information costs surrounding usage.

Nonetheless, while DRM is reasonably effective at controlling certain kinds of uses, it has limits. A digital camera's license, for example, may prevent lending the camera to another.[169] Most DRM we encounter cannot act to prevent this. Maybe a camera could require a password to work, but the owner could simply tell the borrower what the password is. The camera's software could constantly remind the owner that lending is not allowed; however, it would also have to remind the owner of all other limitations—requiring the owner to read and comprehend them—again undercutting the goal of reallocating information costs to automated systems.

In summary, while it may be possible to significantly lower information costs associated with idiosyncratic licenses, the technology necessary to do so comes with its own set of problems and potential harms. Lowering information costs with technology may prove ineffective, prevent some necessary uses of property, and undermine important privacy values.

V. CONCLUSION

In 1928, Zechariah Chafee concluded his exploration of equitable servitudes on chattels with the observation that "the present failure to enforce such restrictions has not caused obvious evils . . . . Until the need for . . . servitudes on chattels becomes more certain, they are not likely to acquire assured validity."[170] The need for servitudes on chattels never became certain, but "servitudes" have nonetheless evolved with vigor in the realm of

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a user is copying part of a work for purposes of piracy or parody." (citing Edward W. Felten, *A Skeptical View of DRM and Fair Use*, Communications of the ACM (Apr. 2003) at 57, 58)).

[169] *See, e.g.*, Canon EOS-1D Mark II N Firmware License Agreement, http://web.canon.jp/Imaging/eos1dm2n/eos1dmk2n_firmware-e.html (last visited June 18, 2016) (cited in Winston, *supra* note 10, at 97 n.13).

[170] Chafee 1928, *supra* note 21, at 1013.

intellectual-property-embedded goods.[171] This Article attempts to explain the historic divergence of servitude law on land and chattels in terms of the information costs associated with investigating and understanding property interests. In doing so, it establishes that the justifications for high standardization in personal property are similarly applicable to intellectual-property-embedded goods. As a result, it argues that attempts to create servitudes on chattels, as well as usage and transfer restrictions on networked products, should continue to be viewed with suspicion, particularly in light of the social costs to privacy and autonomy likely to be associated with their implementation.

[171] *See* Van Houweling, *supra* note 9, at 924–49.