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Recommended Citation

Michael J. Meurer & Peter Menell, *Notice Failure and Notice Externalities*, in 5 *Journal of Legal Analysis* 1 (2013).

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NOTICE FAILURE AND NOTICE EXTERNALITIES

*Peter S. Menell and Michael J. Meurer*¹

ABSTRACT

The emergence of intangible resources, such as intellectual property illuminates a previously unrecognized market failure: what we call a “notice externality.” The incentives of those claiming intellectual property diverge from the social interest. Inventors and creators can sometimes benefit from obfuscating the scope of rights and keeping others in the dark about their intellectual property. This article explores the principal causes of notice failure in the development of intangible resources and offers a multifaceted framework for diagnosing, preventing, internalizing, and ameliorating its adverse effects.

1. INTRODUCTION

The institution of private property addresses a prime resource allocation concern in market-based economies: appropriability (Even 2009). Property rights encourage investment in resource development by granting property owners rights to exclude and develop their resources, which can enhance owners’ ability to derive value from their investments. The right to exclude encourages farmers to cultivate crops by ensuring that they, and not interlopers, will be able to reap the harvest. It also encourages land developers to build homes knowing that they can prevent squatters from occupying the dwellings. In these ways, the

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doi:10.1093/jla/las019

rights and institutions of private property promote efficient land resource development.

In modern real estate markets, notice rarely poses a serious problem for property development. Land boundaries are typically recorded in government administered and publicly accessible recording offices. Landowners can usually determine who their neighbors are, the boundaries of their land, and restrictions on land development relatively easily. This enables property owners to assess the parameters for developing their land and, when they wish to exceed those parameters, the counterparties with whom they need to bargain for additional rights.² Problems can arise—such as where prior owners agreed on boundaries that diverged from those reflected in deeds, circumstances surrounding easements and covenants have changed, and the government restricts land use—but these complications rarely stand in the way of determining relevant counterparties, and institutions, such as zoning boards and judicial proceedings to quiet title, can assist parties in planning.

Effective notice is a far greater challenge when the resources in question are intangible. Such resources can be difficult to navigate because of the amorphous nature of intangible boundaries, the difficulty in determining whether an intangible resource is already “owned,” and the complex rights associated with intangibles. Unlike tangible assets, the nonrivalrous nature of intangibles enables many people to possess them simultaneously without interfering with others’ use of the resource. It can be exceedingly difficult and costly to even identify “neighboring” intangible property rights owners.

The development of wireless email technology tragically illustrates the problem of notice failure. Research in Motion (RIM) set out to develop mobile email devices in 1995. At the time, there were no apparent “neighbors”—*i.e.*, competitors in the marketplace. For technology developers, however, there is another important neighborhood to check: the Patent and Trademark Office (PTO). That is not an easy task given the millions of issued patents (plots of intangible real estate). Unlike real estate maps, these records are not organized geographically. In the mid-1990s, there were no Boolean search tools and it would have been difficult to identify which classes of technology to check. The PTO’s classification system was (and remains) outdated and does not deal well with cutting edge technologies for the simple reason that it is difficult to “map” intangible *terra incognita*. Moreover, the PTO database at the time did not include patent applications, so there might be no way of knowing about potential neighbors—a particularly significant problem in emergent

2 Where a land use is for public use, the government can invoke the power of eminent domain to allocate property rights.

technologies. Furthermore, the proliferation of digital technology patents creates countless new neighbors, often with fuzzy, multidimensional boundaries. Had RIM exhaustively searched PTO records in the first half of 1995, the time that it attracted substantial institutional and venture capital investors, it would not have found any intangible “neighbors”—*i.e.*, patents covering wireless email systems. Unfortunately for RIM, a patent would issue to NTP, Inc., in July 1995 covering “Electronic Mail System with RF [Radio Frequency] Communications to Mobile Processors and Method of Operation Thereof” (U.S. Patent No. 5,436,960, July 25, 1995).³ But even if RIM had located the NTP patent, it would have still been in a bind. Even though patents come with a presumption of validity, there were good reasons to question the novelty and nonobviousness of the NTP patent and it would have taken years for courts or the PTO to provide a definitive ruling.⁴

RIM’s BlackBerry device and service was introduced in 1999, quickly becoming a market leader. In early 2000, NTP sent a cease and desist letter to RIM. RIM conducted a review of the patents and determined that the NTP patents were invalid and not infringed by the BlackBerry. In November 2001, NTP sued RIM for infringement of several patents growing out of its initial wireless email patent application in the Eastern District of Virginia, known for its “rocket docket.” Following trial a year later, the jury found infringement on all asserted claims and awarded damages of \$33 million (Fried 2002). Meanwhile, RIM requested that the PTO re-exam the patents at issue. In August 2003, Judge Spencer increased the damage award to \$53 million (*NTP, Inc. v. Research in Motion, Ltd.*, 2003 WL 23100881 (E.D.Va. 2003)).⁵ Of greater moment, Judge Spencer ordered injunctive relief that threatened to shut down the BlackBerry service (*id.*). The Federal Circuit stayed the injunction pending appeal. In August 2005, the Federal Circuit affirmed the trial court decision in part, reversed in part, and remanded (*NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282 (Fed. Cir. 2005)). On remand, the District Court denied RIM’s motion to

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- 3 The patent application had been filed on May 20, 1991. Several other patents, containing over 2000 claims, would flow from this original filing.
 - 4 RIM discovered a series of manuals published by Telenor, a Norwegian telecommunications company, between 1986 and 1989 describing a wireless email device. Thomas Campana, the primary inventor of the NTP patents, traced his invention date to July 1990. NTP would ultimately sue RIM on eight patents emanating from the 1991 patent. On re-examination initiated by the PTO and RIM, the PTO would reject over 2200 claims across the eight patents. See *In re NTP, Inc.*, 654 F.3d 1279 (Fed. Cir. 2011) (vacating-in-part, reversing-in-part, and remanding).
 - 5 Judge Spencer also awarded \$4.5 million in legal fees and costs.

stay further proceedings pending re-examination of the patent. In January 2006, the Supreme Court denied *certiorari* of the Federal Circuit decision, opening the way for injunctive relief. With the injunction threat looming, RIM ultimately settled the case for \$612.5 million in March 2006 (Krazit & Broache 2006). The problems reflected in this case—identifying patent neighbors and ascertaining patent boundaries—have increasingly plagued the information technology sector, adding substantially to the costs and risks of technological resource development (Bessen & Meurer 2008).

Somewhat distinct notice problems arise in the development of expressive works. While tangible resource boundaries tend to be well-defined and capable of precise measurement, the scope of copyrighted works and the permissible extent of fair use can be difficult to ascertain. These problems have become all the more frequent in the digital age, where technology makes it easy for anyone to integrate existing works into blogs, mosaic art forms, and mashups. Furthermore, the lack of formalities in copyright law make it difficult to locate copyright owners to even negotiate a license. Whereas copyrighted works—such as a photograph, a sound recording, or an audio-visual clip—might be readily available, developers can encounter great cost and difficulty in identifying, locating, and contacting the rights holders of such works. In the extreme, the work is an “orphan,” thereby presenting the subsequent creator seeking to incorporate the prior work with a stark choice: omit the work or run the risk of an owner emerging and facing defense costs, possible injunctive relief blocking their entire integrated work, and potentially large statutory damages.

As these examples illustrate, developers of technological and expressive works often must cope with substantial notice problems. In other words, they often face challenges in determining the “neighbors” with whom they must deal in developing their projects and the scope of rights affecting their work.

Property scholars have explored various notice problems in general and with particular focus on intellectual property. Clarissa Long (2004) suggested that differing information costs explain differences between the patent and copyright regimes. Thomas Merrill and Henry Smith (2000, 2001) explained the efficiency benefits of standardization in property regimes based upon notice considerations. Building on that work, Henry Smith (2003) has explored how the language of property can produce informational externalities.⁶ Michael Heller’s (1998, 2008) work on the “tragedy of the anti-commons” explored how fragmentation of property rights across a wide range of resources can produce gridlock. Molly Van Houweling (2008, 2010) has examined the

6 In particular Smith considers “a speaker who does not face the full costs of the processing by the audience.”

distinctive notice problems flowing from fragmentation of copyrighted works as a result of software and other open content licensing strategies.

We advance this literature by developing a framework for understanding the range of notice problems and identifying a particular externality associated with claiming resources—a “notice externality.” Developers of resources—whether tangible or intangible—ideally seek to know all potential encumbrances in advance of investing their time and money in a project (cf. *Goetz & Scott 1985*, 265–72). Just as contracting parties would ideally operate with fully specified contracts, resource developers would like to know at the outset all contingencies affecting their choices. Such information includes the boundaries and holders of neighboring properties as well as the extent to which those rights affect “neighboring” activities—*e.g.*, nuisance law for nontrespassory activities, copyright law’s fair use doctrine, and patent law’s doctrine of equivalents.

Notice information comprises ownership/boundary facts as well as legal standards governing the scope of property rights. Ownership and boundary facts are a public good that is jointly produced by private and public action. Since private actors cannot fully appropriate the value of providing such information in many contexts and, more significantly, can benefit from strategically hiding, obfuscating, and distorting such information, the quality and the quantity of notice information will be suboptimal in many circumstances. The act of obtaining an intellectual property right imposes costs on others seeking to develop intangible resources. The proliferation of such rights, as well as the uncertainty regarding their validity and scope, can impose substantial costs on other creators, thereby undermining progress—the very purpose undergirding the granting of patents and copyrights (U.S. Const., art. I, § 8, cl. 8). We look to legal and economic scholarship on externalities to guide our analysis and frame policy prescriptions.

The NTP–RIM saga suggests that the notice problems caused by the intellectual property system can exceed the benefits of granting intellectual property rights in the first place. RIM had independently developed wireless email technology, yet incurred hundreds of millions of dollars in litigation costs and market risk that could have been avoided if no patents ever issued to NTP. If the patent system afforded reasonable notice, RIM would have been able to identify the relevant counterparty at the time that it set out to develop its wireless email device business. Merely by seeking patent protection for its invention, NTP imposed a notice cost on all potential developers of wireless communication developers. Although there is nothing inherently wrong with seeking patent protection—in fact, public policy encourages inventors to do so—NTP did not bear the full notice cost it imposed on countless others. This cost is exacerbated by several patent system features, notably the application

secrecy rule,⁷ the difficulty of navigating patent records that are available, and the ambiguous boundaries and doubtful validity of many patents.

Although notice externalities arise most prominently in the context of intangible resources, they are not limited to these fields. All resource systems in which parties claiming property rights potentially impose costs upon third parties suffer from this market failure. Viewing this resource problem through the market failure lens substantially broadens the range of policies and institutions that can be deployed to improve resource development planning.

Not all notice failures result from notice externalities. Notice failure can result from inherent ambiguities in the scope of property rights as well as distorted resource claiming incentives. Our policy framework extends to the full range of notice failures.

By establishing property-type rights and providing the principal institutions for recording and enforcing such rights, government plays a central role in the provision of notice. Yet, private actors play a comparably important role. Private parties bear responsibility for the information about new resources—how clearly they are described and justified. They can also take private action, such as marking their claims, to inform others of their rights.

Private parties' incentives to undertake these efforts, however, are not necessarily aligned with the social interest. Private parties tend to under-provide public goods because they do not appropriate the full value of their investments. In particular, they do not obtain the positive externalities that they bestow on others. The government as well as private actors play a variety of roles producing and disseminating notice information. In intellectual property law, standard setting organizations and industry-wide cross-licensing agreements have emerged in part to address problems of notice failure.

This article articulates the source and characteristics of notice failure and the distinctive pathology of notice externalities. Part I characterizes notice failure and notice externalities and explains how they differ from other important resource problems, such as resource fragmentation, in resource development. Part II breaks out the range of factors influencing the quantity, quality, and accessibility of notice information. It explains why notice failure is more severe for many intangible resources and why efficacious tangible property notice rules

7 At the time that NTP filed its patent application, the Patent Act provided that applications would be not available to the public until and unless the patent issued. See 35 U.S.C. § 122 (1994). Under the American Inventors Protection Act of 1999, Pub. L. No. 106-113, 113 Stat. 1501A, applications filed on or after November 29, 2000 are published 18 months after filing unless the applicant pursues protection only in the USA, in which case the applicant can maintain the application in secret until the patent is granted (35 U.S.C. § 122 (2012)).

and institutions do not readily carryover to intangible property contexts. Part III develops a framework for preventing, internalizing, and ameliorating notice failure and offers a range of policy recommendations.

2. NOTICE FAILURE AND THE THEORY OF NOTICE EXTERNALITIES

This section first characterizes notice failure and defines “notice externality” by reference to conventional externalities and in contradistinction to other sources of information costs, such as fragmentation and lack of standardization. Section B presents a typology of notice costs. Section C describes the perverse incentives that underlie notice externalities.

2.1 Distinguishing Sources of Notice Failure

When a land or factory developer sets out to build a structure, or a business considers introducing a new product into the marketplace, they would ideally know the full range of potential impediments to their projects. The land developer does not want to encroach her neighbor’s land. The factory developer does not want to cause a nuisance. And the product developer does not want to infringe any patents. Each of these actors will likely retain a resource specialist (*e.g.*, land surveyor, land use consultant, environmental lawyer, patent advisor) to determine whether the proposed project invades or infringes the rights of others. They would like to know, to the extent feasible, the rights of others before sinking their investment.

But like the contract theorist’s fully specified contract, the economist’s world of costless transactions, and the physicist’s vacuum, full knowledge of all potential constraints on resource development might not be achievable in the real world. Neither property law nor property deeds can fully specify the scope of all potential nontrespassory invasions (nuisances). Nor can copyright law or copyright registrations fully delineate all potential fair uses of the protected work. Yet, this idealized hypothetical baseline provides a valuable construct for assessing the sources of notice failures and a goal for policy intervention.

We can usefully divide the range of notice issues into two buckets: (i) “deed” information—factual information relating to the actual resource boundaries and the identity of the owner(s); and (ii) scope of property rights—information relating to the legal scope of the rights pertaining to the particular resource claim (such as nuisance, fair use, etc.). The first bucket comports with a more conventional definition of notice information. Yet, as suggested above, the resource developer cares about both buckets. Therefore, it makes sense for us

to use a definition of notice information that encompasses the functional needs of resource developers.

Notice externalities arise primarily from the “deed” or resource claiming bucket, but can be exacerbated by ambiguities attributable to the second bucket.

The familiar pollution externality provides a good starting point and analogy for motivating notice externalities. A pollution externality arises, for example, when a factory discharges a pollutant that harms a neighboring farm. More generally, an externality arises whenever a decision-maker chooses an action without regard to the full impact of that action on some other party or parties. Under standard economic assumptions, a factory chooses a level of discharge that maximizes its profits. Absent coercion, such a factory would not consider (read “internalize” in economic parlance) the cost that its pollution imposed on the farm. The pollution cost to the neighbor is called a negative externality. If the factory does not have to pay (or otherwise internalize) the pollution cost borne by the neighbor, then a profit-maximizing factory will discharge too much pollution when compared to the social optimum.

If the factory and the farm are merged into a single enterprise, then the full cost of the pollution would be internalized and the combined firm would choose the optimal level of discharge. A contract between the farmer and the factory owner can also achieve optimal pollution levels. If the farm possesses the entitlement to be free from pollution, then under the Coasean assumption of efficient contracting, the factory would purchase permission from the farm to discharge the optimal level of pollution. Likewise, if the factory enjoys an entitlement to pollute, then efficient contracting would lead the farm to negotiate with the factory to discharge the optimal level of pollution. Of course, efficient contracting faces many obstacles caused by private information, strategic behavior, cognitive limitations, and other factors (Menell & Stewart 1994, 57–63). Absent a merger or contract, pollution costs can also be internalized through government regulation, emission fees, or tradeable pollution rights.

Both private bargaining and government regulatory strategies for internalizing externalities can be effective, but they are both prone to error and subject to information costs. Ideally, property law should be crafted and property rights assigned to encourage private responses that internalize pollution externalities. When efficient private ordering is unlikely and pollution harms are significant, government intervention is needed to allocate resources efficiently.

The notice externality runs roughly parallel to the pollution externality story. A notice externality arises when the private returns to providing notice information are less than the social value. This can happen because providing notice can be costly, but also because resource owners sometimes benefit when a third-party trespasses on or infringes her rights. As the NTP–RIM example highlighted, NTP was in a stronger bargaining position after RIM had unwittingly

invested heavily in a potentially infringing wireless email technology. Had RIM been aware of this potential encumbrance before investing, it would have had greater flexibility to negotiate a deal, develop a noninfringing alternative, or pursue other investment opportunities. NTP clearly benefited from its patents not being easily known. Thus, some resource claimants may prefer to obscure the existence, scope, or ownership of their property rights. These choices can impose costs on third parties for which the resource owner is not accountable.

This is not to say that resource claimants will always choose to hide, obscure, or degrade notice information. Good notice sets the stage for timely purchase of necessary property rights or avoidance of those rights. Notice information has value to resource developers who seek to attract capital and acquirers. It is also valuable to those developers who seek to discourage squatters, interlopers, and infringers. Notice information is a public good and hence can manifest the familiar collective action pathology. But private action and coordinated action (such as in the form of collective rights organizations) can produce viable solutions under appropriate circumstances.

Uncertainty about the scope of legal rights also produces a notice problem (Bessen 2009). Even where a developer knows the ownership and boundaries of neighboring parcels, she might still be uncertain about how high she can build a structure, how much pollution her factory can emit, or how loud musicians can perform. Zoning, pollution regulations, and nuisance law govern these activities. The developer would like to be able to know these land use boundaries in assessing development choices. Similarly, a collage artist or documentary filmmaker would ideally like to know the boundaries of the fair use doctrine in developing new projects (Menell & Depoorter 2012). Likewise, technology developers would like to be able to gauge not just the literal boundaries of “neighboring” patents but also the reach of the doctrine of equivalents.

The next section explores the range of notice costs. Section C discusses incentives to generate or degrade notice information.

2.2 Notice Failure Costs

Much like the factory imposes pollution costs on neighboring farms, a resource claimant imposes notice costs on potential resource developers. Any system of private ownership or exclusive rights—such as land, patents, or copyrights—entails title, due diligence, marking, and related costs.

In general, inadequate resource notice imposes four types of costs on other resource developers:⁸ (i) costs of determining owners of potentially conflicting

8 In a similar vein, Long (2004) identifies three types of parties adversely affected by notice costs: avoiders, transactors, and builders.

property rights; (ii) costs of ascertaining boundaries of those properties; (iii) costs of assessing the scope of those property rights; and (iv) dispute resolution costs. Inadequate notice poses a risk of trespass or infringement upon other resource developers. Inefficient notice regimes raise development costs and generate wasteful litigation.

In many contexts, these costs are quite manageable because the number and complexity of “nearby” property rights are small, and thus the cost of evaluating relevant property rights is a small fraction of the value of the development project. Notice costs rise as the number of “neighbors” grows, as it becomes more difficult to identify relevant counterparties, and as the rights become more difficult to evaluate. Notably, notice costs also tend to rise with the value of the development project because the returns to enforcement of property rights tend to grow with value. Bad projects usually will not attract enforcement, whereas good projects usually will. The familiar Hollywood quip—“where there’s a hit, there’s a Writ”—reflects this dispute selection phenomenon. Blockbusters attract more lawsuits than box office flops.

The NTP–RIM story reflects a particularly pathological notice failure. It is not entirely clear whether NTP behaved strategically, but there is little question that the patent system’s notice rules hampered RIM’s development plans and produced tremendous unnecessary legal wrangling. In another modern Dickensian drama, Rambus hid most of its pending patent applications (and ongoing efforts to expand its patent claims) from an industry standard setting body in which it was participating presumably in the hopes that the organization would adopt a standard that infringed its patents (*Rambus Inc. v. Fed. Trade Comm’n*, 522 F.3d 456, (D.C. Cir. 2008); [Hovenkamp 2011](#), 230–233).

Documentary filmmakers can bear substantial notice costs. After extraordinary filmmaking and rights clearance effort, Henry Hampton produced the landmark 14-part documentary *Eyes on the Prize: America’s Civil Rights Years/Bridge to Freedom 1965*, which debuted on PBS in 1987. Stanford History Professor Clayton Carson and editor of Dr. Martin Luther King Jr.’s papers praised the documentary as “the principal film account of the most important social justice movement of the 20th century” ([Dean 2005](#)). The film contained hundreds of copyrighted works—photographs, music, and film clips—for which clearance was painstakingly obtained. Unfortunately, many of the permissions expired in 1987 and Hampton did not have the foresight to obtain rights to exploit the underlying works in the yet-to-be-developed DVD format. As a result, access to the documentary was substantially limited for nearly two decades ([Brown & Harris 2005](#); [Heller 2008](#)). After expenditure of approximately one million dollars and nearly two decades of detective and negotiation work, sufficient rights were cleared (or material replaced) to re-release *Eyes on the Prize* in DVD format in 2006 ([Dean 2005](#)).

In many cases of notice failure, the resource developer knows the property owner, but attempts to avoid infringement rather than bargain for permission. When the scope of the rights is ambiguous, such a strategy can prove costly. The following case studies drawn from intellectual property law illustrate the risk:

- In 1998, Nickelodeon Television Network approached snack product manufacturer Nabisco about developing a new line of crackers based on its hit children's series CatDog, which features a two-headed creature that is half cat and half dog. Pursuant to the Joint Promotion Agreement, Nabisco marketed a mix of cheddar cheese flavored crackers in three shapes: half of the crackers were modeled after the CatDog character, one-quarter were shaped like bones (for the dog half of CatDog), and one-quarter were shaped like a fish (the cat half's favorite). Pepperidge Farms, the owner of a registered trademark on the shape of goldfish crackers, sued Nabisco on the ground that one-quarter of the crackers in their mix infringed and diluted the goldfish trade dress (*Nabisco, Inc. v. PF Brands, Inc.*, 191 F.3d 208 (2nd Cir. 1999)). After finding that the CatDog goldfish cracker likely diluted Pepperidge Farm's trademark, the court granted a preliminary injunction blocking Nabisco from distributing the cracker mix.
- In the mid-1970s, Kodak, the leading photography company, decided to enter the instant camera market that Polaroid had long dominated ([Photography: Instant Battle 1976](#)). In order to avoid infringing Polaroid's patent portfolio, Kodak hired a top patent lawyer to work closely with Kodak's technical staff as they developed what they believed would be a noninfringing competing camera. The patent lawyer gave frequent advice about design choices intended to avoid infringing Polaroid's patents. Nevertheless, when Kodak launched its new camera, Polaroid sued for patent infringement and won (*Polaroid Corp. v. Eastman Kodak Co.*, 789 F.2d 1556 (Fed. Cir. 1986)). It was little solace to Kodak when the district court judge praised Kodak for taking such care to avoid infringement (*Polaroid Corp. v. Eastman Kodak Co.*, 1990 WL 324105, *76-*79 (D.Mass. 1990)).⁹
- In the late 1980s, Borland Corporation developed an improved spreadsheet program ([Menell 1998](#)). Many customers in the marketplace, however, had already made substantial investments in developing customized

9 Judge Mazzone noted that “[d]uring the lengthy and detailed patent clearance process he performed for Kodak, Mr. Carr considered over 250 Polaroid and non-Polaroid patents and rendered 67 written and countless oral opinions on both the film and camera patents.” He concluded that the record “shows a patent clearance process that could serve as a model for what the law requires.”

macros—specialized sequences of spreadsheet commands—keyed to the Lotus 1-2-3 menu command hierarchy. In an effort to provide a bridge for those customers to Borland’s *Quattro Pro* spreadsheet, Borland programmers carefully developed code to enable Lotus macros to operate within Borland’s product. Borland employed procedures to ensure that no Lotus code was copied. Nonetheless, Lotus sued alleging that Borland had infringed copyright in its menu command hierarchy. Lotus prevailed at the district court, but the First Circuit reversed (*Lotus Development Corp. v. Borland Int’l, Inc.*, 49 F.3d 807 (1st Cir. 1995), *aff’d by an equally divided Court*, 526 U.S. 233 (1996)). During the years that this litigation distracted both Lotus and Borland, Microsoft’s Excel product gained substantial ground and became the market leader.

In these three cases, Nabisco, Kodak, and Borland sought to design competing products without violating rivals’ intellectual property rights. Nabisco and Kodak lost. Borland ultimately prevailed in court, although the litigation likely contributed to its (and Lotus’s) marketplace decline. These sorts of gambles arise because the scope of intellectual property rights is uncertain, negotiating with competitors can be particularly difficult in the shadow of such uncertainty, and intellectual property systems lack good preclearance institutions. Competitors cannot typically obtain definitive rulings on the precise location of boundaries and the scope of rights. The litigation costs represent a direct social loss, but the greater social cost may come from the chilling effect of property rights with fuzzy boundaries. A land owner should be able to plant crops up to a neighbor’s property line. Likewise, firms should be able to compete vigorously by approaching intangible property lines. The scope of rights should not be effectively expanded because of the fear of litigation.

Now that we have delineated various notice costs, it is useful to distinguish other sorts of bargaining and informational costs associated with private property systems. The tragedy of the anticommons involves notice costs, but does not necessarily reflect a notice externality. An anticommons problem can arise when the existence, scope, and ownership of relevant property rights are known to everyone. The social harm flows from the costs of negotiating the best resource use involving highly fragmented resources. As Michael Heller has cataloged, numerous veto threats cause delay or abandonment of desirable projects, or cause the price of inputs to soar above the monopoly price because of the perverse nature of oligopoly pricing of complements. *Eyes on the Prize* shows that the cost of locating copyright owners can be very great. But after the owners have been located, the hold-out problem remains—permission from nearly every copyright owner was required to exploit the series on the DVD format.

Notice externalities are also not simply a problem caused by uncertainty. Notice failure impedes early bargaining between property owners and resource developers because potential counterparties often cannot find each other until after a dispute arises. When developers can identify relevant counterparties before sinking large investments, the opportunity exists to negotiate in advance and to take steps to mitigate hold-up problems (Williamson 1979, 1985).

We also distinguish notice externalities from the costs of dealing with nonstandard property forms examined by Thomas Merrill and Henry Smith (2000): “The existence of unusual property rights increases the cost of processing information about all property rights. Those creating or transferring idiosyncratic property rights cannot always be expected to take these increases in measurement costs fully into account, making them a true externality.” Although related to notice externalities in that standardized forms can reduce the costs of communication, the Merrill and Smith standardization externality derives principally from distinct economic phenomena (Hemenway 1975; Katz & Shapiro 1985; Menell 1987; Lemley & McGowan 1998). The notice externality concept illuminates a deeper pathology.

2.3 Notice Provision Incentives

At first blush, one might think that resource claimants would prefer clear boundaries and accessible notice information.¹⁰ This instinct can be correct for several reasons. First, claimants will want to secure their property and will therefore seek to comply with applicable legal requirements. For example, claimants will specify land boundaries using the Public Land Survey System, write claim language in a patent application, or include drawings in a design patent application. Second, claimants prefer to invest in boundary information when that will increase the value of their resources—*e.g.*, through sale, financing, collaboration with other developers, rental, or licensing. Land developers are likely to find that subdivisions with clear boundaries and covenants will maximize the sale price of the land parcels contained in the development. In addition, the developer may feel competitive pressure to make efficient investments in notice (Smith 2003). Third, resource claimants sometimes produce boundary information as a byproduct of the efforts to deter trespass or infringement via self-help measures, like fences, locks, and encryption. When these positive motivations predominate, notice externalities will not manifest or will be relatively inconsequential.

10 Of course, even if an owner prefers clear boundaries, it will only produce notice information up to the point when the marginal cost equals the marginal benefit of such information. Furthermore, it is possible that government production of such information will “crowd out” private production of the information.

In other settings, resource claimants can gain strategic advantages from obfuscating their property interest and identity. Gary Libecap and Dean Lueck note that under metes and bounds land systems—which affords greater leeway in the specification of boundaries than formal marked boundaries or rectangular survey systems—settlers had at least two incentives to leave boundaries vague and flexible: (i) “in a wilderness it was costly to locate precise boundaries during the initial land claim, and hence difficult for the surveyor who followed to find those boundary markers”; and (ii) “given the lack of information about the location of the most desirable lands at the time of the initial land entry, claimants did not want to be bound to absolute markers” (Libecap & Lueck 2011a). Along similar lines, a patent applicant gains from being able to update her claims as competitors introduce new products, thereby improving the likelihood that the competitor falls within the scope of the claimed invention.¹¹

In addition, remedies for trespass or infringement, such as injunctive relief, can provide the resource owner with much greater bargaining leverage after a developer has already sunk substantial resources into a project or product. The cost of licensing a copyrighted work for use as a film prop or set design will be relatively low before the film is shot because the director will have alternative props and designs available. But after the film has been produced and marketed, the threat of an injunction on the eve of release places the infringer over a barrel.¹²

When the price of lodging resource claims is low, claimants have little to lose and potentially a lot to gain from hoarding rights and lying low. Many of the rights will prove valueless, but even a small possibility of extracting substantial value from independent developers who commercialize similar technologies can justify the up-front claiming investment.¹³ Nonpracticing entities in the patent world benefit from the difficulty that the developers face in searching the millions of patents and patent claims.

11 See Burk and Lemley (2009a) (observing that patentees routinely overclaim in the hope of retroactively claiming ownership over inventions that were not contemplated at the time of patenting); Chen (2008) (noting that patent drafters use “vague and ambiguous language in order to preserve sufficient maneuverability for future litigation”). The applicant cannot claim beyond what she “possessed” as of the filing date (*LizardTech, Inc. v. Earth Res. Mapping, Inc.*, 424 F.3d 1336, 1345 (Fed. Cir. 2005); *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473 (Fed. Cir. 1998)). But having a vague specification could well provide greater flexibility for expanding claim scope through continuation practice.

12 In *Woods v. Universal City Studios, Inc.*, 920 F. Supp. 62 (S.D.N.Y. 1996), the court granted a preliminary injunction against the film *12 Monkeys* based upon the unauthorized use of a graphic work for the design of one film set.

13 Gladwell (2008) reports that a prominent nonpracticing entity, Intellectual Ventures, generates hundreds of patent applications per year via “invention sessions.”

In some cases, private advantages can flow from hiding ownership and acquisition strategies. The classic pipeline assembly problem illustrates the hold-out problem that can arise when single parcels having relatively low value on their own take on enormous leverage when they become essential to a large project. For that reason, developers legitimately seek to avoid large-scale property assembly efforts from becoming known. The power of eminent domain provides a mechanism for addressing this concern when the project is for public use.

Opportunities to profit from hiding or obfuscating notice information will depend on the nature of resources, the efficacy of notice institutions, the scope of resource rights, and the remedies available for trespass and infringement. As the next section explores, intangible resources are particularly prone to notice failure.

3. NOTICE FAILURE AND RESOURCES

This section examines the circumstances in which notice failure is most likely to manifest. We begin by looking at land notice systems as a baseline for understanding notice rules and institutions. Part B then explores the particular notice challenges posed by intangible resources.

3.1 Land

A land developer typically has little trouble identifying property rights and property owners who might credibly assert a claim against a proposed project. The tangible, geographic, and rivalrous characteristics of land, as well as the precision of land claims and the availability of public recording systems and related institutions (such as finance and title insurance), provide relatively reliable and inexpensive means for verifying potential property conflicts. Furthermore, there are relatively few abutting neighbors with whom a developer must negotiate any adjustments.

If we ask a residential landowner about her neighborhood and neighbors, she might respond something like the following: “We live on a quiet residential street of quarter acre lots. Martha and Tim Burns live on the north side of our property, the Sanchez family lives on the south side, the Johnsons live behind us, and the Cohens live across the street.” And even if she did not know all of the names, she could easily determine them from county property records. If she wanted to build a new garage, she would be able to identify all those who might be affected and hire a surveyor to determine the boundaries reliably.

In contrast, if we were to ask the developer of a new smart phone about their neighborhood, they would be hard pressed to identify their neighbors or even the contours of the neighborhood. They would likely be able to identify the principal competitors in the marketplace, but smart phone technology exists

within an opaque multidimensional domain covered by several technology fields. The developer would have to assess a bewildering array of patents to determine whether it could practice its innovative design.

Inherent characteristics of land make it easy to measure and communicate. Land surveys are precise and inexpensive when compared to the value of most land. Signs, fences, and other structures are also available to communicate boundary and ownership information efficiently.

Public and private institutions have developed over hundreds of years in conjunction with surveying technology and the law to clarify ownership, boundaries, and rights. Publicly available records disclose rights holders and deeds. In addition, title companies have developed their own libraries of land records to make search and assessment of land rights more efficient.

The seemingly simple notion that land boundaries can be defined with respect to a pre-established grid was first implemented in the USA in the Public Land Survey System in the western territories shortly after the Revolutionary War. Before this rectangular grid was established, surveying was relatively expensive and imprecise. Notice problems on the American frontier were common and significant. A typical metes and bounds deed might describe the property as bounded “From the point on the north bank of Muddy Creek one mile (1.6 km) above the junction of Muddy and Indian Creeks, north for 400 yards, then northwest to the large standing rock, west to the large oak tree, south to Muddy Creek, then down the center of the creek to the starting point (Public Land Survey System http://en.wikipedia.org/wiki/Public_Land_Survey_System).” Centralized, pre-surveyed land systems involve substantial up-front costs. Thus, mandating such a system would have delayed settlement of frontier lands. For these and other reasons, much of the land mass of the USA was settled through decentralized, metes and bounds allocation systems, whereby claimants defined property boundaries with nonstandard methods of measurement and parcel shape. Nonetheless, individuals demarcated land claims in rectangular parcels when the land was flat and homogeneous (Libecap & Lueck 2011a). They claimed land using metes and bounds when topography was rugged and quality varied. Using a natural experiment from 19th century Ohio, Gary Libecap and Dean Lueck (2011b) found large initial net benefits in land values from the rectangular system that persisted well into the 20th century. The lack of an overall framework for coordinating land demarcation, the vagueness of boundaries, and the irregular shapes of parcels were major contributors to property disputes.¹⁴

14 Libecap and Lueck (2011b) found the litigated dispute rate in metes and bounds regions to be nearly eighteen times the rate for rectangular survey regions in 19th-century Ohio.

Good notice in land is further aided by the relatively simple structure of real property law. For example, the *ad coelum* doctrine affords a landowner control over all resources within the boundaries of the three-dimensional column defined by the deed. Thomas Merrill and Henry Smith (2000) emphasize the value of standardization in property forms and modularity in designating property boundaries. Various common law doctrines and statutory rules reduce and resolve notice problems on the back-end. The adverse possession doctrine and good faith improver statutes provide mechanisms to resolve disputes over clouded title (Dwyer & Menell 1998, 76–84, 292–296).

This is not to suggest that notice problems do not arise in modern real property settings (Heller 2008). The principal problems, however, relate to assessing permissible uses of land in more densely populated communities.¹⁵ Neighbors can object to development projects that negatively affect the value of their land. Zoning regulates permissible land use. The goal of zoning is to encourage compatible use of neighboring parcels. Nuisance law also addresses conflicting land use by granting neighboring land owners protection against noxious uses of land. These rules introduce some uncertainty into land use planning.

But even so, notice costs are usually not severe and zoning institutions enable developers to determine whether a development project passes muster before the major construction costs are incurred. Furthermore, some uncertainty about permissible uses is not necessarily an obstacle to early, efficient resolution of disputes among affected parties. Land developers can typically identify relevant counterparties relatively easily. Uncertainty about liability by itself usually does not cause bargaining failure. Rather, breakdowns tend to be driven by private information about a dispute or divergent beliefs about the likely trial outcomes. Such breakdowns might be related to notice, but are more commonly attributable to other factors.

Thus, modern systems of private property rights in land (and most tangibles) provide good notice because: the inherent characteristics of tangible resources keep measurement costs low; public and private institutions support efficient search for information about land rights and land owners; many of the rules governing tangible resources are relatively clear; and institutions enable developers to resolve disputes prior to large development expenditures. Hence, notice externalities do not frequently arise. Rules and institutions enable developers to obtain good notice relatively quickly and at low cost before large

15 Zoning restrictions and nuisance law significantly constrain landowners' ability to develop land in many settings. These regimes typically seek to internalize the costs that development imposes on third parties—neighbors and the community at large.

investments are sunk. The next section explains why these salutary qualities do not necessarily carryover to intangible resources (Menell 2011).

3.2 Intangible Resources

An essential component of developing any project—whether tangible or intangible—is assessing the risks posed from potentially conflicting rights owners. Such risks impair the primary objectives of the project, run up the costs of assessing the project, and stand in the way of obtaining financing. The nature of real property in conjunction with real property rights and institutions minimize the costs of identifying conflicting rights and rights-holders, ascertaining boundaries, quieting title, preclearing development, and insuring against problems that might arise. In most land development contexts, notice problems do not stand in the way of the project. They represent a modest component of the overall budget.

In contrast, developers of many intangible resource projects face significant problems in identifying potentially conflicting rights, ascertaining the boundaries of those properties that they can find, locating the owners of potentially conflicting properties, and assessing the scope of potentially conflicting rights. Neither the PTO nor the Copyright Office can look up a development tract and provide the names, addresses, and contours of all “neighboring” property owners. The courts cannot definitely quiet title among all intangible rights holders. The developer cannot typically gain predevelopment clearance of any identified potentially conflicting right short of negotiating a license. Nor can developers typically obtain insurance against infringement risks. These problems undermine the matching process that can be critical to resource planning and development. They implicitly encourage resource claimants to hide and obfuscate notice information in several important circumstances, producing notice externalities. As a result, the ratio of notice costs to overall development cost can be prohibitively high for intangible resource projects.

We compare the notice provided by intangible property systems to the notice provided by real property systems along three principal dimensions: inherent characteristics of the resource that influence measurement and search costs; the effectiveness of institutions for recording, verifying, clearing, and insuring against property claims; and the complexity and dynamism of rights associated with the resources. Figure 1 provides a map for navigating the many complicating factors.

3.2.1 Inherent Resource Characteristics

A simple but important starting point for our comparison is the number of relevant property rights that need to be considered by a resource developer.

Figure 1. Determinants of Notice Externalities.

A. Inherent Resource Characteristics
1. Number of Neighboring Property Rights
2. Usefulness of Physical Inspection of Resource
3. Standardized Measurement Technology
4. Difficulty Codifying Boundary Information
5. Likelihood of New Uses of the Resource Emerging
B. Institutions
1. Quality of Public Property Rights Registry
2. Private Institutions that Publicize and Clear Property Rights
3. Dispute Resolution and Pre-Clearance of Development Projects
4. Risk Spreading (Insurance)
C. Complexity and Dynamism of Property Rights
1. Coherent or Contested Normative Framework
2. Complexity of Rights, Defenses (including Safe Harbors), and Remedies
3. Competition Concerns – Antitrust, Misuse, and Freedom of Contract
4. Dynamic and Collaborative Nature of Creation and Invention

A parcel in a residential neighborhood typically borders two to eight other parcels. In contrast, there is no typical number of neighbors bordering an expressive work, a trademark, or a patented invention. At one extreme, the Google Books project involves copying millions of books, each of which can embed many expressive works. Many of them are under copyright, but the copyright status and the identity of the copyright owners are often unclear. Furthermore, many books contain embedded licensed copyrighted works, such as photographs and contributions to collective works. At the other extreme, the makers of corporate training videos can often be confident that no copyrights owned by others could be credibly asserted against them. A film can incorporate dozens of copyrighted works—such as script elements derived from literary works, embedded film clips, sound clips, sound tracks, and props. There are

over 5000 U.S. trademark registrations of word marks containing the word “united.”¹⁶ A laptop computer incorporates hundreds of components, each of which may itself read on numerous patents (Phelps & Kline 2009).

After locating neighbors, land developers can learn about boundaries, ownership, and squatters by physically inspecting the parcel. The location of walls, structures, and landmarks can be directly observed. By contrast, intangibles—as nonrivalrous resources—can be used simultaneously by different users and therefore inspection does not conclusively resolve ownership. Therefore, search within the marketplace might not offer sufficient notice to subsequent independent creators.

The next critical difference between tangible and intangible resources concerns the existence of standardized measurement systems. Land parcels typically can be represented on a two-dimensional grid with neighboring properties lying contiguously. Modern survey technology enables land boundaries to be determined with scientific precision. These coordinates can be easily recorded within a publicly accessible database and represented in a systematic geographical information system.

Unlike land, intangible resources cannot be cataloged in advance. Standard measuring rods are not available for most intangible resources. Many intangible neighborhoods have complex, multidimensional boundaries. Software, for example, is notoriously amorphous, whereas chemistry has the Periodic Table to guide cataloging of knowledge. We cannot, for example, simply allocate up to 160 acres per settler, as the Homestead Act authorized to entice development west of the Mississippi River. A hint of the difficulty in organizing information about patents comes from analysis of patent classifications. The structure of the classification changes as new fields emerge.

As a result, intangible resource boundaries are often difficult to codify (Long 2004). The patent system allows patentees to be their own lexicographers, which contributes the challenge of defining boundaries (Menell, Powers, & Carlson 2010). Judge Zobel invoked *Alice in Wonderland* in explaining patent claim construction:

“When I use a word,” Humpty Dumpty said, . . . “it means just what I choose it to mean—neither more nor less.”

“The question is,” said Alice, “whether you can make words mean so many different things.”

16 See U.S. Patent and Trademark Office, Trademark Electronic Search System (search conducted on October 15, 2011) <<http://tess2.uspto.gov/bin/gate.exe?f=tess&state=4003:5r21hv.1.1>>.

“The question is,” said Humpty Dumpty, “which is to be master—that’s all.” (*Polaroid Corp. v. Eastman Kodak Co.*, 641 F.Supp. 828, 838 n.8 (D.Mass. 1986), *aff’d* 789 F.2d 1556 (Fed. Cir. 1986)).

Reflecting the relative imprecision of words in comparison to geophysical measures, scholars have found a relatively high reversal rate for claim construction rulings (Anderson & Menell 2012; Moore 2005a) and shown that even experienced patent jurists fare little better than new judges (Schwartz 2008, 2009). The jurisprudence of claim construction has been roundly criticized for lacking coherence (Burk & Lemley 2009a; Mullally 2007; Miller 2005; Wagner & Petherbridge 2004).

Copyright boundaries depend in part on audience reaction to an expressive work. While copying of the entirety of a copyrighted work typically crosses the infringement line, it is often difficult to determine the protection of components or nonliteral elements of a copyrighted work (Merges et al. 2012, 549–52). Similarly, trademark boundaries are tied to whether consumers are likely to be confused by the use of a word or symbol. Actual consumer confusion can matter, but ultimately the test depends on multiple factors used to gauge conjectured consumer reaction.¹⁷

Rights are harder to locate and understand when the uses of property change over time. The range of possible uses of inventions and expressive works is often not understood at the time of creation. In his principal telegraphy patent application, Samuel F.B. Morse sought to claim all the uses of “the motive power of the electric or galvanic current, which I call electro-magnetism, however developed for marking or printing intelligible characters, signs, or letters, at any distances” (*O’Reilly v. Morse*, 56 U.S. (15 How.) 62, 112 (1854) (invalidating claim 8)). Half a century later, Guglielmo Marconi, the first person to demonstrate the use of radio waves to communicate messages, envisioned ship-to-shore communication as the primary use of this technology. Fortunately for General Electric Corporation (GE), licensee of Marconi’s patents, the claims supported broadcasting and GE leveraged these rights in its Radio Corporation of America joint venture to build a vast consumer electronics and broadcasting empire (Watkins).

17 Boundary definition and verification problems also arise with regard to some tangible resources. Subsurface mineral rights in the American West often failed to provide clear boundary information in the second half of the 19th century. Although boundaries around surface mineral claims can be described using traditional surveying techniques, mineral veins meander below the surface with occasional discontinuities caused by faulting. Different miners would sometimes tunnel to the same vein at different sites. Since measurement was difficult and the geology was not well understood, each miner would claim the vein, and costly and protracted litigation would often follow.

3.2.2 Institutions

Comprehensive, reliable, publicly accessible, and readily searchable resource registries form the foundation for an ideal system of notice provision. County land offices have long provided such services for land resources. Similar registries exist for public land resource claimants. Although the PTO and the Copyright Office maintain indices of patents, registered trademarks, and registered copyrights, they fall well short of the ideal.

As noted earlier, until a decade ago, the PTO did not disclose patent applications unless and until it granted a patent. Even today, applications remain secret for 18 months after filing and can be kept secret until patent issuance if the applicant chooses to pursue patent protection only in the USA. Although patent damages can only extend back to the time that the public was on notice of the claimed invention, developers might well be sinking large investments in technologies that infringe upon inchoate patent rights.

Two significant and related problems for the patent system are the slow speed and questionable quality of patent examination. Many technology markets move quickly, yet patent prosecution averages approximately three years from filing. Furthermore, and of particular relevance to notice quality, the examination system affords patentees substantial opportunity to revise their claims during the prosecution period through continuation practice (Lemley & Moore 2004). Of perhaps greatest significance, the PTO has a high rate of false positives (invalid patent grants) (Allison & Lemley 1998; Lemley & Sampat 2008) and devotes little effort to ensuring the clarity and scope of patent claims (Bessen & Meurer 2008). Furthermore, the secrecy of patent applications (for at least 18 months in most cases) and the *ex parte* nature of examination limits the prior art considered by the examiner.

Since copyright and trademark registration are voluntary, PTO and Copyright Office registries fail to provide the public with reliable notice of claimed works. U.S. copyright works need not be registered unless the owner seeks to enforce their rights in court. Owners of works of foreign origin never need to register their works. Although the U.S. copyright law provides various enticements to register copyrighted works,¹⁸ the Copyright Office registry is notably incomplete (Sprigman 2004; U.S. Copyright Office 2006; *cf.*, Ginsburg 2010). Moreover, copyright owners bear no legal responsibility to update their ownership information. Furthermore, Copyright Office records can be costly and difficult to search and cannot provide a guarantee as to the

18 Copyright registration records a copyright claim, secures rights to file an infringement action (for U.S. works), establishes *prima facie* validity of copyright, expands remedies, and assists in providing constructive notice of facts in recorded documents.

contours of the neighborhood.¹⁹ Federal trademark law protects unregistered trademarks (Lanham Act § 43(a); 15 U.S.C. § 1125(a)), and hence all manner of trademarks—from word marks and logos to trade dress (nonfunctional aspects of product shape and packaging)—can be “owned” and yet difficult to trace.

Private institutions supplement public registries. Title insurers, for example, have developed more thorough and easily searchable tract indices for land resources. The supplementation of public intellectual property registries, however, is spotty. Collective rights organizations, such as ASCAP and the Harry Fox Agency, have developed independent systems for tracing particular classes of copyrights (musical composition ownership). The Copyright Clearance Center provides collective licensing services for corporate and academic users of copyrighted works. Private search enterprises, such as Thomson Reuters, offer a wide range of intellectual property clearance services, but at a high price and without guarantees.

Unlike land institutions—which enable developers to preclear projects through zoning administrations and quiet title through legal proceedings—intangible resource regimes do not provide much in the way of advance clearance options. Trademark law provides the most effective mechanism through the intent to use (ITU) application process (Beebe et al. 2011). In essence, the developer of a new product or service can vet a mark with the Trademark Office and obtain a priority date (based on the application date) and preapproval for inherently distinctive marks. Other users of related marks can participate through opposition proceedings—a form of pre-grant review. The successful applicant receives a Notice of Allowance prior to incurring the costs of marketing goods or services under the mark. Upon introducing the mark within the statutorily designated period, the applicant can file a Statement of Use upon which the Trademark Office can complete examination and issue a registration certificate. Upon registration, the applicant receives a constructive priority date as of the ITU application filing date.

19 See U.S. Copyright Office, Circular 22: How to Investigate the Copyright Status of a Work 3 <<http://www.copyright.gov/circs/circ22.pdf>> (“The complete absence of any information about a work in the Office records does not mean that the work is unprotected.”; “The Copyright Office does not maintain any listings of works by subject or any lists of works that are in the public domain.”; “Individual works such as stories, poems, articles, or musical compositions that were published as contributions to a copyrighted periodical or collection are usually not listed separately by title in our records.”); U.S. Copyright Office, Circular 6: Obtaining Access to and Copies of Copyright Office Records <<http://www.copyright.gov/circs/circ06.pdf>>. Works registered prior to 1978 can only be found in the Copyright Public Records Reading Room at the Library of Congress. Works registered after 1978 are available through an online catalog.

Neither the patent nor the copyright system provides nearly as effective preclearance services. The PTO's re-examination process allows developers to contest the issuance of patents.²⁰ This process entails substantial risk to the party seeking review. Unless the patent is invalidated, there will often remain questions as to whether competing developer's composition of matter, device, or process infringes the patent. Given the proliferation of patents covering many fields, the re-examination process rarely affords assurance of freedom to operate. Furthermore, the PTO does not provide binding interpretation of claim scope.

Another route developers can sometimes pursue is a declaratory judgment action in federal court. Such proceedings are costly, time-consuming, and often expose the developer to countersuit. Furthermore, they cannot be pursued unless the patentee threatens enforcement. Due to ambiguity over what constitutes a sufficient threat to support jurisdiction over a declaratory relief filing (and the strategic advantages relating to venue), patentees and alleged infringers often engage in a complex drama analogous to Kabuki theater. Therefore, the developer cannot obtain a definitive determination of noninfringement without enduring a judicial enforcement proceeding, which jeopardizes the developer's upfront investment as well as substantial monetary damages and attorney fees.

Standard setting organizations (SSOs) can provide a partial institutional response to the preclearance problem in some technology industries (Lemley 2002). In particular industries, such as those developing network technologies, standard setting bodies promote notice of intellectual property rights, and reduce ex post holdouts through by-laws requiring disclosure of intellectual property rights (including inchoate rights) and binding signatories to license proprietary technologies on fair, reasonable, and nondiscriminatory (FRAND) terms. But given that those terms are not specified ex ante, the cost of FRAND essential patents can remain uncertain when investments are made and parties must still incur substantial transaction costs resolving disputes. At a minimum, however, these arrangements should prevent outright blocking of competing uses of proprietary technologies by SSO members—*i.e.*, they appear to take injunctive relief off the table should a dispute arise.

The copyright system fares little better with regard to conventional projects. Documentary filmmakers face stark choices in using works of uncertain provenance (Menell & Depoorter 2012; Aufderheide & Jaszi 2011; Donaldson 2008). Even when they can find the owner of a copyrighted work, cumulative creators—those seeking to build on the works of others—frequently encounter difficult questions as to whether a use falls within the ambit of the fair use

20 Pursuant to the America Invents Act, challengers can now initiate postgrant review during an 18 month period following patent issuance (35 U.S.C. §§ 321–29). It remains to be seen whether this procedure will prove effective at weeding out invalid patent grants.

doctrine. Short of taking a license, there is often no way to be assured that the use will be legal. Furthermore, the risks of erring can be high—possibly an injunction or statutory damages. Technology developers also face significant risks introducing new devices and services that pose the potential for direct or indirect liability. As with patents, there is no preclearance institution for resolving these uncertainties before substantial investments have been made and substantial liability exposure risked.

The Digital Millennium Copyright Act (DMCA) introduced two innovative procedures for balancing technological innovation and copyright protection. Under the Section 512(c) safe harbor (17 U.S.C. § 512), online service providers (OSPs) can host works uploaded by others without fear of financial liability or substantial disruption to their operations if users post infringing works. The safe harbor provides for a notice and takedown procedure that allows copyright owners to seek removal of infringing works efficiently. The OSP need merely follow the statutory procedures for expeditiously removing or blocking access to the allegedly infringing material. The uploader can serve a counter notification stating that she believes in good faith that the material was wrongfully removed, which the OSP must pass along to the copyright owner who sought removal. The copyright owner then has 10 working days in which to seek judicial relief. If she does not do so, the OSP has four working days to restore the material. This set of responsibilities and procedures has afforded OSPs with substantial freedom to develop hosting services without fear of crushing liability. It also provides copyright owners with relatively efficient means for blocking dissemination of infringing copies.

The DMCA also provides a regulatory procedure for addressing the scope of its anticircumvention provisions (17 U.S.C. § 1201). Under Section 1201(a)(1)(C) of the DMCA, the Librarian of Congress has authority to exempt classes of “noninfringing uses” for 3-year periods (subject to renewal). The Librarian has gradually expanded the list of exempted uses to include circumvention of technical protection measures to enable “jailbreaking”²¹ of iPhones and “vidding”²² of small portions of video works for educational uses by college professors and media students, documentary filmmaking, and non-commercial videos.

Private insurance can mitigate exposure to notice problems. Movie studios, musicians, and software developers can spread the risk of copyright liability through errors and omission coverage (Donaldson 2008). Documentary

21 “Jailbreaking” refers to circumvention of technical protection measures on smartphones in order to allow third-party applications and services.

22 “Vidding” refers to incorporating portions of motion pictures into new works.

filmmakers have particular difficulty finding affordable liability insurance due to the challenges of verifying and assessing infringement risks. Due to the limited availability of insurance, documentary filmmakers can encounter tremendous difficulty in lining up distributors for their works. These distributors—which are large, highly capitalized firms—fear exposure for direct and indirect liability.

Software developers can generally obtain insurance against the risk of a trade secret lawsuit, but have much greater difficulty obtaining comparable coverage against the risk of patent infringement. The market for insurance against patent infringement is almost nonexistent, possibly because of the tremendous risk of nonpracticing entities emerging from the woodwork, the unpredictability of patent infringement litigation, and the variable costs of patent defense.

3.2.3 Complexity and Dynamism of Property Rights

Private land rights reflect a relatively simple, broad, and absolute conception of exclusivity. Within the three-dimensional column established by the *ad coelum* rule, the landowner holds the rights to exclude, possess, use, reap fruits, destroy, and transfer, subject to correlative rights of neighbors (Merrill 1985b).²³ Thomas Merrill and Henry Smith (2000) explain that property law offers land owners a limited set of choices about how they can structure real property rights in order to reduce the costs of third parties to understand the content of property rights.

Intellectual property rights are more qualified, remedies more complex, and defenses more numerous than rights, remedies, and defenses in real property law. As a result, there is greater notice information to communicate and a greater opportunity for notice failure. Intellectual property rights systems serve principally as instrumental exceptions to the default background norm of free competition (Menell & Scotchmer 2007). Patents and copyrights create temporary, artificial scarcity relating to the use of knowledge for the purpose of promoting progress in technology and expressive creativity. Trademarks function primarily to promote integrity of the marketplace by enhancing consumer decision-making and encouraging firms to supply quality products and services by protecting means of designating source.

In contrast to the broad, uniform, and intuitive land rights bundle, intellectual property regimes employ far more variegated and limited bundles of rights (Menell 2007c; Lemley & Shapiro 2005). These more complex rights structures reflect a range of countervailing legislative and constitutional purposes: (i) promoting cumulative creativity; (ii) restricting monopoly exploitation; (iii) avoiding impairment of free expression; (iv) accommodating access by

23 Zoning, nuisance, and takings law operate as the principal limitations on these exclusive rights.

underserved constituencies; and (v) limiting overreaching by the publishers. As a result, intellectual property regimes employ numerous doctrines that involve substantial subjectivity (e.g., copyright's infringement standard (substantial similarity of protected expression) and fair use defense, patent law's doctrine of equivalents, trademark law's infringement standard (likelihood of confusion), exemptions, compulsory licenses, inalienability rules, and temporal duration). In addition, intellectual property law deploys various complex channeling doctrines (idea/expression dichotomy, useful article doctrine, and functionality doctrine) to prevent interference among the modes of intellectual property protection.

For related reasons, intangibles have more complex remedial structures than traditional property entitlements. Reflecting the near automatic granting of injunctive relief for trespass on real property, Calabresi and Melamed (1972) characterized entitlements protected by a "property rule" to require that the holder consent to any encroachment or other violation: "once the original entitlement is decided upon, the state does not try to decide its value." In contrast, the Supreme Court held in *eBay v. MercExchange*, 547 U.S. 388 (2006), that granting of injunctive remedies in intellectual property cases depends on balancing of equitable factors. Monetary relief can be particularly difficult to determine in intellectual property cases. The Patent Act affords owners no less than a reasonable royalty. But given the uniqueness of patent resources, the value of patents can be particularly elusive. Moreover, the Patent Act allows for damages to be increased by up to a factor of three in exceptional cases. This places tremendous importance upon whether the infringer acted "willfully." This doctrine discourages intangible resource developers from searching patent records.

Due to the valuation difficulties and concerns about underenforcement, the Copyright Act allows copyright owners to elect statutory damages within a wide band. The Supreme Court has placed discretion to set statutory damages within the jury's hands, further complicating the valuation determination.

The nearly schizophrenic commitment of patent and copyright law to broad access and diffusion of information as well as strong rights to exclude has further complicated the law in these areas. Antitrust law, misuse doctrines, and preemption doctrines have been deployed against patent and copyright owners to promote competition. Particular problems arise in leveraging intellectual property rights into related markets (e.g., Microsoft's integration of web-browsing technology into its operating system), the development of standards (e.g., efforts by companies to influence industry-wide standards without disclosing their patent applications), and licensing of intellectual property rights (e.g., restrictions on use of licensed products). Antitrust and fair use limitations can create additional uncertainty in determining the effective

scope and enforceability of intellectual property rights, further clouding the intangible resource boundaries and who may exercise power under these rights.

The interplay of federal intellectual property law and contract law is especially murky. Under the Supremacy Clause of the U.S. Constitution, federal law overrides conflicting state law. Even where federal law does not expressly preempt state law, courts will refuse to enforce state law (including contracts that would otherwise be enforceable as a matter of state law) where federal law “occupies” the field or where state law “stands as an obstacle to the accomplishments of the full purposes and objectives of Congress” (*Hines v. Davidowitz*, 312 U.S. 52, 67–68 (1941)). The preemptive scope of federal intellectual property law is notoriously vague and subject to conflicting jurisprudence. It is unclear, for example, the extent to which intellectual property owners can override the operation of patent law’s exhaustion doctrine or copyright’s fair use doctrine or first sale doctrine through contractual restrictions.

The final set of factors influencing notice concern the dynamic and collaborative nature of expressive creativity and technological innovation. Landowners rarely if ever need to take notice of entirely new additions to the stock of resources. Furthermore, new accretions do not tend to influence the use and enjoyment of existing land parcels. In contrast, advancing technology creates an inexhaustible and constantly expanding frontier. Technology companies must live in this intangible wilderness and hence are continually affected by the accretion of rights. Even in the copyright realm, new forms of artistic creativity—such as remixes—often operate in the vast gray area created by copyright law’s balancing standards.

The mingling of public domain material with the contributions of an intellectual property creator further complicates the notice challenge. Whereas even the slightest incursion across a land boundary will ordinarily violate the owner’s rights, many components of copyrighted works are freely available for use by others. Patents are limited to the particular claimed combination of elements, not the elements themselves. Furthermore, patents cannot wall-off unpatented prior art. Similarly, the words of a novel and the colors in a painting are generally free for others to use.²⁴ Copyright inheres in original selection and arrangement of elements. Trademark law offers protection to Miller Lite[®] for the beer made by Miller Brewing Company, but Miller cannot block other beer makers from using the term “Lite” in their trademarks or to describe their beer.

24 Note, however, that colors can be protected by trademark law (*Qualitex Co. v. Jacobson Prods. Co.*, 514 U.S. 159 (1995)), although this form of protection prohibits only the use of the color in ways that create a likelihood of confusion and are not functional. Thus, although Owens Corning controls the use of the color pink in insulation products (*In re Owens-Corning Fiberglas Corp.*, 774 F.2d 1116 (Fed. Cir. 1985)), others are free to use the color pink for other purposes.

Thus, while land rights can be analogized to a cleanly cut block of cheddar cheese, many intangible resources are more analogous to an uneven slice of Swiss cheese. The fuzziness of the boundaries as well as the lack of protection for fermentation holes complicate the provision of notice and expand the potential for opportunistic behavior.

4. NOTICE POLICY FRAMEWORK

With this background in place, we are prepared to analyze policy responses to address notice externalities.²⁵ In order to focus on notice failure, we assume that the marketplace will efficiently develop resources if private parties have easy access to reliable information about potential impediments to pursuing their development projects. If they can determine the owners and contours of potentially conflicting rights in advance of significant investments, then they will be able to make efficient decisions. Thus, we are assuming away transaction costs that might manifest after identification of conflicting property owners and determination of boundaries and rights.

We divide our framework into three principal categories. We begin with notice infrastructure. Section 1 examines how the rules and institutions governing direct provision of notice information can be improved to enhance resource notice. As noted previously, resource notice is a jointly produced public good. The government provides the foundational legal infrastructure for establishing and enforcing resource rights. The market operates on top of these rules and institutions. Private parties acquire, buy, sell, divide, and develop such rights through private transactions. The interaction of the state and private parties produces resource rights and notice of their existence, contours, and extent. Thus, the government is uniquely situated to establish the authoritative registry of resource claims.²⁶ If infrastructure is adequate to prevent notice failure, as is typical in the real property context, then notice externalities do not arise. But for the reasons explored in Part II, it is unlikely that notice externalities for intangible resources can be handled entirely through registries. Drawing upon the toolbox for addressing other forms of externalities, Section 2 explores notice cost internalization policies. We explain how prices and penalties can be used to reshape the potentially distorted incentives of resource owners to overclaim, confusingly claim, obscure, and opportunistically assert

25 Drawing in part on earlier presentations of this article, the Federal Trade Commission (2011) identified notice as a critical policy lever for improving the functioning of the patent system.

26 This is not to suggest that private registries cannot augment public registries. Title insurers, for example, have developed tract indices that are more easily searchable than publicly accessible grantor–grantee indices.

resource rights. Section 3 presents a third set of policies that mitigate the adverse effects of notice failure on resource developers. Various aspects of the design of resource rights and remedies reduce the risks and costs of developing resources in an imperfect notice environment. Section 4 discusses the interplay among these three policy approaches and offers two innovative policy proposals to illustrate complementarities among policy tools.

4.1 Direct Provision of Notice Information

The most direct means of addressing notice externalities is for the government to provide a comprehensive, transparent, easily searchable index of all resources, resource owners, and means for contacting resource owners as well as institutions for efficiently clarifying the scope of rights. As noted earlier, the government provides these services relatively effectively in the case of real estate. County land offices record property ownership (and encumbrances) increasingly on a tract-by-tract basis. These indices are up-to-date and publicly available. Various property doctrines encourage parties to record possessory, nonpossessory, and financing interests associated with the land. To the extent that parties are unable to determine title, they can bring quiet title actions in state courts. Zoning ordinances set forth categorical rules for land use. Parties can seek variances from such rules, enabling them to preclear their development projects before investments are expended.

These rules and institutions have worked well for avoiding notice problems in real estate development and their lessons can usefully be extrapolated to intangible resources. We can usefully boil these rules and institutions down to six notice-promoting elements: (i) a publicly accessible registration system; (ii) full, clear disclosure by claimants; (iii) reliable and prompt examination of resource claims; (iv) transparent notice information and registry search tools; (v) clear and efficient marking of claimed resources; and (vi) institutions for resolving boundary disputes, preferably before significant investments have been made.

4.1.1 Public Registry

In the ideal model, which is approached by land registry systems, the government (or a duly designated government-authorized institution) provides a comprehensive, up-to-date, authoritative, publicly accessible registry that enables third parties to determine the state of title and the location of boundaries reliably and at relatively low cost. As discussed previously, the patent, trademark, and copyright systems fall well short of the ideal.

From a notice standpoint, there are strong reasons to require prompt publication of all patent applications in order to inform intangible resource

developers of the scope of potential rights affecting their investments. As highlighted earlier, RIM wandered into such a mine field unwittingly. The subsequent litigation consumed substantial financial resources and needlessly disrupted the development of wireless email technology. Patent notice could be significantly improved merely by requiring patent applications to be publicly available immediately upon filing.²⁷

Patent application secrecy has been justified as an inducement for inventors to choose patent protection rather than trade secrecy.²⁸ This justification for application secrecy has not been carefully scrutinized and there are good reasons to question its cogency. We are not aware of any evidence that 18 months of secrecy actually induces a significant number of inventors to choose patents instead of secrecy. It is clear that many inventors never consider secrecy because it is simply not feasible for composition and product inventions that disclose their elements. More importantly, for all the patent applications that would be submitted regardless of whether applications are kept secret for 18 months—society loses the disclosure and notice benefits for those 18 months.

Incompleteness rather than secrecy is the main problem with the copyright (Sprigman 2004; *cf.*, Ginsburg 2010) and trademark registries. Registration is not required for parties to obtain copyright and trademark rights. Moreover, copyright owners bear no legal responsibility to update their ownership information. Registration is required to enforce a copyright on a U.S. work in court,²⁹ but trademark owners can bring suit in federal court even for unregistered marks (Lanham Act § 43(a); 15 U.S.C. § 1125(a)). Technological advances have enabled the development of accessible registries at relatively low cost. Notice externality concerns reinforce calls to re-examine the Berne Convention principle disfavoring copyright formalities (Sprigman 2004; U.S. Copyright Office 2006).

Since federal trademark law protects unregistered marks, and all manner of indications—from word marks and logos to trade dress (nonfunctional aspects of product shape and packaging)—can be “owned” and yet be untraceable. Notice policy favors eliminating protection for unregistered trademarks, thereby assuring the trademark registry that completely covers federally enforceable trademark rights.

27 Relatedly, the PTO could require parties to record changes in patent ownership immediately upon execution of the transfer. The ability to mask true ownership imposes costs upon competitors and cumulative inventors in identifying relevant counterparties.

28 The law discourages secrecy because patent disclosures potentially contribute to scientific and engineering knowledge.

29 Owners of works of foreign origin never need to register their works.

4.1.2 Disclosure Quality

For land, the quality of disclosure is relatively straightforward. Land boundaries can be identified with high precision based on historical tract indices and surveying techniques. Land usage and informal agreements can complicate publicly available information, but such problems are relatively rare.

Trademark law mandates significant disclosure by registrants. They must provide a description “for any mark not in standard characters” (TMEP §808.01), explanation of any special meaning of a term in a mark to the relevant industry (TMEP §808.01(a)), designations of goods and services (15 U.S.C. §§1051(a)(2) and (b)(2); 37 C.F.R. §2.32(a)(6); TMEP §§1402 et seq.), and, importantly, disclaimers. Section 6 of the Lanham Act (15 U.S.C. §1056) gives trademark examiners discretion to “require the applicant to disclaim an unregistrable component of a mark otherwise registrable.” Many trademark registrations today expressly disclaim subject matter.³⁰

Copyright law does not mandate much disclosure from copyright registrants, just general information about the type of work and ownership of the copyright. There is nothing comparable to the disclaimer practice in trademark law. This distinction is significant because unlike tangible resources, copyright protection does not extend to all aspects of a work. Unoriginal, functional, and other public domain elements fall outside of the copyright protection. Given that nearly all works comprise and build upon unprotected elements, cumulative creators can face a difficult task determining the aspects of a copyrighted work in which copyright subsists. Copyright registration forms ask copyright owners to provide “a brief general statement” of what has been added to preexisting material on which a derivative work or compilation has been based,³¹ but such statements rarely provide a clear indication of what aspects of the work are not protected and do not disclaim protection in a reliable manner.

The quality of patent disclosure varies tremendously. At one extreme, chemical composition claims disclose a specific molecular structure. At the other extreme, software process claims can be vague and still clear the written description, enablement, and best mode disclosure requirements.³² Unlike

30 See U.S. Patent & Trademark Office (2011) (reporting that during the 18 month period from April 16, 2008 through October 16, 2010, approximately 29% of the first Office actions (not including examiner’s amendments), 6% of the final Office actions, and 5.5% of the appeals to the Trademark Trial and Appeal Board contained a disclaimer requirement).

31 See, for example, U.S. Copyright Office Form TX (literary works) <<http://www.copyright.gov/forms/formtx.pdf>>.

32 See 35 U.S.C. §112; *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931 (Fed. Cir. 1990) (holding that software patent applications need only high level functional descriptions); *Fonar Corp. v. General Electric Co.*, 107 F.3d 1543 (Fed. Cir. 1997) (holding that software patent applications need not disclose flowcharts or source code). See generally *Fromer* (2009).

copyrights and trademarks, which involve actual physical or graphic embodiments, many patent claims are inherently abstract. The scope of a patent need not align with the patentee's actual device or process. Furthermore, many patentees do not practice their invention. Patents are defined by the claim language, which can be ambiguous. By seeking broad and vague functional claims (as well as specific claims), the patentee maximizes the likelihood that the patent can be stretched to reach unforeseen competing technologies during the patent life. Patents necessarily exclude prior art—a statutorily complex body of knowledge that predates the invention date—which can also be ambiguous in scope. The imprecision of patent claim scope in the software and business method fields is so bad that many developers ignore patents at the front-end and deal with licensing and litigation (Lemley 2008; Bessen & Meurer 2008).

The quality of patent disclosure can be improved by adding teeth to the written description, claim indefiniteness, and best mode doctrines. Recent developments in the law have cut in both directions. During the past year, the PTO has initiated rulemaking to assist examiners in carrying out their responsibilities in implementing the claim indefiniteness standard set forth in Section 112, Paragraph 2 with particular emphasis on computer-implemented invention claims.³³ On the other hand, the recently enacted America Invents Act largely eliminates enforcement of the best mode requirement.³⁴

Furthermore, the PTO could require applicants to do more to clarify claim scope and the basis for examination. Applicants could be required to resolve commonly litigated claim scope issues up-front such as: (i) whether the claim preamble is a limitation; (ii) whether a claim term is intended to be “means-plus-function”; (iii) the precise “corresponding structure, material, or acts” associated with “means-plus-function” claim limitations via hypertext; (iv) whether embodiments in a claim are intended as illustrations or limitations; and (v) the delineation of claim restrictions on a claim-by-claim basis through inclusion of standardized format claim charts. Second, applicants could be required to designate a default dictionary for use in construing all claim terms that are not specifically defined. Third, applicants could be required to disclose the relevance of all prior art set forth in their information disclosure statement. Fourth, technology groups within the PTO could develop default glossaries for commonly used terms of art that arise frequently in applications

33 See U.S. Patent & Trademark Office, Supplementary Examination Guidelines for Determining Compliance With 35 U.S.C. 112 and for Treatment of Related Issues in Patent Applications, 76 Fed. Reg. 7162 (February 9, 2011).

34 See America Invents Act § 15 (excluding failure to satisfy the best mode requirement from the bases for invalidating a patent in litigation).

within their field. Applications would be interpreted based on those definitions unless applicants set forth their own definition. Fifth, examiners should scrutinize applications for claim breadth, clarity, and numerosity. Sixth, examiners could record all interviews with applicants and place such recordings on the public record.

This disclosure wish list would likely increase the time and effort required to prepare patent applications. The work, however, would reduce the effort to conduct high-quality examination. As Mark Lemley (2001) has suggested, there is critical tradeoff between *ex ante* examination screening and the relatively rare *ex post* judicial scrutiny of issued patents. This analysis needs to consider the many costs of low-quality (*i.e.*, unwarranted and/or overbroad) patents on technological innovation generally. Even patents that do not get eliminated from the system through judicial invalidation nonetheless can disrupt development and diffusion of technology. We are inclined to the view that increasing the burden on applicants to explain, clarify, and justify their filings—particularly in amorphous areas such as software and business methods—will greatly improve examination quality and the overall functioning of the patent system.

4.1.3 *Reliable and Prompt Examination*

Land offices merely record ownership, liens, and encumbrances associated with existing resources. Hence, it is not difficult for them to provide prompt and reliable notice of land claims. Copyright registration and trademark registrations are also relatively prompt with regard to those works and marks that are registered. In contrast, the PTO has a much more challenging task in that it must determine whether applications meet the Patent Act's subject matter, utility, novelty, nonobviousness, and written description requirements. This requires careful scrutiny of potentially long and complex applications, searching of prior art, and comparison of prior art to patent claims.³⁵

First and foremost, the PTO should be provided sufficient resources to ensure prompt, high quality examination. In general, these costs should be borne by the applicants and should be tailored to the costs of examining particular applications (or at least classes of applications). Applicants seeking numerous amorphous claims should pay the substantial cost of fully scrutinizing such applications. They should also pay substantial additional fees for requesting continuations. Just as a home contractor will not add an additional room onto a house project without a substantial change order, the PTO should

35 Burk and Lemley (2009b) report that patent examiners spend approximately 18 hours per application.

have authority to ensure that applicants bear the full costs of ensuring a thorough and careful examination.

The PTO has recently proposed tiering of application fees to enable accelerated examination for a higher fee. Mark [Lemley and Douglas Lichtman \(2007\)](#) would go further and allow applicants to purchase more or less rigorous examination in exchange for stronger or weaker presumptions of validity. Another proposal would allow for delayed examination to reduce the effective backlog on examiners. Many other jurisdictions allow applicants to defer examination, which amounts to a trade of deferred fee payment at the price of fewer years of protection.

Second, the PTO should implement more sophisticated patent quality review procedures and make greater efforts to retain the most effective examiners. Such procedures should evaluate examination quality on the basis of correctness of validity determinations and scrutiny of patent boundaries.

Third, the Patent Office should scale back continuation practice with particular focus on the problem of notice externalities ([Lemley & Moore 2004](#)). The continuation game, in conjunction with the secrecy of patent applications, vastly expands the opportunity for applicants to gain unfair advantage against practicing entities and competitors.

Fourth, in line with recent amendments expanding pre-issuance submission of prior art by third parties and enhancing postgrant review (America Invents Act §§ 6–8), greater efforts should be made to expand the ability of the public to provide prior art and analysis to the PTO.

4.1.4 Registry Accessibility

The availability of a transparent, accessible, and easily searchable registry provides one of the best antidotes to notice externalities. Intellectual property law should strive to empower developers to identify all potential impediments to their projects and the counterparties with whom they can resolve differences.³⁶

As noted in Section 3.2.2, the lack of comprehensiveness of intellectual property registries undermine the accessibility of notice information. But even if all intellectual property claims were registered, there would still be the problem of determining the contours of the development neighborhood. The patent classification system does not provide the ability to determine all potentially relevant neighbors with precision or at reasonable cost. For example, a new digital dashboard technology might infringe all manner of software patents, yet a search of automobile patents would likely miss many encumbrances. Unlike land claims that can be accurately captured on a two-dimensional grid and be

36 See [Meurer \(2011\)](#) for a model of how the law influences patent search activity.

physically inspected, patent claims are abstract and multidimensional. The development of Boolean search tools has helped, but the vast proliferation of patents, particularly in the software field, has made searching patent records particularly difficult. Registered copyrights and nonword trademarks can also be difficult to search for analogous reasons.

Thus, subsidizing the development, maintenance, and evolution of intellectual property registry search tools and portals can play an important role in supporting accessible notice information. The government further contributes to good notice by standardizing the way that new property rights are claimed and by developing taxonomies and classifying property rights. The PTO maintains the Acceptable Identification of Goods and Services Manual to classify trademarks, and the U.S. Patent Classification to classify patents.³⁷

Looking forward, the government could make investments in infrastructure to reduce the cost of searching for patents and copyrights. These investments would produce public goods that tend to be underprovided by the private sector. On the copyright side, advances in content identification technology have vastly improved the ability to match uploaded works to digital repositories, such as YouTube. Such systems could be deployed to allow anyone to scan an image and instantaneously obtain accurate data on the copyright status. If combined with re-introduction of copyright formalities, prospective users of works could relatively easily identify the owners. In addition, further resources could be devoted to collecting and organizing rights ownership databases. This is a particular problem in the music field.

One of the most pressing needs in the patent field is the development of standard terminology for use in software inventions. Chemical patent boundaries are more easily understood and searchable because patent attorneys and inventors rely heavily on a system of chemical nomenclature developed and maintained by the International Union for Pure and Applied Chemistry. There is no guarantee that an equally successful system can be developed for software inventions, but the idea has drawn the attention of the IEEE Standards Association and other nongovernmental organizations, who are working on developing standard software nomenclature. One bit of evidence suggesting progress could be made on this front comes from semiconductor patents, where the Texas Instruments TTL Data Book has become a de facto standard for naming certain components of semiconductor inventions.

Property systems differ in the role the government plays in crafting property boundaries. Intellectual property owners inevitably play a significant role in

³⁷ There are international counterparts of both of these systems. The PTO is currently working with other patent offices to improve and harmonize patent classification.

determining boundaries when they create an intangible asset. If intellectual property law limited protection to literal copying of tangible embodiments of creations, then there would be no role for the government in specifying boundaries. The challenge for intellectual property systems comes from setting the scope of owners' rights against approximate or nonliteral copying and affording prospective developers the ability to determine potential encumbrances through searching public registries. Greater effort devoted to improving the comprehensiveness and accessibility of intangible registries could substantially reduce notice externalities.

4.1.5 Clear Marking of Resources

Marking of physical embodiments of works provides potential users of intangible resources with notice of potential exposure. Patent, copyright, and trademark law each encourage rights owners to mark physical embodiments of the claimed works, although both patent and copyright law have weakened marking requirements over the past several decades as well as penalties for failure to provide accurate notice information. Since copyright protection only protects owners against actual copies, a strong copyright marking requirement affords potential users of a work useful information about whether copyright protection subsists.³⁸

Technological advances in product identification, information distribution platforms, and scanning technologies open up promising avenues for enhancing product marking of intellectual property rights. Universal product codes, as embodied in barcodes and Aztec Codes (two-dimensional barcodes),³⁹ which can be scanned by smart phones, can be linked to websites that provide detailed information about intellectual property rights. Almost all products today use product codes. Congress could pass legislation requiring any company selling products embodying intellectual property rights to maintain a website providing standardized information about all intellectual property rights associated with those products. As companies acquire new rights, those websites could be updated accordingly. Such a system would not resolve all intellectual property notice problems, but it would enhance access to such information and provide

38 A user of an unmarked work would, however, need to be careful to ensure that the copy was authorized. Copying of an unmarked, pirated work would not provide a defense.

39 The Aztec Code was invented in 1995. See Aztec Code http://en.wikipedia.org/wiki/Aztec_Code



useful records for tracking intellectual property rights. We build on this proposal in the final section.

4.1.6 *Dispute Resolution Institutions*

As discussed in Section 3.3.2 with the exception of trademark law's ITU process, intellectual property regimes provide little in the way of preclearance review of products and uses. This represents a major problem for developers of new technologies as well as authors and artists. The inability to test the scope of intellectual property rights without risking substantial investment and liability exposure discourages innovative projects and might lead to overly prudent licensing. This inclination toward licensing could produce an undesirable feedback mechanism, whereby the licensing itself becomes proof that the entitlement covers the use (Gibson 2007). Whether or not that occurs, it is troubling that potential users of prior works or even independent developers of technological products cannot obtain clear *ex ante* rulings short of risking infringement litigation.

As noted previously, the DMCA introduced innovative mechanisms for insulating OSPs while expediting blocking of infringing websites and tailoring the scope of the anticircumvention provisions in advance of substantial exposure. Such creative enforcement tools and regulatory flexibility could alleviate some of the problems associated with the high costs of tracing ownership and navigating some of copyright law's amorphous standards (Menell 2002; Liu 2004; Tushnet 2010; Singh 2011). Furthermore, there is good reason to consider preclearance processes for fair use determinations (Nimmer 2006; Carroll 2007). On the other hand, addressing these problems administratively could stand in the way of potentially more promising market-based solutions (Merges 1996).

* * * * *

By comparison to real property notice infrastructure, intellectual resource notice rules and institutions are notably incomplete. There are significant opportunities to improve the quality of public registries and afford developers better means of determining potential encumbrances and relevant counterparties in advance of incurring large investments and exposure to significant liability. Merely requiring those claiming intangible resources to promptly and fully disclose their claims would substantially limit the extent of notice externalities. Developing preclearance institutions poses significant challenges, but is worth exploring. Filling these gaps, however, will not entirely eliminate notice externalities due to the inherent ambiguity of many intangible resources. Hence, it will be worthwhile to explore other tools for internalizing notice externalities and reducing their adverse effects on resource development.

4.2 Internalizing Notice Externalities

Land registration rules and institutions work relatively well at providing notice to property developers and therefore neither policymakers nor courts have developed rules for internalizing notice externalities.⁴⁰ Such tools hold significant unrealized promise for improving intangible resource notice.

Even though society seeks to encourage invention and creativity through granting intellectual property rights, the process of claiming such resources and the amorphous nature of some intellectual property boundaries and rights can impose substantial costs upon the broader community of inventors and creators. As a result, intellectual property systems raise the risks and costs of developing intangible resources, which can dampen the very incentives that intellectual property law seeks to stimulate. Those who finance innovation will integrate those risks and costs into their investment decisions. Inventors and creators might be discouraged by having to deal with unknown and unknowable claimants after great effort has been expended. Notice externalities result in economic waste to the extent that ex ante negotiation might have resolved the encumbrance risks at the front-end rather than at the back-end. The “net” effects of intellectual property regimes may well be positive, but there is little question that overall social welfare could be improved by reducing the notice externalities.

Scholarship on externalities teaches that prices and penalties are tools that can be used to internalize external costs. Section 1 shows how application and maintenance fees can be used to “price” notice externalities. Section 2 shows that the content of intellectual property law can be shaped to “penalize” parties who exploit notice externalities.

4.2.1 Prices and Subsidies

Nearly a century ago, Arthur C. Pigou (1920) famously proposed imposing the external costs of the harmful activity on the entity causing the adverse effects on third parties (see also Baumol 1972). Such Pigouvian taxes (or better perhaps better characterized in the current political era as Pigouvian “user fees”) are widely used throughout the economy to alter the activity levels of harm-causing conduct. The classic example is imposing an effluent charge to control pollution. If a factory is required to bear a fee equal to the marginal social cost of its pollution, then it will internalize the social cost of pollution discharge—which will result in the efficient level of the polluting activity.⁴¹

40 As we will see in Section 4.3, however, courts have developed doctrines to reduce some of the harms from notice externalities in real property contexts.

The corresponding policy instrument with respect to notice externalities would be to impose a user fee equal to the marginal social notice cost of property claiming activities. William Landes and Richard Posner (2003) propose imposing modest, periodic fees on copyright owners to keep their copyrights in force. These fees could be chosen to respond to the hold-up risk associated with old, low-value copyrights. Owners of high-value copyrights would pay the fees and keep their copyrights in force, whereas owners of low-value copyrights would allow their rights to lapse.⁴² Such a policy could have substantially alleviated the search and negotiation costs incurred in clearing the *Eyes on the Prize* DVD.

Likewise, notice costs in the patent system can be controlled through the use of fees.⁴³ Economists find that the volume of patent applications falls in response to an increase in application fees, and the decision to maintain an issued patent in force is sensitive to the magnitude of maintenance fees.⁴⁴ Even the very low maintenance fees imposed today cause the majority of U.S. patents to lapse before their full term has run (Moore 2005b).⁴⁵ Higher maintenance fees can be a desirable way to clear away patents on inventions that have not been commercialized, so as to provide greater freedom for developers who are willing to take on the costs of commercializing products (Parchomovsky & Wagner 2005).

Patent fee-setting garnered significant attention during discussion leading up to adoption of the America Invents Act. Most of the focus, however, was on increasing PTO staffing to address the large and growing patent backlog. Although we believe that increased PTO funding is called for to improve the

41 Economic analysis of tort law distinguishes decisions to take care from decisions about activity level (Polinsky & Shavell 2007). Successful internalization of an externality responds to both of these choices. A manufacturer who internalizes product safety risks will typically adjust both product design and output to account for accident costs. Similarly, when parties acquire new property, they should consider both *how they claim* the new property and the *number of new rights* they claim. Since intellectual property rights inevitably suffer from some degree of notice imperfection, policy analysts must also pay attention to how many rights are created (activity level).

42 Landes and Posner (2003, 474) interpret their empirical research as showing that “most copyrights depreciate rapidly and therefore that few would be renewed if even a slight fee were required.”

43 This policy could reduce clearance costs and the risk of inadvertent patent infringement but it does not address other notice problems, such as secret applications and amorphous claims. Reducing the number of applications might indirectly yield higher examination quality, but that would depend on examination resources and incentives to bring forth prior art.

44 A recent survey of the empirical research finds inelastic responses of applications and renewals to fees (de Rassenfosse & Pottelsberghe 2010). This indicates that significant fee increases may be required to affect patenting activity. But administrative fees in the USA are very low when compared to the legal fees paid to get a patent. Therefore, a substantial increase in PTO fees does not necessarily mean a substantial increase in total fees that must be paid to acquire a patent.

45 This is consistent with patents elsewhere in the world (Pakes).

speed and quality of patent examination, simple cost recovery is an incomplete way to think about fees. Instead patent (and also copyright and trademark) fees should be set so that applicants internalize not only the costs that they impose on the government, but also the costs that they impose on third parties.⁴⁶ Ideally, fees should be relatively higher on inventions that are apt to generate higher notice costs. Software patents, for example, are likely to impose greater notice costs than chemical composition patents. The number of inventions per product tend to be much greater for software than for chemical compositions (Bessen & Meurer 2008). Furthermore, software patent boundaries tend to be much harder to discern causing more claim construction disputes and more inadvertent infringement (*id.*). Thus, strictly on notice grounds, stiffer fees should be imposed on software patents than on chemical composition patents.⁴⁷ The larger point is that fees are tools that can and should be used to influence the decision to apply for a patent, the number of claims to include, and the length of time for which the patent is maintained in force.

Internalization can also be implemented through a system of tradeable patent permits (Ayres & Parchomovsky 2007; Dales 1968). In an ideal world, a policy-maker with full information could equally well regulate private decision-makers by collecting patent fees or by specifying the quantity of patents that can be granted. Permits alone or a permit fee hybrid system would alleviate notice externalities and *in theory* could be superior to regulation by fees alone.

As noted in Section 4.1.4, the government can also address notice problems through subsidization of technologies and databases that improve the quality of notice information. For example, the PTO could expend greater resources on development of better technology classification systems and search tools. Similarly, the Copyright Office can digitize its records and develop better publicly accessible search tools.

46 Rather than focusing on notice costs, economists have studied renewal fees as a tool for tailoring the reward provided by a patent system that has a fixed term (Cornelli & Schankerman 1999; Scotchmer 1999). Another strand of the literature examines fees as a tool that could be used to internalize the congestion costs that one patent applicant imposes on another (Marco & Prieger 2009). In contrast, legal scholars have noted that patent fees can be used to mitigate “prosecution externalities” arising from efforts to build large patent portfolios (Parchomovsky & Wagner 2005) and fees can be used to discourage marginal patent applications that generate notice costs by increasing clearance search cost (Collins 2008).

47 Other policy concerns besides notice should also be considered. Advances in chemical technology tend to be less cumulative than advances in software technology. Economic analysis suggests that excessive patenting is a greater risk for cumulative technologies, and this may be a separate reason to favor higher fees on software patents.

4.2.2 Penalties

Property law can be structured in such a way that it penalizes a property owner who provides poor notice. The law can penalize property owners by reducing the damages they can collect, limiting the scope of their property right, or invalidating their property right. These penalties internalize notice costs when they are triggered by acts that degrade boundary information, hide the ownership or existence of a property right, or strategically delay enforcement. Thus, prices and penalties play distinct roles. User fees respond to notice costs caused when property owners acquire too many rights or keep those rights in force too long. Penalties respond to notice costs caused when property owners obfuscate, hide, and delay.

Courts have developed several doctrines to penalize patent owners who hide their patents (Hovenkamp 2011). As noted previously, the courts have struggled to resolve antitrust claims against and patent enforcement actions by Rambus in the wake of its less than forthright participation in an industry SSO.⁴⁸ The courts blocked Dell's enforcement of patents that it failed to disclose as part of a standard setting process (*In re Dell Computer Corp.*, 121 F.T.C. 616, 617–19 (1996)). In another case involving failure to disclose patent filings during a standard setting process, the court applied the doctrine of equitable estoppel to block enforcement of a patent (*Qualcomm Inc. v. Broadcom Corp.*, 548 F.3d 1004, 1018 (Fed. Cir. 2008)).

The law can also penalize rights owners who fail to assert their rights promptly upon learning of infringing activities. Thus nonpracticing entities as well as copyright holders who are not easily traced could be barred from recovery or have their recoveries limited- if they opportunistically delay prosecution or enforcement (Meurer 2003; *Symbol Techs. Inc. v. Lemelson Med.*, 277 F.3d 1361, 1364 (Fed. Cir. 2002); *A.C. Aukerman Co. v. R.L. Chaides Construction Co.*, 960 F.2d 1020, 1040 (Fed. Cir. 1992)).

Section 112 of the Patent Act spells out the key obligations of patent applicants to communicate clear boundary information. Failure to comply with these requirements narrows the scope of the patent by invalidating the defective claims. Claims can be invalidated for lack of definiteness, for lack of support in the written description, and because they are not enabled by the patent disclosure. The Federal Circuit has tightened the written description requirement as a means to police strategic stretching of patent claims to ensnare new products

48 The Federal Trade Commission (FTC) penalized Rambus for “deceptively fail[ing] to disclose to the [standard setting organization] the patent interests it held in four technologies that were standardized.” See, *In the matter of Rambus, Inc.*, Docket No. 9302, 3 (August 2006). The D.C. Circuit reversed the FTC on the grounds that the Commission did not properly establish causation between the alleged acts of deception and acts of monopolization in violation of Section 2 of the Sherman Act and Section 5 of the FTC Act. See, *Rambus v. FTC*, 522 F.3d 456 (D.C. Cir. 2008).

introduced by competitors (*Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336 (Fed. Cir. 2010) (*en banc*); *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473 (Fed. Cir. 1998)). Unfortunately, the courts have promulgated a permissive enablement standard for software inventions (*Burk & Lemley 2009b*, 61–62) and largely eviscerated the claim definiteness requirement. Claims are invalidated for indefiniteness only if they are “insolubly ambiguous” (*Marley Mouldings, Ltd. v. Mikron Indus.*, 417 F.3d 1356, 1361 (Fed. Cir. 2005)).

Design of effective penalties to induce improved disclosure and claim drafting is a great challenge. We identified PTO fees as an appropriate tool for internalizing notice externalities caused by too many property rights. Fees are a simple, ex ante solution to problems involving discrete choices, such as whether to apply for a patent, how many claims to add, and how long to maintain a patent in force. As ex post financial levers, penalties can be more finely tuned. They are typically determined after a dispute has arisen. Courts have greater ability to ferret out more detailed information about the activities in question (*Kaplow 1992*). Greater subtlety is essential in inducing an inventor to disclose the right information or claim an invention clearly.⁴⁹

4.3 Harm-Reducing Policies

A third approach to addressing notice externalities is to limit the harm to those resource developers who cannot reasonably determine the landscape of encumbrances. Real property law has developed various doctrines for decreasing the disruption caused by notice failure.⁵⁰ Rose (1985, 78) observed that “[s]ociety is worst off in a world of vague claims; no one knows whether he can safely use the land, or from whom he should buy it if it is already claimed, the land may end up being used by too many people or by none at all.” The doctrine of adverse possession is one tool the law uses to prevent stale claims from being asserted (*Merrill 1985a*; *Singer 1987*). Courts are also disinclined to read property interests broadly, when they suspect claimants are engaging in opportunistic behavior (*Faus v. City of Los Angeles*, 67 Cal.2d 350, 431 P.2d 849, 62 Cal.Rptr. 193 (Cal. S. Ct. 1967)). In some states, good faith improvers of land can take title to improved property subject to compensating the original owner for the value of the land prior to the improvements (Good Faith Improver Act, Cal. C. Civ. Proc. §§ 871.1–7; *Raab v. Casper*, 124 Cal. Rptr. 590 (Ct. App. 1975)). Limitations on the running of nonpossessory interests promote notice and constrain assertion of

49 Meurer and Nard (2005) explain how limits on the patent law doctrine of equivalents, such as the prosecution history estoppel doctrine can be used to penalize patent applicants who invest too little effort in drafting clear claim language.

50 *Sterk (2008)* suggests that high search costs can explain the unwillingness of the courts to award injunctive relief in cases of “innocent” boundary encroachments.

remote property interests (French 1982, 1998; Sterk 1985; *Tulk v. Moxhay*, (1848) 41 Eng. Rep. 1143(Ch.) 1143–45; Ames 1904; Van Houweling 2008, 891–99; see generally, Restatement (Third) of Property: Servitudes 2000).

Policies aimed at reducing the harms associated with notice failure already play a significant role in intangible resource law. They can be usefully divided into three categories: (i) liability standards; (ii) remedies; and (iii) de-propertyization.

4.3.1 Liability Standards

Liability standards cover a wide range of policy levers: required liability elements, defenses, exemptions, compulsory licenses, and safe harbors. These policies serve a variety of purposes. We focus on doctrinal and statutory adjustments to reduce harm from inadequate notice, but such benefits should be weighed in conjunction with their effects on other purposes of the intellectual property regimes (such as appropriability).

Unlike patent or trademark law, copyright law requires the rights owner to demonstrate copying by the defendant as an element in proving infringement (*Arnstein v. Porter*, 154 F.2d 464, 473 (2d Cir. 1946)). As a result, developers can insulate their projects from infringement claims by carefully documenting independent creation. This is commonly done in the software industry as a means of developing interoperable, yet noninfringing, programs, and products. This approach cannot be used where the developer seeks to incorporate full or significant expressive features of copyrighted works into their project.

In contrast, patents can be infringed through entirely independent activities. In fact, relatively few patent infringement cases outside of Hatch–Waxman actions (which inherently involve copying to provoke a challenge) involve copying (Bessen & Meurer 2008; Cotropia & Lemley 2009). Given the difficulty of determining the patent neighborhood—secret patent applications, proliferation of patents, amorphous claims—a strong case can be made for prior user rights and/or an independent creation defense.⁵¹ At a minimum, such policy reforms appear justified in the software field, where various conditions—such as alternative means of appropriability (first-mover advantages, copyright protection, and trade secret protection), low capital costs, and relatively low technological risk (Menell 1987)—obviate patent protection and opportunistic enforcement predominates. The independent invention defense would go a long way toward limiting the risk posed by opportunistic entities. It would also improve the conditions needed to support a robust insurance market for

51 Other scholars have also advocated these policies, although not primarily on notice grounds (Lemley 2007, 1534–35; Vermont 2006; Shapiro 2006; Maurer & Scotchmer 2002; Harriel 1996).

spreading the risks of patent claims. In contrast, given the high capital costs of pharmaceutical research, the risk of near-simultaneous invention in conjunction with an independent invention defense could reduce invention incentives by diminishing appropriability.

The law can also reduce exposure to inadequately disclosed rights by crafting limitations on the scope of rights (Hargreaves 2011). The Copyright Act creates several relatively bright line exemptions that insulate users from liability when transaction costs are apt to be high (Fagundes 2009). For example, the Copyright Act expressly permits pictorial representations of architectural works “if the building in which the work is embodied is located in or ordinarily visible from a public place” (17 U.S.C. § 120(a)). Categorical fair use designations could further improve notice, for example, by creating a 30 second rule for sound or film clips in particular contexts. Any such rule would undoubtedly prove to be over- and underinclusive. But given the unavailability of effective preclearance institutions and the substantial uncertainty and cost surrounding fair use adjudication, clear but imprecise rule might be the better approach in areas with high transaction costs.

4.3.2 Remedies

The type and size of remedies greatly affect the chilling effects of notice failure (Hovenkamp 2011). The Supreme Court’s *eBay* decision affords courts substantial discretion to consider opportunistic enforcement of intellectual property rights (*eBay v. MercExchange*, 547 U.S. 388 (2006)). Justice Kennedy’s concurring opinion expressed concern about patent owners using the threat of an injunction “as a bargaining tool to charge exorbitant fees to companies that seek to buy licenses to practice the patent.” (*Id.* at 396.) He went on to note that injunctive relief “may have different consequences for the burgeoning number of patents over business methods, which were not of much economic and legal significance in earlier times. The potential vagueness and suspect validity of some of these patents may affect the calculus under the four-factor test.” (*Id.* at 397.)

The awarding of damages presents a useful place to integrate concerns about notice externalities. There is good to reason to discount damage awards in those circumstances in which it is particularly difficult to identify and evaluate intellectual property encumbrances,⁵² the boundaries surrounding the plaintiff’s rights are amorphous, or where the law is ambiguous (e.g., fair use, doctrine of equivalents). Courts should be wary of awarding substantial liability where there is little if any evidence of harm. This is particularly true in the context of

52 This could be true in the context of patent thickets and orphan works.

statutory damages, which can be wholly disproportionate to harm with respect to Internet-related activities.

Ronald Coase's (1960) seminal observation about the reciprocal nature of harm provides a useful perspective for thinking about uncertain resource rights and boundaries. It is ambiguous whether the social cost of developing a competing product near a patent boundary or moderately transforming a copyrighted work should be imposed entirely on the developer of the "neighboring work," the rights owner, or shared between the two. Since transactions are not costless, the law needs to strike the balance. Since society seeks to promote both pioneering works and cumulative creativity, the better approach could well be to apportion liability in contexts in which a modestly infringing neighboring work could not feasibly be cleared or where the rights holder unreasonably withheld consent or opportunistically delayed enforcement (*cf.*, Menell & Depoorter 2012). This can usefully be analogized to a comparative negligence regime (Calabresi 1975; Sterk 2011; Prosser 1953).

4.3.3 De-Propertization

A more aggressive reform strategy calls for a shift away from proprietary rights systems altogether. Harold Demsetz (1967) theorized that private property rights emerge over time as the value of the asset subject to the property rights increases, and as the costs of measuring, monitoring, and enforcing private property rights decreases. By extension, as the costs of identifying and avoiding property rights rise, then policy should move away from propertization (*cf.*, Smith 2002). We have long questioned the wisdom of patent protection for computer software and business methods on notice and other grounds (Menell 1987, 2007a; Bessen & Meurer 2008). Similarly, there are serious questions about whether photography should enjoy the full duration and range of protections afforded other copyrighted works (*cf.*, Hughes 2012).

Open source and open innovation projects seek to achieve de-propertization by precommitting inventors and creators to not propertizing their creations (Carver 2005). Many of these initiatives also impose strong disclosure requirements that directly address notice externalities (*e.g.*, General Public License v3 <http://www.gnu.org/copyleft/gpl.html>). By their essential design, however, these projects opt-out of the primary justification for intellectual property: appropriability. It is a testament to how problematic the software marketplace has become that many leading commercial enterprises have chosen the open source path (Merges 2004).

4.4 Hybrid Policies and Policy Innovations

Although our policy framework divides into three separate conceptual spheres—notice infrastructure, internalization, and harm reduction—many policy reforms cut across these domains. Improved public registries lessen notice externalities, effectively reducing the need to internalize the social costs of notice failure and for harm-reducing policies. Many of the harm-reduction policies have the collateral effect of internalizing notice externalities by reducing the potential reward for infringement actions. They function as penalties for inadequate notice.

Our analysis highlights some enticing low-hanging notice policy reforms. There would appear to be substantial advantages to mandating prompt public notice for all intellectual resources on publicly accessible and readily searchable digital registries. Patent applications ought to be published immediately upon filing. Copyright claimants should be required to register their claims and maintain accurate information about ownership and subsistence. Trademark claimants should be required to register their marks. We also believe that application and maintenance fees should be rethought as means of internalizing the social costs of intangible resource proliferation.

We recognize that there are counterarguments to prompt, mandatory disclosure of intangible resource claims. These counterarguments, however, have not been established through careful empirical or theoretical research. And in many respects, they reflect anachronistic conditions. Perhaps the Berne Convention's principle that the enjoyment and exercise of copyright "shall not be subject to any formality" made sense in 1886, but there is good reason to believe that it is frustrating documentary filmmakers and other cumulative creators today. At a minimum, notice concerns create a burden on proponents for any regime that does not provide prompt, mandatory disclosure as well as registry update and maintenance fees for intangible resources. Advances in digital technology over the past two decades make it eminently feasible to implement such requirements efficiently and effectively.

Beyond these relatively straightforward ramifications of the notice externality framework, the notice lens illuminates some promising innovative policy mechanisms for improving the functioning of intangible resource regimes. We sketch two such regimes below. Section 1 explores the use of a hybrid property tax mechanism/liability cap to reveal valuable information about which patent applications pose potential exposure, internalize notice externalities, and enhance resource developers' ability to manage development risks. We recognize no misapprehension that such a reform could produce complex effects and calls for extensive deliberation; our treatment merely sketches a conceptual model. Nonetheless, we believe that the exercise highlights useful insights for

addressing notice problems for highly congested and amorphous resource contexts. Section 2 examines how advances in digital technology could be used to assist developers of creative works to identify potentially infringed works, clear such works, and/or obtain safe harbor. These proposals barely scratch the surface of innovative solutions to notice externality problems.

4.4.1 Patent Revelation Mechanism: Intangible Property Taxes/Damage Caps

Google's chief legal officer commented that "a modern smartphone might be susceptible to as many as 250,000 potential patent claims" (Lohr 2011; see also Phelps & Kline 2009). The notice problem is so severe that competitors in many high tech fields do not even bother trying to learn about potential encumbrances (Lemley 2008).⁵³ The costs of due diligence and the difficulty of ex ante bargaining lead technology developers to deal with these patent thickets through building defensive patent portfolios and ex post bargaining and dispute resolution. Defensive patenting can itself exacerbate the notice problem as patent portfolios developed by practicing entities fall into the hands of more opportunistic enterprises (Phelps & Kline 2009; Chien 2010; Hagui & Yoffie 2011; Ewing 2011; Did Intellectual Ventures Drive Micron to Privateer Patent Enforcement? (June 29, 2011), *Gametime IP*; Wild 2011).

This vicious cycle intensifies as patents proliferate. Various harm-reducing policies—such as creating an independent invention defense/prior user right, limitations on remedies for nonpracticing entities, and abolishing certain classes of patents—partially address patent notice problems, but they do little to screen bad patents at the front-end. In an ideal regime, greater emphasis would be placed on weeding out unmeritorious patent applications and enabling developers to determine which patents affect their development projects at the front-end. With that goal in mind, we offer an alternative approach to patent reform that focuses on internalizing the costs of patents through a mechanism that would call attention to the most significant patents.

We begin by reference to real estate taxation. Most jurisdictions impose property user fees (or taxes) on real property owners as a means of spreading the social cost of the land ownership within communities. Property fees are generally scaled to property value. This reflects in part that larger and more valuable properties demand greater public service costs—such as police, fire,

53 In contrast, pharmaceutical and biotechnology companies—and their financial backers—put substantial effort into determining potential patent barriers at the front-end of their research projects (Eisenberg 2011). This is due to several factors including the high costs of R&D and regulatory approval (which makes due diligence particularly important), the comparative clarity of composition claims, the relatively small number of researchers and patents in particular areas, and the effective ability to know the patent and research neighborhood through professional circles.

roads, education, local government, and other infrastructure. Such fees at least partially internalize the user costs of real property ownership.⁵⁴ Property fees are also imposed over time. Communities can vary these fees as property values change—through land improvements or market conditions.

Along those lines, patent filing and maintenance fees could be thought of as internalizing the direct and external (notice) costs that patent applications and issued patents impose on the public. But how should patents be valued for purposes of imposing such fees? Patent valuation is particularly difficult (Kelley 2011; Parchomovsky & Wagner 2005; Allison, Lemley, & Walker 2009). Often the holder of the patent is in the best position to know its value. This provides an intriguing opportunity.

Our concept—which might be called the “Illuminating Needles in the Patent Haystack Act”—offers a mechanism for revealing patent valuation through a dual user fee/liability cap. Patent applicants would be required to disclose their estimated patent valuation upon filing their application. This value would serve several functions. First, it would provide a basis for assessing the filing fee for reviewing the application, and if granted, maintenance fees for the issued patent. By scaling the filing fee to the estimated value of the invention, the PTO would get a clear signal of how many resources to devote to examination. The maintenance fees would also be higher by analogy to property taxes. Property taxes are scaled to property value in part because more valuable properties typically entail higher municipal service costs. Similarly, more valuable patents impose a greater overhead costs on independent and cumulative inventors. In essence, the maintenance fee would at least partially internalize notice externalities.

A significant caveat is in order. In our ideal system, patent filing and maintenance fees would be scaled to the level of examination costs and external effects of distinct patent fields (or neighborhoods). Thus, even very valuable pharmaceutical patents might have relatively low maintenance fees because there is reason to believe that notice externalities are relatively small in that technology neighborhood. In contrast, maintenance fees for software patents should be relatively high per dollar of valuation due to the large notice costs of

54 States impose royalties and taxes on hardrock mining operations on state lands, but the federal government has never done the same for resources extracted from federal lands. See U.S. General Accounting Office 2008, Hardrock Mining: Information on State Royalties and Trends in Mineral Imports and Exports (July 21, 2008) <<http://www.gao.gov/new.items/d08849r.pdf>>; Obama fiscal 2012 budget proposes hardrock mining royalties, Platts (February 14, 2011) <http://www.platts.com/RSSFeedDetailedNews/RSSFeed/Metals/6830235>. Firms extracting oil and gas from federal lands and waters pay between 12.5% and 16.7% in royalty lease payments. See U.S. Federal Oil and Gas Royalties, OpenCongress <http://www.opencongress.org/wiki/U.S._federal_oil_and_gas_royalties>

these ambiguous grants on software developers. Software patents lie in the floodplain.

Why wouldn't patent applicants simply choose a low value in order to minimize their fees? The back-end of our proposal addresses that problem. The applicant's value estimation would serve as a cap on total patent infringement recoveries during the life of the patent. Thus, applicants would have a strong incentive to pick a realistic value. This value would signal to competitors, which needles in the patent haystack are potentially harmful to their businesses. Competitors would have stronger incentives to submit prior art during examination and pursue postgrant oppositions, where patents have high damage caps and are vulnerable to invalidation.

This mechanism would enable the PTO and competitors to identify those patents that are worth their attention on the front-end. Competitors would be in a position to self-insure against low-value patents and could seek to license or insure against high-value patents. Patentees would more carefully prioritize their portfolio development as they would face higher maintenance costs and scrutiny on high-value patents.

We recognize that calibrating this proposal would be quite complicated.⁵⁵ But the conceptual elements of this proposal highlight directions for improving up-front patent quality screening, better notice, and affording developers greater ability to understand the patent neighborhood. This proposal also emphasizes the importance of tailoring the patent system to particular technology classes (Menell 1987; Burk & Lemley 2009b). Although there will always be line-drawing problems, the heterogeneity of technological fields and external costs of the patent system should push toward greater technological specificity of patent rules and institutions. Notwithstanding its substantial implementation challenges, our proposal would shine a bright spotlight on the most important patents at the front-end of the technological development, thereby affording competitors with choices about how to develop their technologies and businesses with a better understanding of the neighborhood.

4.4.2 Copyright Revelation Mechanism: Digital Identification Safe Harbors

Advances in digital identification technologies over the past decade have created the ability to identify audio, textual, graphic, and visual works at low cost and with high precision. Audible Magic Corporation was among the first to develop sophisticated acoustic fingerprinting technologies. It now provides audio and

55 For example, our proposed system would have to grapple with updating of patent valuation (with the possibility of intervening damage limitations on those who entered the marketplace when patent valuation was lower), allocating valuation among portfolios, and how patent caps would apply across the marketplace.

content identification tools to companies seeking to track digital media and identify and block infringing content. Shazam offers an application that allows a mobile phone to identify almost any sound recording. YouTube's ContentID (AudioID and VideoID) system enables content owners to block, monetize, and track usage of their works within the YouTube's expanding online ecosystem. Although initially reluctant to participate, many content owners have opted in to the YouTube platform and derive revenue from web traffic to their own and user-generated videos that re-use their works (within the permissions that they specify).

These technologies provide the framework for a universal copyright notification system. If all copyrighted works were digitized and registered, which is both feasible and consistent with the broader aims of the copyright system (Menell 2007b), potential users of copyrighted works could employ relatively inexpensive and now commonplace optical scanning and audio devices to identify the copyright status of any registered work.⁵⁶

A mandatory copyright registration and digital deposit system could provide the foundation for a robust digital clearance system for copyright owners and users. Suppose that a documentary filmmaker was seeking to use photographic works of unknown provenance. Under a decentralized safe harbor regime (and assuming no actual knowledge of the photograph's copyright status and ownership), the filmmaker would scan the work using specified technology. If the scan did not produce a match, then she would be able to use the work without fear of injunctive relief. Furthermore, the scan would reduce costs in locating true owners if a universal registration system were in place. As with orphan work proposals, various forms of liability rules could be developed (ranging from zero to fair market value) to address any legitimate copyright holder who comes forward.

This system could create some problems for low resolution copies of works, but such concerns are likely to be manageable. Documentary filmmakers (and other users) have an incentive to obtain high-quality versions of whatever they use. Although this system would not resolve fair use and bargaining breakdowns, it does resolve the problem of using untraceable works.

56 A parallel system could be used for identifying what patents cover a particular product or service. Patent owners could be required to provide standardized optical recognition labels on their products. Digital cameras could scan those labels, which could link to the websites maintained by the patentees with information on patent, copyright, and/or trademark protections. The relevant intellectual property offices could establish rules for proper disclosure on such websites. Such databases are now becoming fairly common for many products with barcodes and Aztec codes.

5. CONCLUSIONS

Notice problems have become a common pathology in the development of intangible resources and markets. The proliferation of intellectual property rights has greatly increased the costs of developing various intangible resources. Inventors and creators, and the enterprises that commercialize their creativity, increasingly confront conflicts that would be avoidable with better access to information about the ownership and scope of the rights. The Patent Office could perform its duties more effectively if applicants provided fuller and more forthright disclosure and bore the social costs of seeking patent protection. Those who wish to build on the works of others—such as documentary filmmakers and mashups artists—are hampered by the incompleteness of the copyright registry. Businesses seeking to market their products cannot definitively determine the trademark landscape from Trademark Office records. The result is that nearly all innovative and creative enterprises face a high cost of determining the intangible neighborhood surrounding their projects.

This article has highlighted structural causes of notice externalities plaguing intangible resource development. The emergence of intellectual resources has brought to light a fundamental market failure affecting the development of all resources. Notice externalities result when resource claimants lack appropriate incentives to provide adequate accessible information about their claim. The difficulty of learning the contours of rights affecting resource development undermines progress. Due to the inherent characteristics of land and many other tangible resources as well as technology for definitively identifying their boundaries, publicly accessible ownership registries, and institutions for resolving disputes, notice externalities do not manifest in many tangible resource contexts. As a result, the general phenomenon of notice externalities has not attracted attention.

Intangible resources are inherently more difficult to describe and identify. The available registries are incomplete and difficult to navigate. There are no well-functioning institutions for determining freedom to operate. Intellectual property rights and remedies further complicate the notice challenge. As a result, the intellectual property systems encourage parties to hide, obfuscate, and distort notice information. In the patent field, this has produced a vicious cycle, whereby all manner of enterprises hoard patents for defensive and offensive purposes, further obfuscating the patent landscape and sowing the seeds for future opportunism. The development of expressive works and trademarks also face serious problems as a result of unclear boundaries and ownership. Although the courts have begun to rein in some of the most egregious abuses, we believe that there are good reasons to conduct a broad sweep of the intellectual property system to combat notice externalities.

The problems of notice failure and notice externalities should be addressed at three levels: direct provision of notice information, internalization of notice externalities, and rules for reducing the harm from notice failure. Advances in digital technology—which brought the problem of notice externalities to light—also provide tremendous potential for reducing the range of notice failure problems.

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