

If you can't tell the boundaries, then it ain't property

1 Introduction

In the previous chapter, we argued that the large and growing cost of patent litigation plays a critical role in the deteriorating performance of the patent system. We suggested that costly litigation is largely a matter of inadvertent infringement. Inadvertent infringement arises because patent boundaries are often fuzzy or hidden, or because the cost of searching patents and negotiating a license in advance of technology adoption is typically difficult and expensive. In this chapter we document the failure of patent laws and institutions to put the world on notice of patent boundaries, leading to inadvertent infringement. The next chapter uses empirical research to link notice failure to patent litigation in general and to the litigation explosion in particular.

A successful property system establishes clear rights. Clarity promotes efficiency because “strangers” to a property can avoid trespass and other violations of property rights, and, when desirable, negotiate permission to use the property. The concepts in the last sentence are critical to understanding the failures of the patent system. As we shall see, increasingly, patents fail to provide *clear notice* of the scope of patent rights. Thus, innovators find it increasingly difficult to determine whether a technology will infringe anyone’s patents. Similarly, they find it increasingly costly to find and negotiate the necessary patent licenses in advance of their technology development and adoption decisions. Thus, *clearance* procedures that work well for tangible property are undercut by a profusion of fuzzy patent rights.

An ideal patent system features rights that are defined as clearly as the fence around a piece of land. Realistically, no patent system could achieve such precision, but our current system appears to be critically deficient in this regard. The comparison to tangible property is informative. In Chapter 2, we suggested that patent law shares many doctrinal features with the law of tangible property, but that the *application* of these doctrines might be substantially different.

This chapter compares in detail the law and institutions that promote patent notice with the corresponding law and institutions that provide notice for tangible property. The patent system fares badly in this comparison; certain institutions that contribute to clear notice are pitifully underdeveloped. It is hardly surprising, then, that patents, unlike tangible property, have a significant problem with inadvertent infringement. Moreover, we find some evidence that notice problems have been getting worse.

2 Bad Fences Make Bad Patents

2.1 Two Kinds of Inadvertent Infringement

We begin by looking in detail at inadvertent infringement, notice and clearance. Inadvertent patent infringement often arises either when a firm independently invents a technology that was previously patented, or when a firm attempts to design non-infringing technology that competes with a patented technology. Disputes arise in some

cases because alleged infringers are not aware of the earlier invention and the purported patent rights. Other disputes arise because the set of potentially relevant patents is large, the scope of the claims is vague, and many of the claims may be invalid. Under these conditions, designing around patents is difficult and clearing the rights may be prohibitively expensive.

The BlackBerry case illustrates the first type of inadvertent infringement. Chapter 5 recounts how RIM, the maker of the BlackBerry, was ensnared in a long-running patent infringement lawsuit with a company called NTP.¹ NTP co-founder Thomas Campana Jr. tried and failed to commercialize wireless e-mail but he did acquire several patents relating to the technology. Mike Lazaridis, the founder of RIM, independently invented similar technology, which he patented, and turned into the BlackBerry without getting permission to use Campana's patents. After five years of litigation, and facing the threat of injunction, RIM settled with NTP and agreed to pay \$612.5 million.

The momentous dispute between Kodak and Polaroid nicely illustrates the second type of inadvertent infringement.² Kodak was the dominant firm in American photography from the earliest days of the industry. Upstart Polaroid introduced instant photography in the late 1940s and enjoyed several years of virtual monopoly in the U.S. market. Kodak explored instant photography and even produced an instant film technology that was used on the Lunar Orbiter in 1966, but they were slow to realize the size of the consumer market and did not enter until 1976. One factor that slowed Kodak's entry was the great care they took to invent around Polaroid's patents. Kodak started research in 1969 on an instant photography product that would compete with Polaroid. From the beginning they consulted with patent lawyers to make sure they steered clear of Polaroid patents. Kodak believed its technology was very different from Polaroid's. Kodak's former senior vice president and general counsel Cecil Quillen Jr. believed: "The Kodak chemistry worked exactly backward from the Polaroid chemistry...." Nevertheless, Kodak lost the patent suit that Polaroid filed one week after Kodak entered the market. They paid over \$900 million in damages and they were driven from the instant photography market.

2.2 Patent Clearance

Of course, RIM and Kodak could have avoided these problems if they had licensed the patented technology up front. That is, they could have cleared the rights in advance. This sort of thing happens routinely with tangible property and even with other intellectual property such as copyrights.

The world of movie production and copyright clearance provides a glimpse of what the patent system should aspire to achieve in terms of notice and clearance. Movies often incorporate a variety of pre-existing copyrighted works. They contain pre-existing sound recordings, new versions of old songs, special effects video, art work displayed in sets, and dialog based on screenplays, and sometimes plays, novels, and other movies. A movie producer must be careful to obtain copyright permission from the owners of the

¹ Barrie McKenna, Paul Waldie and Simon Avery, *Patently Absurd*, Globe and Mail January 28, 2006

² Many commentators credit this case with opening eyes in the business world to the growing importance of patents after the creation of the Federal Circuit. For a behind the scene discussion of the case see Chapter 3 in Fred Warshofsky, *Patent Wars: The Battle to Own the World's Technology* (Wiley, 1994).

copyrights on these other works. If a producer fails to clear the rights, even to a work that plays quite a minor role in the movie, the owner of the infringed copyright can stop all performance of the movie.

Experienced Hollywood movie producers manage copyright clearance without much trouble. The transactions to acquire the necessary rights are relatively standardized.³ The producer usually gets a license to use pre-existing art, music, video, and text. Copyrights to copyrighted work created during the production of the movie are usually assigned to the movie producer through contracts signed by the many collaborators who contribute to the movie.

Motion picture producers and technology developers share comparably complex intellectual property environments. But technology developers have far more difficulty negotiating clearance contracts, or steering clear of problematic patents. The BlackBerry and instant photography sagas are two of many recent examples of sensational failures of patent notice and clearance. Let's try to understand why these failures occurred.

Why didn't RIM clear patent rights in advance of the BlackBerry introduction the way movie producers clear copyrights in advance of movie distribution? One reason is that Lazaridis did not build on Campana's technology the way a movie screenplay builds on the plot of a novel. Campana and Lazaridis independently invented various aspects of the technology, likely without knowing their future rival existed.⁴ RIM first learned about NTP and Campana's patents in early 2000 when NTP sent letters to several companies, including RIM, warning them about NTP's wireless e-mail patents. This was ten years after RIM started developing wireless technology, four years after RIM introduced its prototype of the BlackBerry, and two years after RIM signed contracts with Canadian and American phone companies to supply wireless e-mail service.

But surely, a sophisticated business like RIM was aware that independent invention is not a defense to patent infringement. In fact, an innovator can even get a patent on his technology (like Lazaridis did), and still be liable for infringement of someone else's patent. Why didn't RIM search for patents that they might infringe? After finding such patents they could have negotiated a license, or redesigned their technology to avoid infringement. We don't know why RIM didn't find and deal with Campana's patents at an earlier date, but we can make an educated guess. If RIM had searched, they would have found many patents granted to many inventors with uncertain scope and validity that might apply to various aspects of BlackBerry. Further, RIM would still have to worry about unpublished applications that might mature into patents covering their technology. We suspect that often, it is simply bad business to search for patents and negotiate licenses in advance of technology adoption. The costs of sorting through a large

3 The leading copyright treatise has a chapter on motions pictures that starts with a rights clearance checklist, and contains a variety of forms for standard contracts. Nimmer and Nimmer §25.

4 Campana developed pager inventions in the early 1980s and started working on pagers with text messages around 1985. The trial court judge noted: "It is apparent that RIM developed and conceived its BlackBerry products entirely independent of the Campana patents." *NTP, Inc. v. Research in Motion, Ltd.*, 270 F. Supp. 2d 751, 755 (D. Va. 2003). A decade before Campana, Geoff Goodfellow invented wireless e-mail and published the idea on an Arpanet mailing list. Like Campana, his start-up failed. He didn't patent the idea because he thought it was obvious. RIM identified three other inventors who may have predated Campana. John Markoff, *In Silicon Valley, a Man Without a Patent*, NYTimes Apr. 16, 2006.

number of uncertain property rights is larger than the expected cost caused when any one patent is asserted against the innovator. We cannot be sure, but we would not be surprised if RIM's failure to do a patent search was, at the time, the best decision.

Kodak chose the opposite path, but fared no better. They retained a leading patent expert named Carr to advise them how to avoid patent infringement. Carr conducted an exhaustive review of potentially relevant patents and Kodak carefully developed technology they thought was outside of Polaroid's patent fences. At a late stage in the litigation Polaroid asserted that Kodak had "willfully" (knowingly) infringed its patents, but the trial judge refused to award enhanced damages for willfulness and concluded: "The uncontroverted facts demonstrate that Kodak consulted Mr. Carr early and often as it developed its instant integral photography system."⁵

Kodak's clearance program was thoroughly integrated with its R&D on consumer instant photography. Patent review started seven years before a commercial product was introduced. Carr studied more than 250 patents, many owned by Polaroid and many owned by others. He "rendered 67 written and countless oral opinions on both the film and camera patents." In the lawsuit, Polaroid focused on thirty-four claims contained in ten of their patents. Three of the patents were invalidated. Kodak was held liable for infringing twenty claims in the remaining seven patents.

Carr had advised Kodak that the claims in those seven patents were either invalid or not infringed. "Over the course of three years Mr. Carr reviewed more than 50 potential imaging chemistries for Kodak. Eventually, after working closely with Mr. Carr and performing tests he requested to make certain he understood how the chemistry worked," Kodak chose an imaging technology that was later ruled infringing. Kodak also incorporated design changes to mechanical features of its camera that Carr thought would keep them clear of Polaroid patents. The trial judge concluded that Carr "discussed the Kodak technology with Kodak engineers, and gave his considered advice....That advice simply turned out to be wrong."

These two examples show that the patent notice function breaks down for two sorts of reasons. First, a technology investor may not be able to unambiguously determine the boundaries of a patent, as in the Kodak example. Second, even if the boundaries of patents could be determined and cleared with reasonable accuracy, it may be too costly to do so. Below we look at the law and institutions that give rise to both of these situations.

2.3 Land versus Technology

The BlackBerry and instant camera cases illustrate how notice and clearance failure cause expensive patent disputes. Regrettably, patent notice and clearance problems are widespread. One good way to recognize the size of the problem is by comparing property rights in land to patents.

Real property law gives land owners a clear view of property boundaries. Before building a costly structure near the perimeter of one's land, a sensible land owner will consult a lawyer and conduct a survey of the land. Land records, a survey, and a title search give a potential builder clear notice of where her property ends and her neighbor's

5 Polaroid Corp. v. Eastman Kodak Co., 1990 U.S. Dist. LEXIS 17968 (D. Mass. 1990) at 236.

begins. We rarely hear about lawsuits caused because someone inadvertently built a structure on, or made some other investment in another's property.⁶

A prospective land buyer will take the same steps before buying land. Normally, any clouds on the title to the land will be cleared before the sale is completed. The process of examining property rights to land is routinely provided by a robust market that combines title examination with title insurance.

In contrast, patent search and clearance is hardly routine. The process is costly and inconclusive. Typically, the risk of infringement that remains after a competent patent review is so unpredictable that it is virtually uninsurable.⁷ Similarly, uncertainty about scope and validity undermine the market for patent enforcement insurance.

Overall, the legal infrastructure supporting patent law performs poorly compared to the infrastructure supporting real property law. A few numerical comparisons lay bare the stark contrast. Title insurance on a \$150,000 mortgage runs about \$450 in Iowa, a state with a relatively efficient system.⁸ The revenue from these policies is more than adequate for the insurers to cover their cost of searching and examining the title, defending against future lawsuits, and paying losses that result from lawsuits. Impressively, search and examination is so effective that insurers nationwide pay only about 5 percent of premium dollars on claims.⁹

Now imagine that an innovative firm purchases insurance against patent lawsuits that might arise after it adopts a new technology. What would it cost an insurance company to search and examine patent databases, pay to defend patent lawsuits, and pay for damages (and perhaps even the costs from an injunction)? We do not have an estimate of the search and examinations costs, but unlike title insurance, the lion's share of the cost would probably arise from lawsuits. We reported in chapter 5 that the expected cost of defending patent lawsuits is 6.4% of the cost of R&D investment. This ratio is a lower bound on the cost of our hypothetical infringement insurance. The cost of search and examination plus the expected cost of defending title lawsuits is much less. Dividing \$450 by \$150,000 gives a ratio of 0.3%, which is twenty one times lower than the ratio for patents.

A similar comparison between patents and copyrights would probably be equally discouraging, but we are not aware of any data on either copyright infringement

6 Over the past three years there have been only four lawsuits in California concerning good faith improvement of land. The disputes involved one party intruding onto another's property and making an investment that delivered value to the other's property. The investments involved tree cutting, a road, crops, and landscaping. California law defines a good faith improver as: "A person who makes an improvement to land in good faith and under the erroneous belief, because of a mistake of law or fact, that he is the owner of the land." (Code Civ. Proc., § 871.1.)

7 Richard S. Betterley, *The Betterly Report*, 2006, available at: Richard S. Betterley, http://www.betterley.com/adobe/ipims_06_nt.pdf

8 Melynda Dovel Wilcox, *Cut Your Title Insurance Costs*, December 2005, <http://www.kiplinger.com/personalfinance/basics/managing/insurance/title.html>. In other states the cost may be as high as \$1500. The \$450 figure, at the low end of the range, is probably the best measure of the social costs of the land title system. There are complaints and recent government investigations of anti-competitive practices in the title insurance industry that drive up premium prices.

9 M. Martin Boyer and Charles M. Nyce, *Market Growth, Barriers to Entry, and Banks as Insurance Referral Agents: Evidence from the Title Insurance Industry*, February 2005.

insurance or copyright litigation costs. Two pieces of information suggest that copyright does far better than patent in providing notice and facilitating clearance. First, copyright clearance is relatively standardized in the movie, music, and publishing industries. Second, copyright infringement insurance is available to protect against risks created by errors or omissions in the clearance process.¹⁰

The software industry is especially interesting because patent and copyright lawsuits are both possible. The IT Compliance Institute notes “that sound IT policy can avoid most copyright infringement and trade secret misappropriation, but patent infringement is virtually impossible to avoid; insurance against copyright infringement is affordable, but patent infringement insurance is prohibitively expensive for most companies.”¹¹

2.4 Differences in Law and Institutions

The costs of insurance and clearance are much lower for tangible property than for patents. Why? There are sharp differences between patents and tangible property regarding the law and institutions that promote clear notice. Consider the following contrasts between patents and land:

1. Fuzzy boundaries. Land can be inexpensively surveyed and the survey boundaries carry legal weight. In contrast, although innovators can obtain expensive legal opinions about the boundaries of patents, these opinions are unreliable. There is no reliable way of determining patent boundaries short of litigation.

2. Public access to boundary information. The documents used to determine boundaries for both land and patents are publicly available. However, it is possible for patent owners to hide the claim language that defines patent boundaries from public view for many years and this is being done with increasing frequency.

3. Possession and the scope of rights. Generally, tangible property rights are linked closely to possession, hence, the classic phrase: *possession is nine points of the law*. Patent law also requires possession of an invention, but often this requirement is not rigorously enforced. Consequently, courts sometimes grant patent owners rights over technology that is new, different, and distant from anything they actually made or possessed. Not surprisingly, this practice makes patent boundaries especially unclear in fast-paced technologies such as biotech and computer software.

4. The patent flood. Clearance costs are affected by the number of prospective rights that must be checked for possible infringement. Investments related to a new land use rarely implicate very many parcels of land. Also, we noted in Chapter 2 that property systems include features that discourage fragmentation of land rights. Investments related to new technology frequently need to be checked against large numbers of patents. Although the patent system has features that discourage patent proliferation (notably the non-obviousness requirement), empirical evidence

10 For example, Chubb provides Reputation Injury and Communications Liability covers costs from copyright and trademark infringement lawsuits. <http://www.chubb.com/businesses/ci/chubb1105.pdf>

11 <http://www.itcinstitute.com/display.aspx?id=160> [check to see if this is a quote]

suggests these are not working well.

These four differences can explain the sharp difference in the performance of the notice function and the corresponding differences in inadvertent infringement. We explore them in more detail over the remainder of this chapter.

3 Fuzzy boundaries

3.1 Institutional Failure: Why the Notice Function Works for Property but not for Patents

Property law provides good notice to potential purchasers about the property rights relevant to a contemplated new land use. Patent law often fails to provide good notice to innovators about the patent rights relevant to adoption of a new technology. Property law has stable doctrine and flourishing institutions designed to transmit clear notice. Patent law lacks both.

Suppose a real estate investor wants to acquire a certain parcel of land and build a mall. Her lawyers should be able to tell her that she will need to acquire rights to certain parcels A and B, but not nearby parcels C and D. They should also be able to tell her whether there are any mortgages, easements, future interests, or other interests in the relevant property. To a great extent, public documents give notice of these interests and provide evidence of their validity or invalidity.

The work of real estate lawyers is complemented by the work of title agents and surveyors. Both are licensed professionals who contribute in important ways to the success of property law in providing clear notice. Surveyors work from the plot description found in the deed or in a registered survey and, using well-recognized standardized methods, plot out the boundary lines. In most states, surveyors' boundaries are legally recognized. A typical survey for a residential property costs several hundred dollars. Title agents search deeds and other public information to help lawyers judge the validity of property titles. A title search for a residential property with title insurance also typically costs several hundred dollars.

The patent system also has licensed patent agents and patent lawyers. They can also render a judgment on whether a proposed investment (technology) infringes on valid patents owned by others. They judge both the boundaries and the validity of these patents. They also work by reading legal documents—issued patents—and applying them to the matter at hand. However, there are at least two important differences. First, a legal “opinion letter” on a technology typically costs about a hundred times more (\$20,000 to \$100,000). Second, this finding carries little legal weight.¹²

Indeed, no one except appeals court judges seem to be able to provide a definitive answer on potential infringement (and they often disagree). It is true that patent examiners determine the boundaries of each patent—this is necessary for them to determine whether the patent meets the criteria of patentability, e.g., whether the patent is truly novel. But patent examiners don't record their interpretation of the boundaries of the patent and, even though courts presume that their decisions about patent validity are

¹² Knorr Bremse ???

correct, courts pay little heed to the boundaries that patent examiners use to make these determinations.

District courts hold hearings to interpret the boundaries of patents in lawsuits. In some cases they call on expert witnesses to provide understanding of the technology and industry usage of technical terms. But these determinations get no deference at the appellate level. Sadly, the Federal Circuit reverses the district court judge's construction of 34.5% of the claim terms appealed and this percentage has increased over the course of the 1990s.¹³

These difficulties arise, of course, because it is much more complicated to map the boundaries of a technology from a verbal description than it is to map a plot of land using a standardized surveyor's description. This problem arises partly from the nature of the subject matter and partly from the difference in techniques used to do the mapping. We look at the law of patent claim interpretation in the next section.

But the hard fact is, innovators cannot quickly and easily obtain a reliable judgment on whether prospective technology infringes on others' patents. Perhaps in an earlier time, when technology was simpler, this was not such a serious problem because the ambiguity of patent claims was not so great. But as we develop below, there are reasons to think that this ambiguity has been increasing substantially in recent years. In addition, changes made during the 1990s in the legal methods used to determine the boundaries of patents appear to have made the uncertainty even greater.

3.2 A Nose of Wax?

Patent documents are typically long and obscure. The most obscure and most important part of each patent is the set of claims found at the end of the document. Patent claims create property rights. Each claim is a single sentence — an odd sort of sentence to be sure, which might run on for several paragraphs. Collectively, they determine the scope of the owner's right to exclude — they are the fences that mark the inventor's property. Giles Rich, the most famous patent judge of modern times observed: “[T]he main purpose of [patent] examination... is to try to make sure that what each claim defines is patentable. To coin a phrase, *the name of the game is the claim.*”¹⁴

The game is stacked in favor of inventors and against examiners and the public. Examiners get an average of 18 hours to read and understand the application and make sure that each claim is valid. Patent law imposes many validity requirements. Time pressure inevitably means that inventors will often be able to push through questionable claims. Critics of the patent system quite properly complain that the Patent Office frequently approves of claims that are obvious or lack novelty.

We want to highlight a different problem that has not attracted much comment — the issuance of vague claims. In order to be valid, the claims must meet the requirement found in paragraph 2, of section 112: “claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.” The Supreme

¹³ Kimberly A. Moore, *Markman Eight Years Later: Is Claim Construction More Predictable?* 9 *Lewis & Clark L. Rev.* 231 (2005).

¹⁴ Giles Sutherland Rich, *Extent of Protection and Interpretation of Claims-American Perspectives*, 21 *Int'l Rev. Indus. Prop. & Copyright L.* 497, 499 (1990).

Court long ago recognized that “[t]he claim is a statutory requirement, prescribed for the very purpose of making the patentee define precisely what his invention is; and it is unjust to the public, as well as an evasion of the law, to construe it in a manner different from the plain import of its terms.”¹⁵ Nevertheless, patent applicants sometimes game the system by drafting ambiguous patent claims that can be read narrowly during examination so they avoid a novelty rejection, and broadly during litigation which supports a finding of infringement. The Freeny patent discussed in the Introduction is one example. Limited resources mean that the Patent Office does a poor job of monitoring the clarity of patent claims, and thus notice suffers.

The Federal Circuit has not pushed the Patent Office to monitor vague claim language. In fact, the court itself is reluctant to invalidate an indefinite claim. Allison and Lemley find that only 5.8% of invalidations are based on claim indefiniteness.¹⁶ The Federal Circuit explained:

We engage in claim construction every day, and cases frequently present close questions of claim construction on which expert witnesses, trial courts, and even the judges of this court may disagree. Under a broad concept of indefiniteness, all but the clearest claim construction issues could be regarded as giving rise to invalidating indefiniteness in the claims at issue. But we have not adopted that approach to the law of indefiniteness. We have not insisted that claims be plain on their face in order to avoid condemnation for indefiniteness; rather, what we have asked is that the claims be amenable to construction, however difficult that task may be. If a claim is insolubly ambiguous, and no narrowing construction can properly be adopted, we have held the claim indefinite. If the meaning of the claim is discernible, even though the task may be formidable and the conclusion may be one over which reasonable persons will disagree, we have held the claim sufficiently clear to avoid invalidity on indefiniteness grounds. *Exxon Research and Engineering Co. v. U.S.*, 265 F.3d 1371, 1375 (2001).

The Federal Circuit’s approach appears to be inconsistent with the statute and contrary to the policy concern expressed by the Supreme Court. The Court recognized the social value of a rigorous indefiniteness doctrine in a 1942 case, Justice Jackson stated: “A zone of uncertainty which enterprise and experimentation may enter only at the risk of infringement [suit] would discourage invention only a little less than unequivocal foreclosure of the field. Moreover, the claims must be reasonably clear-cut to enable courts to determine whether novelty and invention are genuine.”¹⁷

As the Federal Circuit admitted, tolerating vague language at the Patent Office yields difficult questions of claim interpretation. The Supreme Court anticipated contemporary claim construction problems when it warned: “Some persons seem to suppose that a claim in a patent is like a nose of wax which may be turned and twisted in any direction, by merely referring to the specification, so as to make it include something more than, or something different from, what its words express.”¹⁸

Some ambiguity would not be too harmful if the public could rely on a predictable method of claim interpretation. Unfortunately, the Federal Circuit has not formulated

¹⁵ *White v. Dunbar*, 119 U.S. 47, 52 (U.S. 1886).

¹⁶ John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 *AIPLA Q.J.* 185, 208 (1998).

¹⁷ *United Carbon Co. v. Binney & Smith Co.*, 317 U.S. 228, 236 (1942).

¹⁸ *White v. Dunbar*, 119 U.S. 47, 51 (U.S. 1886).

such a method. Recall that district court judges do a poor job of predicting Federal Circuit claim interpretation. Certainly, it follows that lawyers will have difficulty counseling potential infringers how an ambiguous claim term will be interpreted. The discussion in the advanced topic section below illustrates the difficulty of this interpretative task.

The Federal Circuit is keenly aware of the notice problems created by uncertain claim construction. The law governing claim construction has long been in flux as courts have searched for satisfactory methods. A significant development occurred ten years ago in the case *Markman v. Westview Instruments*.¹⁹ The case and its progeny made claim construction a question of law subject to *de novo* review in the Federal Circuit. Essentially, this means that the judges in the Federal Circuit have the power to choose the meaning of patent claims anew, ignoring lower court decisions. Alternative approaches would have distributed power among fact-finders, trial court judges, and appellate judges.

Consolidating power in the appellate court offers the benefit of the experience of the Federal Circuit judges, but reliance on their vast experience with patent litigation has not paid off. The goal of predictable claim interpretation has been thwarted by three problems. First, members of the Federal Circuit have been feuding over appropriate methods of claim construction.²⁰ One camp takes a very formal approach to interpretation, and the other camp is more willing to rely on contextual clues to aid interpretation. Second, the appellate court is too distant from the expert testimony and other facts that should be used in sensible claim construction. Judge Mayer of the Federal Circuit laments: “Because claim construction is treated as a matter of law chimerically devoid of underlying factual determinations, there are no ‘facts’ on the record to prevent parties from presenting claim construction one way in the trial court and in an entirely different way in this court.”²¹ Third, in its formalist vein, the Federal Circuit has been skeptical about the use of *extrinsic evidence* in claim construction. Extrinsic evidence comes from outside the patent document and proceedings in the Patent Office. It includes expert testimony, journal articles, dictionaries, and other outside evidence. Much of this extrinsic evidence is available to parties interested in mapping out the scope of a patent before they get near a courtroom. Potentially, greater use of extrinsic evidence would strengthen the notice function, but it would also reduce the power of the Federal Circuit.²²

Fuzzy boundaries are still possible even when claims are relatively precise and their literal scope is clear. *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.* illustrates this point. The case featured yet another case of inadvertent infringement; the parties independently invented a process for purifying dye. Hilton Davis claimed a

¹⁹ 116 S.Ct. 1384 (1996).

²⁰ Wagner and Pethebridge. Both camps are relatively formal, and reject the use of policy considerations during claim construction. In a district court ruling, Circuit Judge Richard Posner, sitting by designation, worried that a broad claim construction of a drug patent that could cover only trace amounts of the claimed compound would be contrary to patent policy. The Federal Circuit reversed, stating that claim construction is not a policy-driven inquiry, but rather a contextual interpretation of language. *SmithKline Beecham Corp. v. Apotex Corp.*, 365 F.3d 1306 (Fed. Cir. 2004).

²¹ Judge Mayer, dissenting, *Lava Trading, Inc. v. Sonic Trading Management, LLC, et al.*, x F.3d x (Fed. Cir. 2006).

²² Burk and Lemley (9 Lewis and Clark L.R. 50) suggest that a great deal of scholarship about the textual interpretation of contracts points to the futility of relying too heavily on intrinsic evidence. Interpreting words can be difficult. They report that recent Federal Circuit cases have had to decide plausible disagreements over the meanings of the words “a,” “or,” “to,” “on,” “about,” “including,” and

version of the process operating at a pH ranging from 6.0 to 9.0. Warner-Jenkinson's technology operated at a pH of 5.0, outside the range of the relevant claim. Nevertheless, a jury found Warner-Jenkinson infringed under the doctrine of equivalents.²³

This doctrine expands the scope of a claim beyond the scope identified through claim construction.²⁴ The original goal of the doctrine was to protect inventors against the risk that a pirate would spot a poorly drafted claim, introduce a slight variation in a patented technology that was outside of the claim, and escape literal infringement. Such evasion could occur if the patent owner did not foresee the manner of imitation chosen by the pirate, and therefore drafted its claim too narrowly. Today the doctrine applies without regard to the motives or methods of the alleged infringer – in particular, it applies to independent inventors and those who make a good faith effort to invent around a patent, as well as to pirates.

The doctrine of equivalents corrodes the notice function of patents and increases the risk of inadvertent infringement. Warner-Jenkinson might have thought a pH of 5.0 was outside the fence erected around processes with pH's ranging from 6.0 to 9.0, but they were wrong. The Supreme Court admitted: “[t]here can be no denying that the doctrine of equivalents ... conflicts with the definitional and public-notice functions of the statutory claiming requirement...,”²⁵ nevertheless, they confirmed the availability of the doctrine against inadvertent infringers.

Advanced Topic: Claim Construction

Good patent policy analysis is not possible unless one has a basic understanding of patent claims, how they are interpreted, and how they create property rights. So, in this section, we present the highlights from a patent lawsuit involving a claim relating to a simple invention. Even though the invention is simple, you will soon see that understanding and applying the claims can be quite difficult even for experienced patent judges.

U.S. Patent No. 4,018,260 relates to a home improvement invention, specifically a set of border pieces used to attach a fabric wall covering to a wall. Drawings from the patent are displayed on the left hand side of Figure 6-1. The patent suggests the advantage of the invention is that it makes it easier for an inexperienced person to hang wall covering. The relevant portion of the disputed claim 1 reads as follows:

“through.”

23 After a round of appeals the case was sent back to the district court and it was dropped or settled. The Supreme Court asked the lower courts to consider whether a doctrine called prosecution history estoppel should have prevented Hilton Davis from using the doctrine of equivalents. Prosecution history estoppel is one of several methods that courts use to screen cases and limit use of the doctrine of equivalents. We will discuss the role of these screens in improving patent notice in Chapter ??.

24 Courts resolve questions about the doctrine of equivalents about 55% as often as they resolve questions of literal direct infringement. www.patstats.org.

25 Warner-Jenkinson v. Hilton-Davis, 520 U.S. 17, 29 (1997).

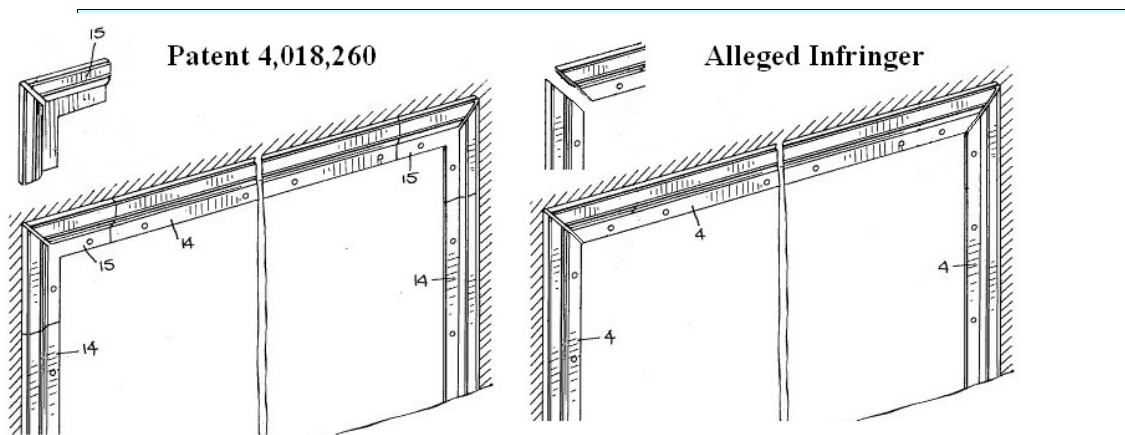


Figure 1. Patent Claim and Alleged Infringing Alternative

1. An assembly of border pieces for creating a framework attachable to a wall or other flat surface for mounting a fabric sheet which is cut to dimensions at least sufficient to cover the surface, said assembly comprising

(a.) linear border pieces and

(b.) *right angle corner border pieces* which are arranged in end-to-end relation to define a framework that follows the perimeter of the area to be covered...

The patentee, Unique Concepts, sued Brown for patent infringement. The defendant made and sold a set of border pieces for hanging wall covering. The outcome of the case turned on the interpretation of claim 1, and in particular of the italicized language: right angle corner border pieces, labeled 15 in the figure.²⁶ The claim also describes linear border pieces (labeled 14) and distinguishes them from the right angle corner border pieces. Brown's set of border pieces contained trapezoidal pieces with a forty-five degree cut (labeled 4 on the right-hand side of Figure 1). Two trapezoidal pieces could be connected to serve the same function as the right angle corner border pieces. Brown did not use corner pieces as in the patent. Thus, the court needed to decide whether the scope of claim 1 was broad enough to include the defendant's product.

The majority of judges ruled there was no infringement, but Judge Rich dissented and offered an alternative claim construction that was broad enough to support a finding of infringement. In effect, Judge Rich argued that the term "right angle corner border pieces" is not restricted to pre-formed corner pieces and it includes the alleged infringer's configuration. The disagreement concerned not only the language in the claims themselves, but also what the patentee's original language claimed, how this was changed in response to Patent Office objections, and how the invention was described elsewhere in the patent.

This dispute reveals the troubling indeterminacy of claim construction. We suspect the uncertainty about claim boundaries is even greater for more complex technologies, abstract claim terms and early-stage technologies.

²⁶ Unique Concepts, Inc. v. Brown, 939 F.2d 1558 (Fed. Cir. 1991).

4 Public availability of boundary information

Determination of boundaries depends on publicly available information. Land deeds are available in county registries. Most patent documents are also publicly available, but not all, however.

Many inventors act strategically to hide their claims from potential infringers. Inventors are allowed to draw out the patent application process for years if that serves their interest — and sometimes it does. They often monitor the technology choices of other firms and write their patent claims to cover the technology of potential licensees. The targeted firms may get locked into a technology choice and find themselves in unfavorable bargaining positions with the patent owner.²⁷

In a notorious recent example, the firm Rambus finagled a semiconductor standard setting organization into adopting a standard that infringed a Rambus patent. Rambus participated in the standard setting process, and learned information that it used to write claims that covered the standard. This strategy worked because the company added the claims to a patent that was pending when the standard setting process began. Thus, the “invention” was completed before the standard was set, but the claims were written *after* the standard was set. Rambus dodged private suits alleging fraud and antitrust violation and was successful in enforcing its patent.²⁸

It appears that hidden claims are becoming more prevalent. One practice used to keep claims hidden is to file “continuation” applications. By the mid-1990s these had increased sharply (to about 31% of all patent applications) over the level of late 1970s.²⁹

The patent system was reformed about ten years ago to reduce some problems of hidden claims. The term of the patent was changed from seventeen years from issue to twenty years from application date, and patents are published after eighteen months, unless the applicant refrains from patenting outside the U.S. These reforms probably had a significant positive effect, but hidden claims are still a problem. Close to half of U.S. patent applications are not published at eighteen months. And claims can still be hidden in patents for which the applications are published, because the applicant can change claim language in a patent without updating the published application. In any case, by 2000, the average length of time a patent was not fully public reached its highest level in 25 years.³⁰

5 Possession and the Scope of Rights

In general, to own, one must possess. Although possession is not sufficient to guarantee ownership, the law by and large assigns initial property rights only to the extent that one possesses—exerts some control over—a property. A possession requirement means that the owner of a property is actually in a position to make the socially desirable investments or transactions that are the key economic benefits of property.

²⁷ The strategic benefits of hidden claim drafting probably explain why the average prosecution time of litigated patents is much longer than patents that are not litigated. ALMT.

²⁸ The FTC recently ruled that Rambus violated antitrust law. That ruling is now on appeal.

²⁹ Lemley and Moore, 84 BU L.R. 69, 2004.

³⁰ That is, the time from initial application to patent issuance, Lemley and Moore, 84 BU L.R. 71, 2004.

Simple possession rules make it easier for third parties to recognize the existence and scope of a property right. If farmer Jones owns and possesses a shirt, a tractor, a house, and a farm, then neighbor Smith should know that he must ask permission before using that property. Furthermore, Smith probably won't have any trouble figuring out that Jones is the owner.

The scope of most tangible property is easily described. Fences, surveys, and land records provide clear notice of the scope of rights to land. The physical structure of goods, machines, buildings, etc., defines those kinds of property — and gives crystal clear notice of the scope of rights. Rental, securitization, liens, and other legal devices may complicate the allocation of rights to use tangible property, but they are *not* relevant to what we mean by scope. Clear scope is present when a stranger recognizes when she is about to use someone's property and puts her on notice to seek whatever permissions are necessary. Everyone recognizes that an unattended boat tied to a dock is someone's property, and it should not be used without permission.

In some cases, when tangible property is taken from nature, the scope of the property rights is not so clear. In these cases, simple physical characteristics are not so useful for establishing legal boundaries because the relevant characteristics change over time or are not fully known initially (that is, they are revealed over time). The mining disputes discussed in Chapter 2 make this point. Another example comes from water law. In certain jurisdictions, the right to use water from a stream running through a property depends on the past consumption of others along the stream. Hence, a newcomer will need to investigate her neighbors' water use to determine whether and to what extent property rights already exist in the stream flow.

In the case of migratory wild animals property law follows the “rule of capture”: you can own what you capture, but not the stock from which it came. Thus, when someone shoots a wild duck, she does not gain rights to the flock. It is easy to see how the rule of capture promotes clear notice. Suppose the first hunter to shoot a duck in a flock actually gained ownership over the flock. It would be virtually impossible for hunters in the next county to recognize the flock was owned. Furthermore, the counterfactual property rule would invite endless disputes about who was the true owner of the flock, and which ducks belong to which flock.³¹

Similarly, the possession rule in patent law is designed to mitigate notice problems. The first paragraph of Section 112 of the patent statute requires that the patent describe how to make and use the invention in sufficient detail so that others can do so. This “enablement” requirement³² makes the patentee demonstrate the practical knowledge

31 The rule of capture applies to natural oil and gas discoveries. A landowner owns the oil brought up from his wells, but the oil field itself is not owned nor does the landowner have any definite claim on future oil withdrawals. Static physical boundaries do not work here because the underground structure of the oil field is not usually fully known until the field has been well-developed. For example, if two wells that are twenty miles apart both strike oil, it may not be clear whether they are tapping the same underground reserve or not. Giving ownership of the entire field to one well-owner will cause costly disputes. Moreover, such a rule would inefficiently penalize the other well-owner if the fields are, indeed, separate. This would effectively discourage prospecting. Instead, the rule of capture works to reduce costly disputes and unearned ownership.

32 Some recent decisions have also read a “written description” requirement of possession into this paragraph as well.

needed to usefully own the claimed invention.

This possession requirement allows courts to invalidate patent claims that are “too broad” in the sense that the inventor did not really possess all the claimed technology. A famous example concerns patents on the light bulb. Edison was not the first inventor of the incandescent light bulb. He had many competitors, and his light bulb built on many earlier contributions.³³ Sawyer and Man, were two competitors who obtained a light bulb patent before Edison achieved his famous invention and they sued Edison. Their patent claimed a light bulb with a “conductor of carbon, made of fibrous or textile material...” Edison made a light bulb with a bamboo filament that fell within the language of the broad Sawyer and Man claim. The court ruled in favor of Edison because Sawyer and Man had actually only made a light bulb using carbonized paper as a filament. They did not make light bulbs with other filaments drawn from the wide range of fibrous and textile carbon based filaments, and in fact, most of those filaments would not work. Edison labored mightily to find a bamboo filament which worked very well—he tried over 6,000 different substances before settling on bamboo. But the Sawyer and Man patent did not describe this important detail. They possessed the specific invention of a light using carbonized paper, but they did not possess the claimed knowledge to make and use *all* “fibrous or textile” forms of carbon, including the bamboo later discovered by Edison. Therefore, the court invalidated Sawyer and Man’s claim because it claimed more than they actually possessed – they claimed technology that was not yet invented.³⁴

Ideally, enablement restricts patent scope so that inventors’ property rights do not stray far from the invention they actually possess. In the past, inventors had to demonstrate a working prototype or scale model of the invention in order to demonstrate possession. Inventors no longer need to provide a working prototype in order to obtain a patent, however, the general possession requirement remains central to patent law.

Thus, we are troubled by the many recent examples of patent claims that have been read broadly to cover infringing technologies that are distant from the invention actually possessed by the patent owner. Many of these infringers have achieved significant inventions that they made independently of any help from the information contained in the patent. Consider, for example, the following two cases.

In a biotech case, Amgen obtained broad coverage from its patent claim on the protein erythropoietin (EPO), a naturally-occurring hormone that promotes the production of red blood cells.³⁵ EPO had been previously isolated and purified but

33 The Supreme Court noted other carbon filament, incandescent lamp inventions “in 1845, by Greener and Staite in 1846, by Roberts in 1852, by Konn in 1872, by Kosloff in 1875, and by others.”

34 In patent law jargon, the broad claim was not enabled. Of course, the current statute was not in effect at that time, however, a similar common law possession requirement existed. A modern counterpart can be found in *Amgen, Inc. v. Chugai Pharmaceutical Co.*, 927 F.2d 1200 (Fed. Cir. 1991). Amgen invented a recombinant version of EPO, a human protein that stimulates red blood cell production, used to treat anemia. Chugai was the licensee of different patent on purified natural EPO. Amgen claimed any functional analog of the recombinant EPO that it actually made. This claim was broad enough to cover Chugai’s EPO. After five years of experimentation Amgen was unable to identify which analogs had the desired properties. The claim was invalidated because of excessive breadth.

35 *Amgen Inc. v. Hoechst Marion Roussel*, 314 F.3d 1313. See Robin Feldman’s discussion of this, “Rethinking Rights in Biospace,” 79 S. Cal. L. Rev. 1.

attempts to obtain therapeutically useful quantities of the hormone from urine or blood had failed. Instead, Amgen isolated the human DNA that coded for EPO and inserted it into Chinese hamster ovary cells. These genetically engineered cells produced human EPO that could be efficiently isolated and purified. As a result, Amgen launched the blockbuster drug Procrit(tm) and they obtained a patent that claimed all “non-naturally occurring” EPO.

Later, an innovative biotech company, Transkaryotic Therapies, Inc. (TKT), developed an entirely different method of producing EPO. TKT did not insert human DNA in a foreign host cell, but instead, they figured out a way to trick human cells into directly producing large amounts of EPO. Amgen successfully sued TKT (and its ally Hoechst) for infringement.

Amgen faced two main obstacles en route to an infringement judgment. First, the claim to all “non-naturally occurring” EPO had to be read broadly enough to cover the EPO made in human cells using TKT's technique. Second, this broad claim had to meet the enablement requirement, that is, Amgen had to show it possessed the relevant technology. Amgen overcame these obstacles even though they clearly did not know how to perform TKT's technique. All that these two technologies had in common was that they shared the objective of producing large quantities of EPO outside of the human body.

A second case concerns the patent granted over relatively abstract ideas to Freeny which we discussed in the introduction. Freeny actually invented a kiosk for generating audio tapes and the like at retail stores. Nevertheless, because his patent claims were highly abstract, they were interpreted to apply to a broad swath of e-commerce, even though nothing in his patent described general purpose transactions over the Internet.

Arguably, the Freeny and Amgen patents suffer from the same defect as the patent of Sawyer and Man: they do not demonstrate possession of the broad range of technologies that they claim. There are two clear problems with this policy. First, it makes patent boundaries incredibly fluid over time. Third parties cannot rely on the plain meaning of a term at the time of patent application – *claim terms are allowed to change meaning over time as technology advances*. Second, it penalizes real innovators who operate in the shadow of early, broad claims. Both of these factors tend to generate costly disputes.

Many of the troubling cases in which patent claims are untethered from actual inventions arise in biotechnology. This is no accident. Several factors have contributed to a “flood” of biotech patents on very early-stage technologies: the Patent Office has granted thousands of patents on gene fragments, the Bayh-Dole Act has encouraged patenting by academic researchers even though most of these inventions are very early stage (Thursby & Thursby), and the Federal Circuit has changed patentability standards to permit patents on technologies that are still far removed from practical application.³⁶

³⁶ In *Brenner v. Manson*, 383 U.S. 519 (1966), the Supreme Court held that “[A] patent is not a hunting license” and early-stage results that did not yet demonstrate a practical, useful application were not patentable. But in *In re Brana*, 51 F.3d 1560 (1995), the Federal Circuit held that the burden of proving a lack of useful application fell on the Patent Office; the court determined that a drug compound with promising test results against tumors in mice had sufficient evidence of practical utility. The Federal Circuit appears to be heading back into compliance with *Brenner*. In *In re Fisher*, the court ruled that a

Inevitably, a large number of patents on early-stage technologies lead to attempts by patentees to assert these patents over later-developed technologies.

Patenting of early-stage technology is not the only situation where patents are asserted against later-developed technologies. For a variety of reasons, which we explore separately in Chapter ??, abstract patent claims are particularly endemic to computer-related patents. Of particular importance, the law has changed to permit the patenting of abstract software ideas, and the number of software patents granted has increased dramatically. The growth in the numbers of these patents also contributes to the frequency with which patents are asserted over fundamentally more advanced later-developed technologies.

The increase in patents on early-stage technologies and the increase of patents with abstract claims has led to lawsuits against later-developed technologies with greater frequency. This has increased the importance of clear possession rules. But judges have not consistently limited ownership to the technologies actually possessed, perhaps because some judges have felt an impulse to reward “pioneer” inventors, a topic we discuss below in Chapter ?. But the court has not been uniform about this, with some judges developing controversial new rules to limit the reach of patents over later-developed technologies. Legal scholar Robin Feldman documents the state of tumult in patent law concerning this issue for biotech patents.³⁷ Unfortunately, we suspect that the net effect of both the expansive reading of patent rights and the new corrective measures has been to increase uncertainty and costly disputes.

6 The Patent Flood

A large number of property rights held by many different owners can make the clearance of rights for new investment costly. If clearance costs grow too large, then complete clearance becomes infeasible, and firms will only do a cursory clearance or, perhaps, none at all.

In Chapter 2, we discussed how property law uses various rules to limit fragmentation of rights, including primogeniture, limits on future interests, property taxes and registration requirements, and zoning and subdivision restrictions.

Patent law also has rules that limit the proliferation of rights. First, an inventor must demonstrate an invention has sufficient practical utility in order to receive a patent. Also, patents are not granted for inventions that are obvious improvements on previous technology. These patentability requirements work to weed out the potential clutter of patents on inchoate or minor inventions. In addition, we saw in Chapter 4 that patent renewal fees work to weed out less valuable patents.

gene fragment patent failed to meet the utility requirement.

37 79 S. Cal. L. Rev. 1. Judges have recently developed new doctrines for interpreting the enablement and written description requirements found in Section 112, see for example, *Regents of Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559 and *Plant Genetic Sys. N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335, but these legal innovations have been controversial. See Judge Bryson’s concurrence in *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1261 and Judge Rader’s dissent in *LizardTech, Inc. v. Earth Res. Mapping, Inc.*, 433 F.3d 1376, even among the various judges of the Federal Circuit. Consequently, these doctrines have not been uniformly applied, possibly leading to increased uncertainty about patent boundaries.

However, the evidence suggests that over the last two decades the number of patent rights has proliferated dramatically. The number of patent applications more than tripled from 1980 (104,329) to 2004 (356,943). That would be great news if it represented dramatic growth in American innovation but the story is not so simple. The growth was *not* caused mainly by a dramatic jump in R&D spending. Instead, the number of patent applications per R&D dollar has grown rapidly, more than doubling since 1985 (see Figure 3).

Empirical research by Bronwyn Hall finds that patent application growth data displays “a very significant structural break between 1983 and 1984” which she attributes to the pro-patent policies of the Federal Circuit. Indeed, Henry and Turner identify a pro-patent structural shift in court rulings that occurred about this time.³⁸ Furthermore, Hall finds the growth comes from U.S. firms in the “electric machinery, electronics, instruments, computers, and communication equipment” industries.³⁹ Much of this growth took place during the 1990s and may be associated with subject matter expansion for software-related inventions.⁴⁰

The growth in patent applications and grants has been accompanied by comparable growth in the number of claims per patent. Even though each patent is supposed to protect only one invention, patents may have multiple claims, many patents have dozens of claims. Inventors write claims to protect different aspects of an invention, for example by claiming a product and also processes for making and using the product. Furthermore, they write claims of varied coverage to hedge against the risk that certain claims are invalidated or read narrowly. Allison and Lemley (??) compared patents from the mid 1970s to patents from the mid 1990s and found that the mean number of claims had grown from 9.94 to 14.87, nearly a fifty percent increase.

The growth in the numbers of patents and the growth in the numbers of claims do not necessarily imply a comparable increase in search costs associated with clearance. If, for example, patents could be neatly divided into technology classes so that only a small class needs to be searched, then search costs might remain reasonable despite the huge increase in numbers. But evidence from litigation suggests that this is not so. Bessen and Meurer (2005) found that about a quarter of all lawsuits between public firms involved firms that patented in very different technology classes *and* which were in unrelated industries. Indeed, it is not hard to find examples where firms are sued over patents covering distant technologies. For example, Amazon.com has been sued by a firm with a patent covering cable TV movie selection and another firm with a patent on a bank ATM interface.⁴¹ This implies that a complete clearance procedure requires careful examination of very large numbers of patents indeed. As noted in the Introduction, David Martin of M-Cam estimates that a typical web shop may need to check over 11,000 patents. Clearly, costs of clearance can be substantial.⁴²

38 Matthew Henry and John Turner, *The Federal Circuit Court of Appeals for the Federal Circuit’s Impact on Patent Litigation*, January, 2005

39 Bronwyn H. Hall, *Exploring the Patent Explosion*, NBER Working Paper 10605, <http://www.nber.org/papers/w10605>, June 2004.

40 Bessen and Hunt (2006) find that software patents—largely in these same industries—account for 25% of the total growth in the number of patents between 1976 and 2001.

41 Statement of Paul Misener before the Subcommittee on Courts, the Internet, and Intellectual Property, Committee on the Judiciary, United States House of Representatives, June 15, 2006.

42 The high cost of clearance was certainly appreciated by the organization developing a standard for the

Moreover, the law actually imposes penalties that discourage thorough clearance. Knowledge gained through a patent search increases the risk of a finding of willfulness in a patent lawsuit. Firms are discouraged from reading patents because of fear of the financial penalties that might follow a finding of willfulness. The disincentive is greatest when a firm believes there are a large number of weak patents in the technological vicinity of its innovation. If the firm is unlikely to license the patents, then reading them simply increases the risk of a finding of willfulness. On the other hand, when a firm believes there are a small number of strong patents nearby, it would read and license them, or be careful to invent around them.⁴³

The cost of clearance ratchets up even more when patents have fuzzy boundaries and when many patents are likely to be found to be invalid. With these uncertainties, a technology investor will have to examine many patents of vague scope and dubious validity. Note that even though the Federal Circuit has strengthened patent rights by making changes to the law that reduced the probability of invalidity, the share of district courts decisions that invalidated a patent is still 27%.⁴⁴ This introduces an element of risk into clearance decisions and it disrupts attempts to invent around patents. Kodak relied on Carr's opinion that several Polaroid patents were invalid. If they thought those patents were likely to be valid, they would have chosen another product design, or perhaps stayed out of the market.

There is abundant evidence that many technology firms follow the same path as RIM and invest little in patent search and clearance. A recent survey of the members of the Intellectual Property Owners organization found that 65 percent of respondents disagreed with the statement: "We always do a patent search before initiating any R&D or product development effort."⁴⁵ Nathan P. Myhrvold, former chief technology officer at Microsoft and currently CEO of an invention development company, grouses: "In most tech companies it is vehemently against company policy for engineers to read patents.... [They] do not check their products to see if they infringe anybody else's patents — a common practice in other industries, known as patent clearance. Nor do they have established programs to license outside patents on a proactive basis."⁴⁶ Myhrvold blames the arrogance of large technology companies, which leads them to believe they can out-litigate and outlast small patent holders, and therefore they do not worry about patent clearance. There might be a few firms that embrace this strategy, but it does not make sense when applied to RIM or other start-ups, and probably does not make sense for most established firms.

Indeed, apparently even a large number of patentees (including small inventors) do not clear their technology. Patent applicants are required to disclose patents (and other

third generation of wireless telephones. They issued a call for disclosure of relevant patents and offers of licensing terms. In reply, they received notice of 7600 patents and a combined royalty request summing to 125% of sales revenue. Lemley & Shapiro, *Royalty Stacking*, Texas L. Rev. (2006)

43 Unless the firm intends to pirate the patented technology.

44 Henry and Turner studied reported patent opinions from 1953-2002. They selected opinions containing substantive holdings and placed them into three categories: invalid, valid and not infringed, and valid and infringed. The 27% figure is the fraction of substantive holdings that resulted in invalidity. The fraction in the pre-Federal Circuit era was 55%.

45 Iain Cockburn and Rebecca Henderson.

46 Nathan P. Myhrvold, Testimony, U.S. Sen. Comm. on the Judiciary, *Perspectives on Patents: Post-Grant Review Procedures and Other Litigation Reforms*, May 23, 2006.

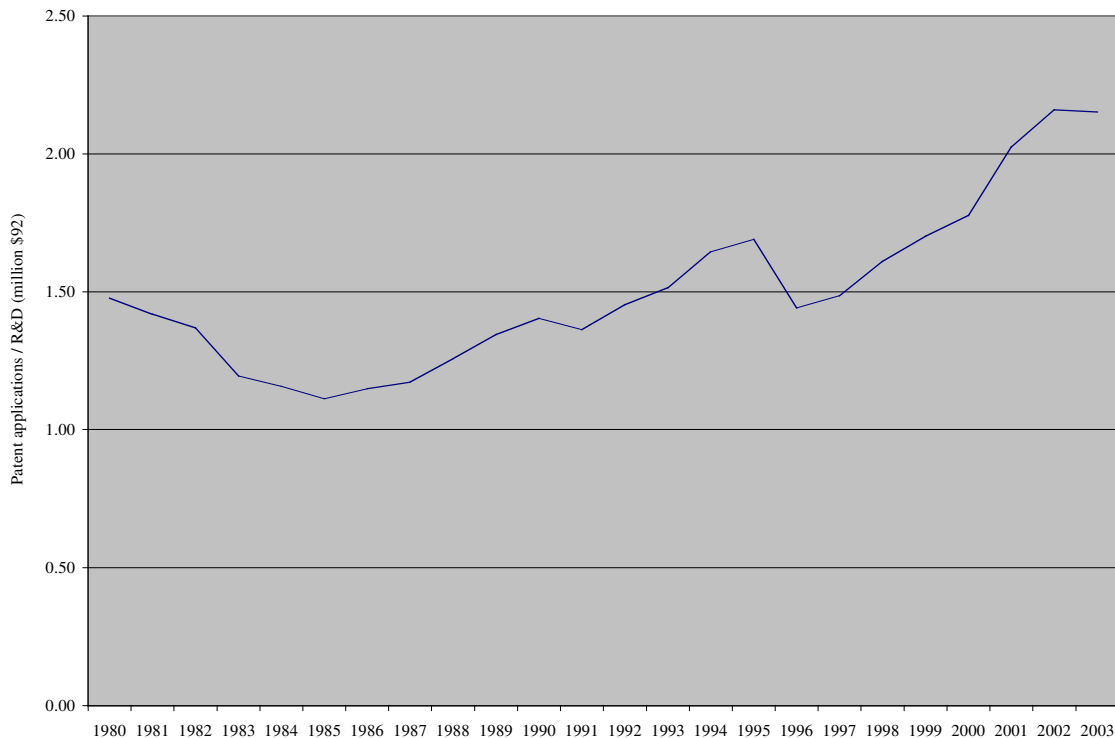


Figure 3. Patent Applications / R&D (Million \$92)

prior art) relevant to the patentability of their inventions. These disclosures supplement the patent search done by the patent examiner. Nevertheless, patent data shows 39 percent of applicants do not reveal a single patent relevant to their application. We doubt that many of the applicants are simply lying, because the punishments to both the applicant and its attorney are severe. And we know that there are relevant patents for most of these inventions, because the patent citations are provided by the examiner.⁴⁷ If these inventors had cleared their technology, they would have been aware of these citations.

Finally, in addition to the costs of searching and identifying rights to clear, a technology investor may also face substantial costs of transacting for those rights.⁴⁸

47 Bhaven M. Sampat, Determinants of Patent Quality. Similarly, 28% of patents issue without an information disclosure statement, which suggests the applicants did no prior art search before filing the application. <http://www.patentchronicles.com/archives/20050403/time-to-first-response-from-patent-office/>

48 When different firms own patents that are complements non-cooperative pricing drives total license fees above the price that a monopolist would charge. Real estate developers are familiar with another bargaining problem created by the need to acquire a large number of property rights – the hold-up problem. If several specific parcels of land must be acquired before a development project is feasible, then a developer would worry that one of the land owners might hold-out, and refuse to sell her land unless she gets a substantial premium over the market price for the land. When land owners first challenged plane flights over their land as trespass, the courts refused to enforce the traditional scope of property rights that extend out to space. The scope of property was sensibly limited to avoid the great social cost that would have arisen as airplane owners tried to obtain flyover rights.

Semiconductor manufacturing is one industry where this problem is felt acutely. “Semiconductor manufacturing is ... notoriously complex, integrating an array of process and product technologies that cover aspects of the circuitry design, materials used to achieve a certain outcome, and methods used in the wafer fabrication process. As several industry representatives pointed out, a given semiconductor product (say, a new memory or logic device) will often embody hundreds if not thousands of ‘potentially patentable’ technologies that could be owned by suppliers, manufacturers in other industries, rivals, design firms, or independent inventors.”⁴⁹ Rosemary Ziedonis finds that fragmentation is such a serious impediment to licensing that it drives patenting behavior by certain firms in the semiconductor industry.⁵⁰

* * *

In this chapter we have uncovered four aspects of the notice problem. To begin, inventors can hide patent claims, and thus boundary information, from the public. Next, even when the relevant public has access to the patent claims they are very difficult to interpret. Even assuming the claims are available and clear, there is a danger that the meaning of claim language will change (and become broader) over time. Finally, even when claims are available, clear, and fixed over time, the cost of searching for relevant patents can be quite high. High search costs arise directly because of the high number of patents that potentially apply to certain technologies, and indirectly because of the high rate of invalidity and the willfulness doctrine both discourage search.

The law and institutions that support notice in the patent system fall far short compared to similar institutions supporting notice for tangible property rights. It is hardly surprising that land title insurance is cheap and readily available while patent infringement insurance is limited, expensive and not widely offered. Nor is it surprising that inadvertent infringement is a serious problem for patents but not for tangible property. In the next chapter we present our evidence that inadvertent infringement caused by notice problems is responsible for most patent lawsuits and for the patent litigation explosion in particular.

49 Bronwyn H. Hall and Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995*, 32 *RAND J. Econ.* 101-128 (2001) *citations deleted*.

50 Rosemary Ziedonis, *Fragmented Markets for Technology and the Patent Acquisition Strategies of Firms*, 818 *Management Science* 50(6), pp. 804–820 (2005). She studied a sample of 67 semiconductor firms from 1980–1994, and found “that capital-intensive firms patent more than five times as aggressively in response to average levels of fragmentation in markets for technology as firms of average capital-intensity, even controlling for differences in R&D spending and size. Moreover, and extending the earlier findings of Hall and Ziedonis (2001), I find that capital-intensive firms do not patent more intensively (again, controlling for other factors) unless they build on fragmented pools of outside technologies. There is little evidence to suggest that these findings are explained by underlying shifts in technological opportunity, divergent R&D efficiencies, or other unobservable sources of heterogeneity within the sample.”