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After the Trolls: Patent Litigation as Ex Post Market-Making

Robert Merges

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**AFTER THE TROLLS:
PATENT LITIGATION AS EX POST MARKET-MAKING**

*Robert Merges**

Abstract.....	556
I. Introduction	556
II. The Benefits of Waiting	559
A. Strategic Delay in Patent Disputes.....	560
B. A Positive Role for Patent Litigation.....	563
C. Litigation and Ex Ante Opportunity Cost.....	565
III. Ex Post Market-Making.....	571
A. Beneficial Ex Post Licensing?	573
B. Product Components and the Patent Market.....	574
C. More on Ex Post Market-Making	577
1. Ex Post Markets as Quasi-Historical Reconstruction	579
2. The Importance of Patents for Companies Not in Product Markets.....	583
3. Summary: Formation of Ex Post Markets	584
IV. Ex Post Markets vs. Rent-Seeking: Policing the Troll Line.....	586
A. Policies to Prevent Rent-Seeking: Policing the “Troll Line”	587
1. Validity Procedures	587
2. Validity Doctrines.....	590
a. Nonobviousness.....	592
b. Disclosure Doctrines.....	594
3. Infringement Doctrines.....	596
4. Remedies	598
5. Procedural Rules.....	600

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B.	Rolling Up the Loose Ends of Patent Reform	602
V.	Conclusion	602

ABSTRACT

Patent policy has been dominated lately by efforts to reduce rent-seeking patent troll litigation. As recent reforms begin to take effect, it is timely to consider the more constructive aspects of patent litigation. This Article contends that the lag between product development and patent litigation, which pushes the problem of patent valuation into the ex post (after product development) period, serves just such a positive function. Research, development, and product roll-out can all take place first. Then, at a later stage, patent litigation sorts out the relative merits and contributions of the various inventors and competitors who contributed to the new product or technology. In the time between early commercialization and litigation, a good deal of helpful information comes to light about the product and its market. This makes valuation more tractable, especially as compared with the early (ex ante) development period, when uncertainty is high. Litigation also serves as a structured process that promotes party settlement, adding another dimension to its potentially positive role.

I. INTRODUCTION

Patent policy has been shaped for the past 15 years by a single imperative: reduce rent-seeking patent litigation.¹ The strengthening of patents that began with the creation of the Federal Circuit in 1982 culminated in the rise of the patent trolls: companies in the business of acquiring and asserting patents whose social value is dubious. The trouble with trolls can be summed up this way: litigation instead of innovation. Trolls either bring nuisance value suits, settling them on the cheap but making up for low margins with high volume; or they target successful products manufactured by others, using patents as a way to extract as much of the value of these products as they can. Troll patents leverage

1. On the other hand, patent doctrine has long favored litigation as a way to weed out invalid patents. The value of patent litigation as a way to increase competition via patent invalidation has been challenged in recent years. See Stephen Yelderman, *Do Patent Challenges Increase Competition?*, 83 U. CHI. L. REV. 1943 (2016).

someone else's large sunk investments, fixed designs, and high switching costs—allowing trolls to extract value when they did not help create it.²

Because the leverage in troll litigation comes from sunk costs, this type of litigation (and the troll licensing demands that go with it) is described as “ex post.” It comes after the target defendant has made its investment. The future profits associated with this investment constitute what economists call a rent. Patent owners bring ex post litigation hoping to capture the value of these rents. And so, targeted defendants end up paying money to patent owners as a way to keep from losing some of the value (rents) created by their own investments.³

Ex ante patent activity is different. It comes before third parties have independently developed a technology. It also necessarily precedes the finalization of product designs, as well as irreversible investments, i.e., sunk costs.⁴ It represents a positive role for patents: facilitation of market

2. On the social welfare costs of patent trolls, see Lauren Cohen, Umit G. Gurun & Scott Due Kominers, *Patent Trolls: Evidence from Targeted Firms* 4 (Harvard Bus. Sch., Working Paper No. 15-002, 2017), <https://ssrn.com/abstract=2464303> [<https://perma.cc/QUY7-VZLN6>]; Stephen Kiebzak, Greg Rafert & Catherine E. Tucker, *The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity* 3–4 (June 16, 2015) (unpublished manuscript), <https://ssrn.com/abstract=2457611> [<https://perma.cc/Z5ZG-4TFS>]; Roger Smeets, *Does Patent Litigation Reduce Corporate R&D? An Analysis of U.S. Public Firms*, 3–5 (Apr. 28, 2014) (unpublished manuscript), <https://ssrn.com/abstract=2443048> [<https://perma.cc/S2UF-2UN7>]. To summarize: trolls are bad.

3. See Richard A. Posner, *Patent Trolls*, BECKER-POSNER BLOG (July 21, 2013), <https://www.becker-posner-blog.com/2013/07/index.html> [<http://perma.cc/386K-5PUC>] (“It is extremely difficult to discern any possible social benefit from trolls, and extremely easy to discern substantial social costs.”); Robert G. Bone, *Of Trolls, Orphans, and Abandoned Marks: What's Wrong with Not Using Intellectual Property?*, 42 COLUM. J.L. & ARTS 1, 51 n. 172 (2018) (“One might argue that [trolls] should be condemned on moral grounds regardless of how they fare in a utilitarian analysis. If holdup is morally blameworthy—which seems quite sensible given its close affinity with extortion—it should matter for moral evaluation that a PAE builds its entire business model around holdup.”).

4. See Federal Trade Commission, *The Evolving IP Marketplace: Aligning Patent Notice and Remedies with Competition* 7–8 (Mar. 1, 2011), <https://www.ftc.gov/reports/evolving-ip-marketplace-aligning-patent-notice-remedies-competition> [<https://perma.cc/BV49-425M>]:

Patent transactions that occur as part of a technology transfer agreement can be considered ex ante because they occur before the purchaser has obtained the technology through other means. Such ex ante patent transactions accompanied by technology transfer are an important means for advancing innovation, creating wealth, and increasing competition among technologies.

See also Federal Trade Commission, *To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy* 23 (Oct. 2003), <http://ftc.gov/os/2003/10/innovationrpt.pdf> [<https://perma.cc/V79T-4S4L>] (discussing two-stage pioneer/improver models of technology development):

Negotiation is more likely to divide rewards to support efficient follow-on activity if licensing occurs ex ante, that is, before the follow-on innovator makes its sunk investments. Although incentives to enter ex ante licenses often may be present, the

transactions. Product components and manufacturing processes are easier to sell in market transactions when covered by patents. Patents make contracts easier to negotiate. And of course, patents figure crucially in the market for pure ideas or inventions. Without patents, it is hard to sell an idea, because once you explain it the other party has it and there is nothing left to sell. In both cases—complex components and pure ideas—patents protect sellers and facilitate contracting. In these cases, patent-related profits are attributable to the market value of the patented item, rather than to illicit leverage or high switching costs. The presence of patents in the ex ante period, in other words, makes it easier for parties to contract. Ex ante, patents add value.

To summarize: patents as tools of ex post rent extraction are bad. Patents as tools for ex ante exchange are good.

The ex ante/ex post distinction has performed admirably in the battles over patent reform. But now that those battles are beginning to recede, we need to revisit this distinction. In the simple before/after view, litigation is associated with activity that takes place after a potential infringement defendant has made irreversible investments. It is inconceivable that the decision to forego ex ante patent negotiations would be made intentionally by the potential defendant—the *infringer*. Furthermore, from a more global perspective, patent litigation must only very rarely make any positive contribution to social welfare. Welfare-enhancing patent activities should all take place in the ex ante period. And it follows that patent activities that take place later—ex post—must be a drain on valuable resources.

As the troll wars begin to recede, we need to recognize that the simple ex ante/ex post distinction is deficient. It lacks subtlety. When patent negotiations are seen in their true light, we will see that sometimes it makes sense for an infringer to forego ex ante negotiations until after the completion of product development. It is just this possibility that I explore in this Article.

Hearings and related scholarship suggested reasons that licensing may not occur ex ante in some circumstances.

I do not mean to confuse the ex post period with ex post justifications for IP rights. *Cf.* Mark A. Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129, 129 (2004) (Ex post justifications for IP rights “focus not on the incentive to create new ideas, but on what happens to those ideas after they have been developed. I refer to these new arguments as ex post justifications for intellectual property because they defend intellectual property rights not on the basis of the incentives they give to create new works, but on the basis of the incentives they give to manage or control works that have already been created.”).

II. THE BENEFITS OF WAITING

Because the ex ante/ex post distinction arose in service of patent reform, the ex post period is usually seen as one in which the accused infringer, the ultimate defendant, is *vulnerable*. The gap between ex ante and ex post, in other words, is one that the patent owner exploits. But I believe there are times when the gap is at least neutral—it can't be helped, and is not intrinsically a bad thing for a potential infringer. More than this, there are times when a potential defendant will actively choose to take advantage of the gap. Waiting, in these cases, is a choice that helps the future patent licensee/defendant. It is not a matter of vulnerability; it is a matter of *choice*.

As I explain later on, the reason this choice might make sense is that waiting to negotiate patent issues can be beneficial. In debates over troll litigation, sunk costs and fixed designs only help patent owners. They generate leverage. But there is a more positive side to waiting. Patent negotiations can be complex and time-consuming. Resources devoted to negotiating in the ex ante period must be taken from other projects and activities. Complete and detailed ex ante negotiations come with opportunity costs. When these are high enough—when devoting resources to negotiating ex ante would starve or drain a crucial activity such as product development—it makes sense to wait.

Waiting has another benefit too. In the ex ante period, there are many unknowns. Will the product under development be successful? How important will the patented technology be to the product design, and to market demand for the product accused of infringing? Are there alternatives to the patented technology that may emerge, putting downward pressure on the value of the patent? Do the parties have all the prior art that is relevant to the patent, or will more prior art come to light over time, affecting the predictions about whether the patent is valid or not?⁵

5. The decision to delay patent negotiations assumes there is some degree of certainty over whether a given patent claim will cover the potential defendant's product design. But delay need not be the result of the well-known problem of "notice failure," which arises from ambiguous or vague patent claim language. Peter S. Menell & Michael J. Meurer, *Notice Failure and Notice Externalities*, 5 J. LEGAL ANALYSIS 1 (2013). With clearer notice, more ex ante deal making would occur. But better notice would not shift all or perhaps even most deal making into the ex ante period. The unknowns I describe—product success, availability of alternatives, knowledge about prior art—are unrelated to notice. Thus, while I wholeheartedly support the Menell-Meurer proposals regarding improved notice from patent claims, I do not believe those proposals would entirely eliminate the need for ex ante market-making in the form of patent litigation. Notice failure ought to be remedied when at all possible; but not all patent litigation is caused by notice failure. On notice-related uncertainty, *see*

Delaying patent negotiations has its costs, but it also means the parties will have much better information.⁶ To the extent that bargaining is facilitated when parties know more, waiting can be quite helpful. Poor information can, at times, lead to less overlap in the parties' bargaining ranges, which drives down the chance they will agree on a deal. As time passes there is a reduction in uncertainty. Delay will usually bring more clarity. A voluntary deal becomes more likely. In this respect, as with opportunity costs, waiting can be good for the licensee/defendant, as well as the patent owner.

A. *Strategic Delay in Patent Disputes*

There are two conceptual errors that lead to the simplistic condemnation of ex post patent deals. First is that relatively early deal making is fairer to both parties; it implements private ordering without facilitating rent-seeking. Second is that patent litigation—which is often the instrument of economic exchange in the ex post period—is very often or usually a bad thing, to be discouraged. In a considerable number of cases, each of these ideas may be wrong. The reason is that, according to the well-known literature on strategic delay in bargaining, there is a good side to delay. If delay is beneficial, then the ex post period may not always be a bad time for deal making. And litigation may not always be a bad way to structure patent-related exchange.

To begin, waiting does not always lead to litigation. Ex post licensing is quite frequent in the patent world. One reason is that prospective licensees do not always know which patents to license. It can be difficult

also Joseph Farrell, *Intellectual Property as a Bargaining Environment*, 9 INNOVATION POL'Y & THE ECON. 39, 41 (2009):

One common and intuitively difficult information problem arises when a producer does not know with whom it must negotiate concerning patents. One might call this a "potential-patent thicket," as distinct from the "actual-patent thicket" that can create multiple-marginalization problems when many patents are known to be infringed by a product. If a technology user cannot even list the patent holders who can block its product, negotiation will be very difficult.

6. Information emerges during the delay period as products are introduced onto the market; the technology in question continues to develop; and more industry patents are issued, and more scientific and technical publications come to light (i.e., the "prior art" in the field grows). Delaying negotiations so as to provoke litigation may lead to the surfacing of other information that arises specifically from litigation itself. See, e.g., John Kennan & Robert Wilson, *Theories of Bargaining Delays*, 249 SCIENCE 1124, 1127 (1990) (footnote omitted):

A common view too is that negotiations are not concluded until the issue is ripe for settlement. . . . [R]ipeness might be interpreted in terms of increased costs of further delay or acquisition or inference of new information; but possibly delay enables clarification of consequences or preferences. A relevant instance in legal contexts is the opportunity that delay provides to proceed with discovery or auxiliary court tests such as appeals.

to know which of the many patents in a certain field actually cover a product that is newly introduced on the market. Even where “patent notice” is adequate, not all patent owners choose to enforce their patents against all potential infringers. Because the burden is on the patent owner to identify infringement and institute enforcement actions, it can make sense for a prospective defendant to let enforcement-minded patent owners identify themselves. By definition, any enforcement that happens as a result is ex post. It is the product introduction that leads the patent owner to the infringer.

Even if a patent owner is known to a prospective defendant, it can still make sense to put off patent bargaining. Strategic delay, as it is known, has its uses. This is true in all fields, including the licensing of patents.

An important reason for delay relates to the information available to one or both parties.⁷ Information is vital to bargaining. A patent owner wants to know how many units of infringing product the infringer will sell. Beyond this, it wants to know how much its technology contributes to the actual profits of the patent infringer-defendant: Does the patent cover a vital component in the defendant’s product—one that drives sales and is crucial to the infringer’s revenue stream and profit margin? Is the patented technology unique or are there ready substitutes for it? Then there are party-specific facts that would be helpful to know. Can the infringer finance a protracted patent fight? Are the defendant’s principals tied up in important work that would be seriously interrupted by dealing with a patent dispute? And so on.

On the other side, the infringer wants to know its potential revenue and profit from the sale of the infringing product. It might not be worth it to fight over a patent on some part of the product if the product will flop. Also, the infringer will want to know if there are alternatives to the patented design: Will it be easy or hard to re-design the product to avoid infringement? Will an alternative design raise costs? And as to patent validity, do we have access to the best patent-defeating prior art? Is there prior art that threatens the patentee’s claims? If we do not yet know, how expensive will it be to find out?⁸

7. See Deepak Somaya, *How Patent Strategy Affects the Timing and Method of Patent Litigation Resolution*, in *Strategy Beyond Markets*, in 34 *ADVANCES IN STRATEGIC MANAGEMENT* 471, 477 (2016), (“Due to the substantial technological and commercial uncertainties that are typical with patents, potential future advantages arising from patent-based exclusivity are generally difficult to predict and therefore specify in a licensing contract.”).

8. The advent of administrative patent validity trials, referred to in some patent systems as “oppositions,” makes much more information about validity available at a much earlier stage. Before 2011, when these trials were introduced in the U.S., this information came out more slowly in a full-

In all these ways, more information often becomes available over time. And information is vital to successful bargaining. With perfect information, there is no need for adjudication at all: Why wait for a court to reach the solution that the parties themselves can find?⁹ Even short of this, the more information the parties have, the more likely there will be some potential agreements that they both will think acceptable given the facts. In technical terms, revealed information increases the chances that the “bargaining ranges” of the parties will overlap.

With respect to delay, one economist describes the bargaining situation between two economic agents (e.g., patent owner and possible infringer) this way:

The agents must both therefore trade off the costs and benefits of delay against the compromise required to win immediate agreement. . . . In uncertain market conditions, agents learn while bargaining occurs. In addition, . . . agents may hold differing views on the asset’s popularity [i.e., potential market] as the market conditions have not been replicated in every detail in the past. Thus . . . the agents may disagree as to their respective bargaining powers and will alter these views to reflect market realizations. Thus equilibrium bargaining delay, or stalling, may result as the players cannot agree on a compromise price which reflects the differing views as to the asset’s popularity.¹⁰

Delay can also send a signal to the other party—a signal with strategic value. One common model along these lines shows delay sending a signal of bargaining strength: I don’t need to reach agreement right away, I can

blown patent infringement trial. Availability of an Inter Partes Review, as oppositions are known in the U.S., thus substantially changes the bargaining dynamic in patent disputes. *See generally* Farrell, *supra* note 5, at 41, :

Information asymmetry is likely to be reduced when more information is publicly available. Thus it would seem that ex post licensing negotiations should, on average, go more smoothly if more information on patent validity were brought out publicly at an early stage, as perhaps by more thorough Patent Office examination, and/or an early opportunity for public opposition.

9. This assumes there is no payoff for trying to influence or trick a court. Even if the parties know the true state of affairs, in other words, they might expend resources to persuade a judge to accept a version of the facts that favors one side or the other. This is a particular risk when the parties are experts in a field, but the judge is not.

10. John Thanassoulis, *Optimal Stalling When Bargaining*, 34 J. ECON. DYNAMICS & CONTROL 101, 101 (2010). By extension, the decision to forego early settlement in favor of litigation follows the same logic. *See* Somaya, *supra* note 7, at 476:

By seeking . . . adjudication, the parties forego at least some cost savings from settling and avoiding adjudication altogether, and must therefore have concluded that the prospects for settlement are poor relative to the advantages gained from adjudication.

wait, you might cave in and my position is strong in any event.¹¹ Where uncertainty is very high, delay often pays off. Indeed, a company may be willing to pay some money up front (e.g., by commencing negotiations or investing in a patent challenge at the Patent Office) to “buy time,” because delaying the ultimate bargaining settlement until later gives more flexibility. This is, of course, the “real options” framework. Using this framework, economists have modeled strategic delay in the competition between two companies engaged in competing R&D projects.¹² Patent-related threats are, of course, one effective instrument in this kind of “delay game.”

Finally, delay can also affect one’s reputation. Because there are typically numerous patents that may cover one or more features of a complex product, a prospective licensee may benefit from a reputation for being a hard bargainer. Delay is closely associated with such a reputation. As one review article puts it, “[E]ach party’s continuing struggle is an investment in a reputation for likely being stronger, which earns a profitable return if the other capitulates first.”¹³

B. *A Positive Role for Patent Litigation*

In policy circles, as I have said, patent litigation is often associated with patent trolls and rent-seeking. Even putting aside the problem of rent extraction, however, several strands of economic research have addressed the high social cost of patent litigation. Galasso and Schankerman, for example, found that one bad experience with patent litigation can be enough to significantly tamp down the research ambitions of a small company, and in some cases, bring small company research programs to a full stop.¹⁴ Likewise, Lee, Oh and Suh find that patent litigation badly hurts defendant firms (those sued for infringement): their financial picture

11. See, e.g., Anat R. Admati & Motty Perry, *Strategic Delay in Bargaining*, 54 REV. ECON. STUD. 345 (1987); Peter C. Cramton, *Strategic Delay in Bargaining with Two-sided Uncertainty*, 59 REV. ECON. STUD. 205 (1992); Christophe Chamley & Douglas Gale, *Information Revelation and Strategic Delay in a Model of Investment*, 62 ECONOMETRICA 1065 (1994). Delay in the presence of a deadline (e.g., product introduction date, or a date after which a court injunction would be ruinous) can also increase one’s bargaining leverage; the deadline forces the other party to accept a deal that would not be accepted in the absence of a deadline. See Ching-to Albert Ma & Michael Manove, *Bargaining with Deadlines and Imperfect Player Control*, 61 ECONOMETRICA 1313 (1993).

12. Helen Weeds, *Strategic Delay in a Real Options Model of R&D Competition*, 69 REV. ECON. STUD. 729, 729 (2002) (“According to the theory of real options uncertainty generates an option value of delay.”).

13. Kennan & Wilson, *supra* note 6, at 1126.

14. Alberto Galasso & Mark Schankerman, *Patent Rights, Innovation and Firm Exit*, 49 RAND J. ECON. 64, (2018).

deteriorates; they reduce innovation activities; and they pursue narrower research projects to reduce the risk of litigation in the future.¹⁵

In the face of so much evidence, is it possible to mount any kind of a defense of patent litigation? I think so. Contrary to conventional wisdom, litigation can be a more efficient substitute for ex ante deal making *in some cases*. When the transaction costs of striking a timely ex ante deal are too high, ex ante contracting can be replaced by negotiation at a later time—negotiation that may well result in litigation.

The argument starts here: Though voluntary ex ante licensing is the ideal, it is in reality not always efficient. Sometimes it's not even possible. It may be difficult to identify all the relevant patents that must be or might be licensed. In a time-critical development project, every available contributor may be needed to ship the new product on time. If future profit hinges on early product introduction, it might make sense to delay patent-related negotiations. And finally, it may be difficult and expensive to bargain in advance over an appropriate royalty rate, given the complexities of patent validity, patent infringement, and estimates of potential damages. For all these reasons it may not make sense in a given case to identify all patent owners and bargain for patent licenses with all of them ex ante.¹⁶ In addition to the general benefits of delayed bargaining, identified earlier, there are *patent-law-specific* reasons why it might make sense to litigate rather than strike an up-front deal quickly.

15. Jongsub Lee, Seungjoon Oh & Paula Suh, *Inter-firm Patent Litigation and Innovation Competition* (Working Paper, Dec. 10, 2018), <https://ssrn.com/abstract=3298557> [<https://perma.cc/E97S-CKEW>].

16. Consider this, on the benefits of waiting:

Viola: "O time, thou must untangle this, not I.

It is too hard a knot for me t' untie!"

WILLIAM SHAKESPEARE, *TWELFTH NIGHT*, act 2, sc. 2.

Litigation alleviates a number of transaction costs.¹⁷ It shifts the resolution of patent issues out of the ex ante period.¹⁸ In a given case, this may be more efficient, for two primary reasons:

Opportunity cost. Litigation allows a company to focus exclusively on product development, in effect shifting the time and resource burden of patent-related negotiations from period 1 (development) to period 2 (post-development negotiation/litigation).

Information cost. By moving the patent negotiation to a later period, the parties have the benefit of more, and sometimes much more, information: product sales data for the accused product (and perhaps the patent owner's product); the value of and alternatives to the patented technology; and a more complete picture of the relevant prior art.

C. *Litigation and Ex Ante Opportunity Cost*

Post-product introduction negotiations or litigation puts off patent-related negotiations until after product launch. This is a little-noticed advantage of litigation compared to ex ante contracting. It could be crucial when it is imperative to speed up product development as much as possible. Patent licensing is complex and often time-consuming. It takes time and effort to negotiate a good result.¹⁹ During product development

17. The arguments here depend on an ex ante cost-benefit analysis, weighing the costs and benefits of additional resources being devoted to patent clearance. As you might expect, practitioners in the field approach this issue using exactly this type of analysis. *See, e.g.*, Jennifer F. Nelson & Scott D. Locke, *Freedom to Operate Opinions: Worth the Cost?*, 33 ASSOC. CORP. COUNSEL DOCKET 86, 97–98 (2015) (discussing cost-benefit analysis for use of (more expensive) outside counsel for “freedom to operate” (patent clearance) purposes):

You will want to triage when to retain outside counsel, and before reaching out to outside counsel, you will want to balance these factors: (1) cost; (2) how close a question it appears to be after your review; and (3) the value of the product to the company. When the cost of the opinion is comparable to the likely profit or the product is likely to be sold on a limited scale for a limited time, usually there is no need to reach out to outside counsel.

18. Of course, it is possible to negotiate an ex post license without having to go to court. Even so, an appreciable slice of patent litigation is of the ex post variety. One explanation is that, unlike with ex ante dealmaking, time may not be of the essence in the ex post period. Litigation is still expensive, but in the ex post period it cannot by definition slow down product development. So at least in some cases the definitive resolution of a conflict may be worth it in the ex post period, whereas expediency might dictate a quick, non-litigated resolution of that conflict if it arose ex ante. In any event I am not suggesting that all licensing in the ex post period ought to be mediated by litigation. As is always true, the cases that are litigated will illuminate and guide the many private licensing and settlement deals made outside the context of litigation.

19. One extensive empirical study found that litigation is more common when the patent owner considers patents more important to its business strategy—when it uses patents directly for profit maximization, rather than using them for leverage to obtain related goals or defensively, to prevent monetary loss from other patent holders. Because these patent holders care more about structuring licensing contracts carefully, licensing negotiations take longer. This leads to later resolution of patent

cycles, this is time and effort that may be in short supply. A company in the midst of developing a product must choose carefully how to allocate its resources. Every person-hour devoted to patent licensing is a person-hour taken from other tasks. In the case of researchers and product development specialists, the opportunity cost of attending to licensing negotiations might be very high in some cases.²⁰

It is easiest to see this by way of a diagram. In a product development project, multiple teams of people have to coordinate to achieve product launch.²¹ Given the need to train and acclimate people to the project, in the short run the number of people is fixed. Thus more attention for one function means less attention to another. Putting more people, and more of their time, on patent transactions means fewer person-hours for other tasks. This is represented in the two figures below. In Figure 1, the scale up/troubleshoot team is fully staffed for the duration of the project. In Figure 2, it is not. People are temporarily moved from the scale up/troubleshoot team to the legal and marketing team—the team tasked with patent search and patent licensing.

disputes, and is associated with higher rates of litigation (because litigation is a product of delayed negotiation). Somaya, *supra* note 7, at 478. For patents that are very important to a company, those with “high strategic stakes,” and are part of a “proprietary [patent] strategy”:

The higher the strategic stakes associated with a litigated patent, the more acute these contracting problems become, and therefore, the more difficult and time-consuming will it be to craft a suitable settlement to address these concerns.

20. For clear empirical evidence on this point, see the invaluable study by Colleen Chien, *Startups and Patent Trolls*, 17 *STAN. TECH. L. REV.* 461, 472 (2014) (stating that surveyed entrepreneurial companies commonly reported “that resolving [a patent] demand required founder time (73%) and distracted from the core business (89%).”).

21. Paul Ellwood, Paul Grimshaw & Krsto Pandza, *Accelerating the Innovation Process: A Systematic Review and Realist Synthesis of the Research Literature*, 19 *INT’L J. MGT. REVS.* 510, 516 (2017):

Contexts of temporal conflict [in organizations working on an innovation] relate to aligning the pace of different innovation activities for the realization of accelerated outcomes. Within this context, we posit that speed is realized by synchronization interventions that . . . ensure the most efficient and effective alignment of interactions between innovation actors and processes.

Contexts of temporal scarcity relate to identifying the most valuable innovation activities to be conducting at any point for the realization of accelerated outcomes. Within this context, we posit that speed is realized by resource allocation interventions that . . . identify the most valuable tasks to conduct at any point in time.

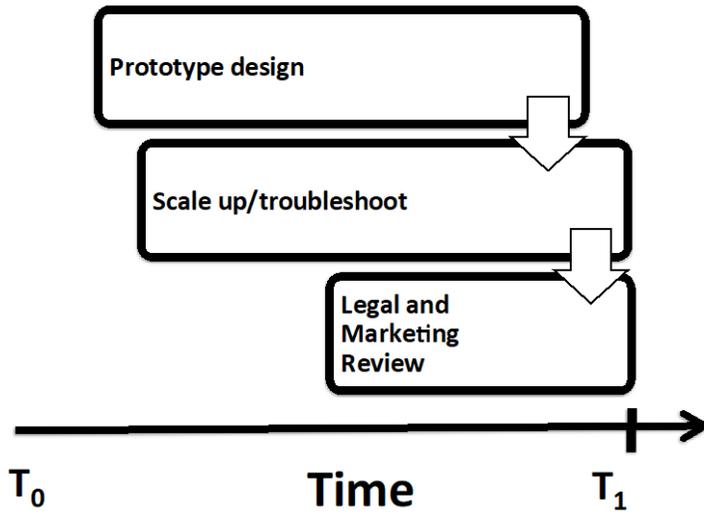


Figure 1: Product Development Staffing, Low Attention to Patents

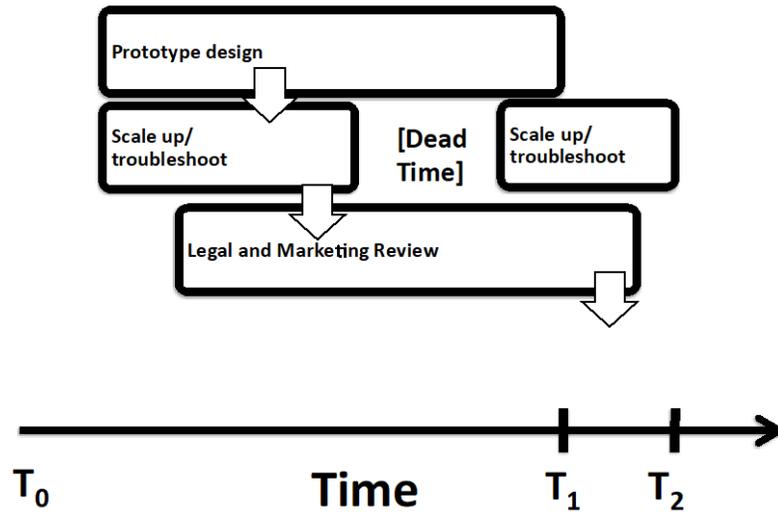


Figure 2: Product Development, High Attention to Patents

Product delivery slips under the scenario in Figure 2, from T_1 to T_2 . Whatever costs the company experiences due to this slip are the opportunity costs of putting more effort into reviewing and licensing patents.

This opportunity cost may be zero, low, or high. The firm involved may be best placed to predict. High opportunity costs are quite plausible, especially where the product development is in heavy competition with other firms. The cost of a slip from T_1 to T_2 can be quite significant if lead time is important, if early mover advantages tend to reverberate over time, or if market share is heavily influenced by relative entry dates.

You can see the potential losses that might be involved by considering one example. Imagine a firm, developing a new product, estimates that market entry will affect initial profits according to the following function.

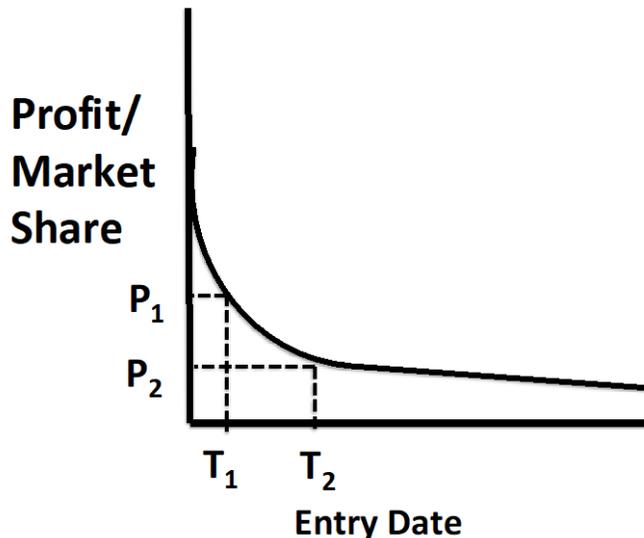


Figure 3: Profit/Market Share as a Function of Market Entry Date

A firm facing this situation will assess the cost of patent search and negotiation, given the size of the teams it has to work with. The basic tradeoff is between profit loss due to a potential delay in entry, and the anticipated ex post cost of patent infringement. The first step in calculating this tradeoff is to estimate the size of the market entry-related opportunity cost, measured by the difference between P_1 and P_2 . Then, the firm would need to estimate the potential cost of patent litigation—litigation, by assumption, that would only occur if the scale up/troubleshooting team was kept on its main task and not diverted to patent clearance. (The staffing situation of Figure 1, in other words.)

For any patent lawsuit, the expected outcome is the sum of (1) the situation if the accused infringer wins (patent owner loses) and (2) the situation if the accused infringer loses (patent owner wins). If a manufacturer saves enough money by avoiding ex ante transaction costs, litigation can actually be more efficient. To see how this is conceivable, consider some of the transaction costs listed above. Assuming that the accused infringer will not be able to recoup its attorney fees, the expected cost of litigation is the sum of the smaller loss if the infringer wins and the larger loss if it loses. Taking P_w as the probability the accused

infringer wins the lawsuit, and P_L as the probability of a loss, this can be written as follows:

$$[(Prob_W) * (C_W)] + [(Prob_L) * (E_L)]$$

where C_W is the cost of a win by the accused infringer (its attorney fees), and E_L is the expected value of a loss. This expected value is the estimated damages the accused infringer will have to pay, plus the accused infringer's attorney fees— $[Prob_L \times (\text{Expected Damages})] + C_W$ (i.e., attorney fees).

Now plug in some plausible numbers. Assume first that the profit differential from devoting more people to patent clearance—the opportunity cost of market entry at T_2 rather than T_1 —is \$25 million. You can think of this as either the loss in sales of the new product in the first year due to delayed entry, or the capitalized cost of smaller market share over the useful life of this product design, again due to delayed entry. Next note that \$5 million is the average cost of patent litigation. We will take the patent owner's chance of winning as the average across patent cases, roughly .4 or 40%.

As these figures show, the accused infringer firm would risk a potential infringement suit with costs and damages of up to \$55 million in exchange for keeping its employees focused primarily on product design, scale-up, and market entry.²² The decision to put off patent search and negotiating would be rational with expected attorney fees and damages that total \$55 million or less.

Obviously, if the opportunity cost of delayed entry is lower, it makes more sense to dedicate additional resources to ex ante patent clearance. This would be true, for example, if the project under consideration is an add-on to an existing product that enjoys a large market share. Adding a few features to an existing product would not normally be expected to have a large impact on profits or market share. But if those features were crucial, timing might be important even for an established product. The point is that this is a matter of choice.

Empirical evidence shows that there can be a significant premium on early market entry by “first movers.” In the recent past, first movers in major product innovations such as laser printers, compact disc players,

22. $(.6)(\$5 \text{ mil}) + (.4)(\$55 \text{ mil}) = \$25 \text{ mil.}$, the benefit of earlier market entry.

and video games have, on average, had the market to themselves for 4.33 years.²³

Closely related to first-mover advantage is the idea of *path dependence*. The classic work in this vein explains how small, random events when a technology is new lay down tracks that influence future developments in profound ways. Path dependence explains why, for example, the Sony BetaMax VCR format came to dominate the field of video recording. It also explains how the QWERTY English-language keyboard came to be the standard layout. In extreme cases, early events make for advantages in a technology or format that become permanent. More recent work in this vein argues that early advantages are often limited to a single product generation, and not the entire lifetime of a pioneering firm or technology.²⁴

Regardless of the durability of a first mover advantage, there is little question that it can be important. At least some degree of extended market power is likely to attend a first mover. Even without full-scale lock in, the pattern or profitability may to some degree be path dependent. There is enough data, and enough hard-won experience, for decisionmakers in a firm to strongly favor early entrance. Given the tradeoffs inevitable in managing any firm, this can mean a conscious decision to skimp on or skip over patent clearance efforts before market entry. This, in turn, makes it more likely that the firm will end up in ex post patent litigation. If so, it will be the result of a conscious choice about firm priorities—a choice that the legal system ought not to condemn out of hand.

III. EX POST MARKET-MAKING

When a patent is acquired or asserted only after third party design or investment, the patent can be used to take value that flows from the effort

23. Rajshree Agarwal & Michael Gort, *First-Mover Advantage and the Speed of Competitive Entry, 1887-1986*, 44 J.L. & ECON. 161, 170 & 175 Table A1 (2001) (showing average period before second entrant for major innovations during period 1962–1986 was 4.33 years; Table lists the 45 major innovations covered in the study). *But see* David Hricik, *Will Patenting Make as Much Sense in the New Regime of Weakened Patent Rights and Shorter Product Life Cycles*, 20 VAND. J. ENT. & TECH. L. 457, 514 (2017) (arguing that contemporary product development requires less time, and second entrants can enter more quickly, than in the past).

24. . See April M. Franco, M.B. Sarkar, Rajshree Agarwal & Raj Echembadi, *Swift and Smart: The Moderating Effects of Technological Capabilities on the Market Pioneering-Firm Survival Relationship*, 55 MGT. SCI. 1842, 1844 (2009) (arguing that superior performance over a sustained period requires early entry in a key market plus other firm resources and capabilities):

The emergence of a new product generation creates a fresh opportunity to capitalize on potential strategic and economic advantages associated with being a market pioneer, even as it removes many path-dependent advantages associated with early entry that may have accrued to the market pioneers of the prior product generation.

and investment of the third party. Especially when it would be very expensive for the third party to change its design, the patent owner can use its patent to extract some of the value created by the third party. The use of patents in this way goes against the traditional rationale for the patent system. Thus the widespread criticism of patent activity in this, the “ex post” period.

Note that rent extraction of this type does represent a voluntary market transaction, in a sense. In broad outlines, it follows the contours of classic private ordering. The holder of an entitlement (patentee) asks a court to recognize its right to compensation from another private party (infringer). Parties often settle this type of lawsuit, and when they do, they can be said to follow the classic private law script: voluntary exchange, supervised by courts if necessary, based on initial state-granted entitlements, resulting in a bargain that leaves both parties better off.

Patent reform implicitly challenged the validity of this narrative in the context of rent-seeking patent litigation. Patent reform efforts started with the observation that rent extraction was not the traditional purpose of the patent system. Reformers emphasized that troll litigation has little or nothing to do with innovation—which is the purpose behind patents, after all. So for reformers, the market exchange fostered by troll lawsuits is not in fact an example of normal, beneficial deal making. Trolls take advantage of structural features of patent litigation, using these features to create illegitimate leverage. This makes patents instruments of rent extraction, rather than tokens of useful innovation. The fact of voluntary exchange is not the important issue. The issue is the weak, overvalued entitlements and the undue leverage they create.

Because undue leverage comes only in the ex post period, reformers emphasized the merits of ex ante deal making. To see why, consider the typical ex ante patent license. A company in the midst of designing a new product might decide to incorporate a patented technology. If so it will license one or more patents covering that technology. This is no different from acquiring any other input into the product—a raw material, a third-party component, new packaging, etc. Presumably, money paid to the patent owner represents the value of the patented item to the licensee’s planned product activities. The deal takes place before the third party/licensee has sunk costs, so the patent owner has no special leverage. The patent deal is a voluntary market transaction, plain and simple. Money earned by the patent owner in this case represents value *she* created.

In comparing the two cases, a simple conceptual pairing seems to emerge. Ex post litigation, leading to market exchange, is not socially

valuable. The markets enabled by litigation (or the threat of litigation) in the ex post period are in some sense illegitimate; they emerge out of bargaining conditions that do not promote innovation. To state it baldly, these are “bad markets,” akin to the market for blackmail or stolen goods. Exchange in these cases may be voluntary, and it may leave the parties better off. But the preconditions for legitimate exchange are absent. Ex ante exchange precludes rent-seeking. It rewards the patent owner not because of undue leverage but because of the inherent value of the owner’s technology. So, ex ante patent markets are “good markets,” they organize private exchange to reward something truly worth rewarding.

A. Beneficial Ex Post Licensing?

Now consider a twist—a common one, in fact. Imagine that the product designer incorporates a patented component but does not license the patent first. And assume the patent owner acquired the patent in question prior to the design of the potential infringer’s product. The absence of a license could be for a number of reasons, as we have seen. The patent may have been pending (not yet issued); the product designer may not have known about the patent; or the designer might have thought its design fell outside the bounds of the patent. The patent owner, finding out about the design, might ask the designer for a license. If the parties negotiate one, the result is a variant of an ex ante deal, but one that is negotiated after product design and launch. But negotiations like these sometimes break down. When they do, the patent owner will often bring an infringement suit. At this point, a court steps into the picture. If the patent is eventually found valid and infringed, the court may provide some combination of remedies in favor of the patent owner.

When this happens, the court is in effect being asked to engage in ex post market-making. It will have to decide (1) whether to issue an injunction preventing sale of products made according to the patent-infringing design, and/or (2) whether and how much to compensate the patent owner for the harm suffered due to the infringement.

When done right, this ex post market-making is the essence of useful (non-rent-seeking) patent litigation. Courts are asked to structure a remedy that emulates the ex ante deal that would have taken place had the parties struck one. But by the nature of litigation, this task is achieved ex post.

Some factors mentioned earlier—especially uncertainty and information deficits—highlight the value of ex post market-making. In some sense, the patent market in some industries works in reverse.

Products emerge as winners; then, after that, the patent market is *imposed* on the industry in a series of licensing deals and patent litigations²⁵ So long as ex post litigation is primarily about constructing legitimate, time-delayed markets, and not rent-seeking, it can add value.

B. Product Components and the Patent Market

IP rights of various sorts will usually cover one or more aspects of an innovative technology. The purchase of a DVD or a computer printer may be characterized by the seller as a kind of dual transaction: there is the physical product, and there are also IP rights that cover features of the product. We need not concern ourselves here with the interplay of personal property concepts governing ownership of the physical object (DVD disk, printer) and IP concepts governing protected features; it is enough for us to understand that there is an IP component to this standard purchase and sale transaction.

The IP component is much more apparent in a different type of transaction—the pure technology license. Indeed, in such a transaction, technology and IP rights (in particular patent rights) are often conflated. An innovative software compression algorithm, or superior map-rendering software technique, may well be covered by one or more patents. The transfer of this innovative technology will often be effectuated via a patent license agreement. But for it to qualify as a true technology transaction, the buyer must gain access to a new technique or family of algorithms. That is, the buyer must acquire a capability that is attributable to the creator of the innovation, viz., the owner of the patent.²⁶ This may or may not involve a transfer of software code, algorithm flowcharts, programming techniques, or the like. But one way or another, the agreement must reflect the transfer of a new capability.

Patents do not map cleanly onto product markets. Therefore, patent markets are different from product markets. Patents typically cover

25. Technically, the market is only imposed when ex post conflicts are resolved via litigation. But because private ex post deals will naturally be heavily influenced by the decisions cases stemming from litigation, court decisions imposing ex post royalty rates help to shape the entire ex post negotiation landscape.

26. I phrased this carefully to capture the case where engineers working for the buyer already know and use the patented technology, because they learned about it through various channels well before the buyer acquires rights to it in a formal transaction. Sometimes, in other words, the information has diffused around a field or industry well ahead of the time when a formal transfer agreement is reached. The formal agreement, in such a case, might be said to simply memorialize the information transfer which occurred informally at an earlier time. *See generally* Robert P. Merges, *A Few Kind Words for Absolute Infringement Liability in Patent Law*, 31 BERKELEY TECH. L.J. 1 (2016).

technological components: small pieces of larger technologies. A patent may cover: part of a mobile phone antenna, for instance; a technique for compressing data to be sent over a network; a method for encoding location information on a CD (an example we will return to later); or any of millions of other small technological components.

Patents map onto technologies. The invention in an antenna patent may form part of a mobile phone antenna. The compression algorithm may be used in a software program for transmitting digital content such as music, video, or text. The popup menu may be part of a software program that handles calendaring or interfaces with travel-related websites.

Technologies, in turn, map onto products. The antenna is part of a mobile phone. The compression algorithm is part of a data streaming program used by music streaming companies or video websites. The popup menu may be part of a travel website or a suite of software for a mobile or desktop device.

Finally, products map onto markets. The mobile phone containing the antenna is sold in competition with other mobile devices, including phones, tablets, and watches. The data streaming program is incorporated into the software of one of several music streaming companies or is used by one video streaming service (Netflix, say) that competes with others (Amazon Prime or YouTube, for example). The popup menu may be part of a desktop operating system such as Microsoft Windows, which competes with free operating systems such as Android for mobile; or it may be incorporated into one travel website (Kayak, for example) that competes with others (e.g., Expedia).

This complex, multi-step “mapping” can be summarized in the following simple diagram:

Patents → Technologies → Products → Product Markets

In the simplest (and least common) scenario, a single patent covers an entire product, which is sold into a discrete economic market. A simple toy, or kitchen appliance, might fit this description. But it is far more common for the mapping to be more complex. In the auto industry, consumer electronics, software (including software platforms), and many other industries, patents cover individual components of technologies. These technologies are aggregated into products which are sold in the market. A typical—and important—example is two-sided platforms, such as Amazon, and social media, such as Facebook. The following Figure illustrates the patent-to-market mapping for these industries:

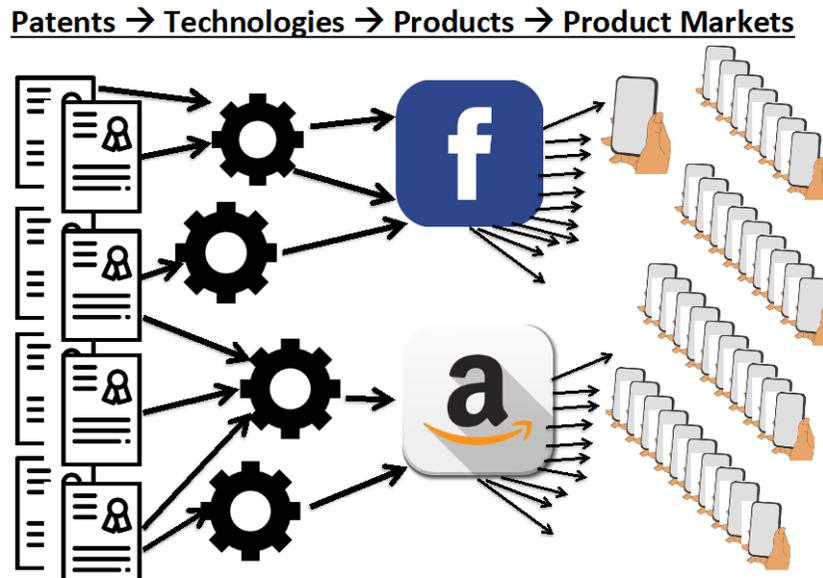


Figure 4: Mapping Patents into Product Markets

In this Figure, the little gears (representing technologies) on the left are covered by patents, sometimes more than one. The implicit point is that patents are not the same as technologies. And it is technologies that make up the inputs into Big Platform products or services, such as the Facebook platform or the Amazon marketplace.

I emphasize this feature of technology transactions—the acquisition of a new capability, attributable to the innovator—to distinguish it from a transaction concerned solely with legal liability. In such a purely legal transaction, the only new asset acquired by the buyer is a legal right, in the form of one or more patent rights. In the typical case where such transactions are concerned, the buyer does not learn about new technology, or acquire any new technical capabilities. It buys patents to protect itself from future patent infringement lawsuits or to possibly sue competitors in patent infringement suits of its own. The transaction neither effectuates nor memorializes the transfer of any innovation or new capability; it is a pure transfer of legal rights, and nothing more.

There is some dispute among patent specialists about the relative volume of the two transaction types.²⁷ Some findings seem to show that much patent litigation has little to do with capability enhancement; the classic study shows that accused patent infringers are almost never proven to have copied any technology from the patent owner. Because defendants in infringement cases are (the study concludes) independent inventors, patents represent not new capabilities but simply a “tax on innovation.” Professor Colleen Chien, in a more recent study, however, disagrees.²⁸ Professor Chien shows that in the important field of software technology, many of the license agreements she studied involve the actual transfer of computer code, know-how, and associated technical information.²⁹

C. *More on Ex Post Market-Making*

A diagram like Figure 4 is misleading. It shows a simple, logical relationship between inputs and outputs: patents comprise technologies, which go into products (such as Facebook and Amazon software/user interfaces), which are sold to consumers (or used to sell things to consumers, including advertising and digital content). The Figure implies that each unique patented invention clearly originates with a single entity. Then each entity transfers rights over the invention to other entities, who assemble technologies. Technology creators in turn sell what they make to product companies, who market products to consumers. Nice, simple, clean and logical.

The problem is that the inputs are both intangible, and in some sense, elusive. Each one is often contested. The technologies that go into products are, in reality, developed by multiple people and companies; different versions and variations originate with many people and organizations at roughly the same time. Patented inventions are even more complex. Patents take a long time to issue after being filed. There may be multiple patents pending on multiple inventions that help to constitute a single technology. The landscape of patent rights—who invented what, at what time, and who owns what—is worked out on a different timescale than the one that determines technology success and product winners. Put

27. See, e.g., Robin Feldman & Mark A. Lemley, *Do Patent Licensing Demands Mean Innovation?*, 101 IOWA L. REV. 137 (2015) (finding that very little technology transfer accompanies most patent lawsuit settlement/licensing deals).

28. Colleen V. Chien, *Software Patents As A Currency, Not Tax, on Innovation*, 31 BERKELEY TECH. L.J. 1669 (2016).

29. *Id.* (“[T]he majority of material software licenses reported by public companies to the SEC from 2000-2015 (N=245) support true technology transfer,” based on a study of the terms of these reported licensing agreements).

simply, technologies emerge first. They are incorporated into products with little or no attention to the patent landscape—there is no time for that. Consumers vote with their feet (or eyeballs), and a product winner emerges. Only well after that happens do the relevant patents issue. And only then does the patent landscape start to take shape. Just as product winners are becoming ensconced in their markets, the many failed product companies may be getting some clarity on their patent situation.

This retroactive (and expensive)³⁰ market-making is inherently inefficient, yet it seems to be the only way that the patent system's timescale can be reconciled with the much more rapid timescale of product competition in platform markets. Ex post, retroactive market reconstruction seems to be an inevitable feature of the patent system as applied to these rapid-fire innovative industries.

The timeline for this kind of market-making is shown in the following Figure. In it, A invents a new technology which it then patents. During the same period when A is patenting, B is assembling many different components into what will become a product—think here of a platform software product, such as Facebook or Amazon or Uber. Think of the components as the many technological modules that make up the software product: instant messaging, sending and receiving graphics files, storage and search capabilities, etc. In the Figure, one part of one component that goes into B's product is the technology that A invented.³¹ The point is to see that A's invention was incorporated into B's product—along with many other technologies that comprise all the technologies inside the product.

30. Particularly when the market-making occurs primarily through patent litigation and not private dealmaking.

31. Whether B independently created this component, or copied it directly from A, or was subtly influenced by A's contribution in its own work, does not matter from the point of view of patent law; adopting a patented invention leads to patent infringement liability in any of these cases. As you might guess, there is controversy over this aspect of patent law. See, e.g., Merges, *supra* note 25, at 1 (summarizing conflicting views). For my part, the difficulty of proving direct copying, together with the many possible avenues by which contributions from the A's of the world make their way into the products sold by the B's of the world, justify the rule that patent owners need not prove direct copying as a condition to receiving compensation for infringement. But many disagree. Compare Merges, *supra* note 25, at 6–7, with Stephen M. Maurer & Suzanne Scotchmer, *The Independent Invention Defence in Intellectual Property*, 69 *ECONOMICA* 535 (2002). In one study, direct copying was found to have been proven in only 1.76% of a sample of reported patent infringement decisions. Christopher A. Cotropia & Mark A. Lemley, *Copying in Patent Law*, 87 *N.C. L. REV.* 1421 (2009). For some context on this study and its findings, see Merges, *supra* note 25, at 7–8.

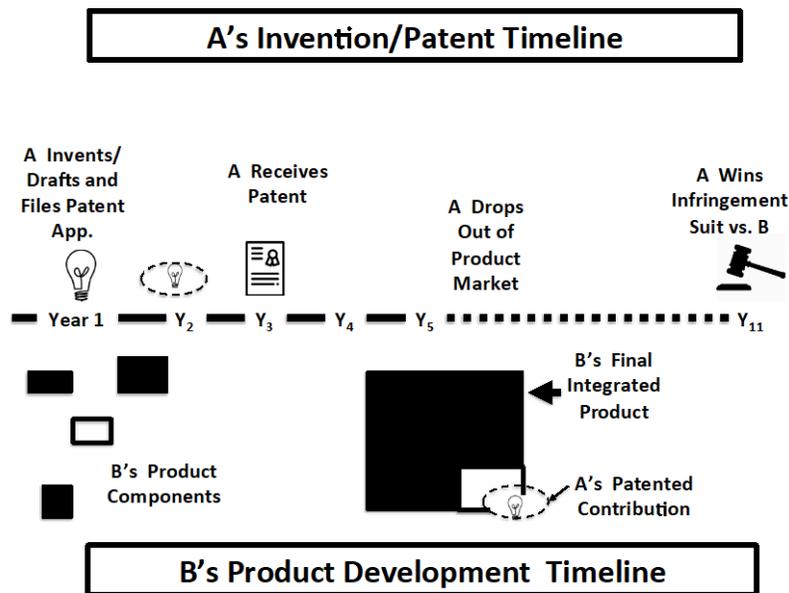


Figure 5: A's Invention and B's Product

The particular scenario captured here shows the patent owning company, A, giving up on the product market before being compensated by B—who is a winner in the product market. This is a common situation, but ex post markets are needed even when A stays in the product market to compete with B.

1. Ex Post Markets as Quasi-Historical Reconstruction

It is commonplace to assume that rapid product innovation cycles are a feature of the twenty-first century economy, and that in some idealized past a statelier progression of products from idea to marketplace better fit the inherent timescale of the patent system.³² But that's wrong. This

32. See, e.g., Hricik, *supra* note 22, at 458:

After examining the available data as to whether these legal changes have already significantly altered the incentive to patent, the Article turns to the second force that reduces the benefit of the coercive power of patents: the fact that a greater number of products have shorter life cycles. Because patents take twenty-four months to issue, and the coercive power of a patent can only be utilized once it issues, the pace of change means that fewer patents will exist in time for their coercive power to be meaningfully applied. Further, that rapid pace of innovation has already created 3D printing, a technology that

dynamic has been going on for over a hundred years. The pattern of innovate first, sort out the patent situation later began at least as early as the late 19th century. It was the defining feature of the race to perfect telephony, the apotheosis of Alexander Graham Bell, and the construction of the monolithic Bell telephone system.³³ It was integral to the folk history of Thomas Edison and the secular gospel of the lightbulb-invention narrative. Court decisions contributed to the careful historical reconstructions of chaotic early invention contests in other industries as well, including semiconductors and lasers.³⁴ This is a traditional and normal function of the patent system. The imposition of ex post quasi-markets for key inputs is a role long assigned to the patent system.

Historians and others have recognized this ex post reconstruction as the origin of “great inventor” narratives. And social constructionists have had their day critiquing these narratives.³⁵ But as historian Kara Swanson

permits rapid and dispersed copying of new products, which further reduces the coercive benefit of patent rights.

33. Christopher Beauchamp, *INVENTED BY LAW: ALEXANDER GRAHAM BELL AND THE PATENT THAT CHANGED AMERICA* (2015).

34. See Nick Taylor, *LASER: THE INVENTOR, THE NOBEL LAUREATE, AND THE THIRTY-YEAR PATENT WAR* (2000); Rosemarie Ham Ziedonis, *PATENT LITIGATION IN THE U.S. SEMICONDUCTOR INDUSTRY*, IN *PATENTS IN THE KNOWLEDGE-BASED ECONOMY* (Wesley M. Cohen & Stephen A. Merrill, eds. 2003).

35. Briefly, the “social construction of technology” school of thought holds that social actors and context determine which technologies become dominant; how those technologies are designed; and who gets to control and receive credit for them. See, e.g., *THE SOCIAL CONSTRUCTION OF TECHNOLOGICAL SYSTEMS: NEW DIRECTIONS IN THE SOCIOLOGY AND HISTORY OF TECHNOLOGY* (Wiebe E. Bijker, Thomas P. Hughes & Trevor J. Pinch, eds., 1987). This school of thought arose in large part as a response and critique of “technological determinism,” which holds that society is shaped by the technologies that it spawns, and that (roughly speaking) society follows from technology, as opposed to determining or defining it. See, e.g., *DOES TECHNOLOGY DRIVE HISTORY? THE DILEMMA OF TECHNOLOGICAL DETERMINISM* (Merritt Roe Smith & Leo Marx, eds., 1994). On how this relates to patent law and history, see Kara W. Swanson, “Great Men,” *Law, and the Social Construction of Technology*, 43 L. & SOCIAL INQUIRY 1093 (2018). For a hint of what a full-blown social constructivist might say about patent law’s role in establishing credit, profit relations, and the basic structure of an industry based on a new technology, consider the words of historian Christopher Beauchamp (himself not a full-bodied, unreconstructed constructivist) regarding the patent litigation over invention of the telephone:

The lawyers [for Bell] have exerted a powerful grip on historical memory. Today we may take for granted that the telephone originated with a single man, that it consisted essentially of a single invention, and that it represented a sharp technological break with the prior art. But for Bell and his legal representatives these were bold arguments, deliberately and consciously made in pursuit of a patent that would control the telephone business. In the courts of the day, and in the judgment of posterity, those arguments succeeded in spectacular fashion. In that sense, it was the lawyers, as much as anyone else, who invented the telephone.

Beauchamp, *supra* note 31, at 5. Despite the suggestion that legal reconstruction was a product of pure social forces, Beauchamp says later in his book that “the role of patents can be surprisingly hard to pinpoint.” *Id.* at 165.

has recognized, the ex post reconstructions mediated by patent law serve not only to canonize the great, but to resolve real-world disputes—to end the argument, as it were. As she says in regard to the famous Bell telephone patent priority/infringement dispute over who invented the building block technologies underlying the telephone:

Bell's legal victories, for example, and his status as inventor of the telephone, are not so much a failure or hoax, a myth designed to obfuscate, cheat other participants in invention out of credit, or cast a rosy glow on a past of independent craftsmen (although the truth produced in a courtroom may serve all these roles), but rather can be seen as the law working, if not perfectly, at least as many observers have described it. The law is functioning as we have designed it to function, to create a dominant story, and thereby end a dispute. Great men of invention are, perhaps, a necessary, or perhaps, at least an inevitable and not undesirable by-product of the legal system.³⁶

As with great pioneers, so with contributors who paved the way for an industry to develop. The patent system has long performed the function of reconstructing what happened in the early days of a technology. In this respect, it has a dual role: it sorts out the (recent) past, and sets the terms for exchange in the future, until the patents at issue expire. The studies of patent battles involving historically significant inventions highlight the way patent law engages in historical reconstruction. Though most of the patent licensing and litigation I am talking about in this Article is not nearly as important as the early fights over Bell or Edison inventions, the process of reconstruction that historians have studied is the same. It goes on, in other words, in hundreds of prosaic cases, which are too minor for historians to study later, but which are of deep interest and concern to the parties involved.

When the argument is ended, or put off for another day, the market begins. Because businesspeople know that the patent system will do its best to sort things out later, they can charge ahead with the essential tasks of trying to develop, combine, and market the right bundle of technologies, and in the process, they hope, win the competition for the best product. When the legal process catches up to the situation, by sorting out the patent positions of the early contributors, it can end up rewarding contributors in a number of different scenarios.

For competitors that wind up with stable market shares, the ex post market can compensate an early contributor for laying the groundwork for the entire industry. A technological pioneer with less than dominant

36. Swanson, *supra* note 33, at 10.

market share can receive “back payments” that it is not likely to make through product sales in a competitive market. Such was the case in the polypropylene industry. Crucial early contributions by researchers at Phillips Petroleum were recognized long after the fact.³⁷ By the time the patent was awarded, the industry had settled down into a highly competitive mature or commodity phase. The royalty payments to Phillips recognized its early contributions, bringing an additional source of profit over and above the profit from the highly competitive market for polypropylene products.

Paice is a good example. This company was founded by an independent automotive engineer named Alex Severinsky.³⁸ He was one of the pioneers in hybrid auto engine technology. Many contemporary hybrid engines build on his award-winning technology.³⁹ Beginning with Toyota in 2007, Paice has successfully asserted several of its early patents against makers of hybrid autos,⁴⁰ which also includes Hyundai and Kia Motors.⁴¹ In an overview of auto industry patent litigation, Paice is listed as a “supplier-competitor,” rather than in the separate category of “patent

37. The original research began in the early 1950s, and after a very long patent interference, or priority contest (a feature of patent law under the 1952 Act which is slowly fading away under the post-2011 law), the patent was awarded to Phillips Petroleum in 1980. *See* Standard Oil Co. (Indiana) v. Montedison, S.p.A., 494 F. Supp. 370 (1980), *aff'd*, 664 F.2d 356 (3d Cir. 1981). An interesting feature of the case is that inventors for one of the losing parties, Montedison, had won a Nobel Prize in chemistry for discovery of polypropylene. The careful reconstruction of early research in the field might be said to call that Prize into doubt. *See* American Chemical Society, Division of the History of Chemistry and The Office of Communications, *Discovery of Polypropylene and the Development of a New High-Density Polyethylene*, at 3, <https://www.acs.org/content/dam/acsorg/education/whatischemistry/landmarks/polypropylene/discovery-of-polypropylene-and-development-of-high-density-polyethylene-commemorative-booklet.pdf> [<https://perma.cc/X33F-XN66>] (“It was believed for many years that Prof. Ziegler and Italian scientist Giulio Natta were responsible for the discovery, because they had been the first to publish their findings—and because they had received the Nobel Prize for their work on these polymers. In 1983, an appellate court ruled that the patent did indeed belong to J. Paul Hogan, Robert L. Banks, and the Phillips Petroleum Company.”)

38. *Alex Severinsky*, PAICE, <http://www.paicehybrid.com/about/alex-severinsky/> [<https://perma.cc/ATP7-Z5YS>].

39. *Id.*

40. *See* Paice LLC v. Toyota Motor Corp., 504 F.3d 1293 (Fed. Cir. 2007) (affirming finding of patent infringement of Paice patents). *See also* Paice LLC v. Toyota Motor Corp., 609 F. Supp. 2d 620 (E.D. Tex. 2009), *dismissed*, 455 F. App'x 955 (Fed. Cir. 2010) (adjusting patent damages, in the form of a royalty rate, as determined by district court).

41. Bill Robinson, *The Future of High Tech Patent Litigation in the Auto Industry*, AUTOMOTIVE WORLD, AUTO INDUSTRY LAW BLOG (April 26, 2017), <https://www.foley.com/en/insights/publications/2017/05/the-future-of-high-tech-patent-litigation-in-the-a> [<https://perma.cc/D7XW-WWJT>].

troll.”⁴² This is a company based on real technology, which was patented. In the race to develop and commercialize hybrid drive trains, Severinsky and his company made real contributions. But it took patent litigation in the ex post period for Paice to receive its deserved compensation.

2. The Importance of Patents for Companies Not in Product Markets

For two types of companies, patents are especially important. Component suppliers, such as Paice, may have difficulty recouping the value of their research. Manufacturers such as auto companies may well undervalue the contributions of outsiders. Research shows that in this situation, patents can be especially important to the survival of specialist component suppliers such as Paice.⁴³ Without patent protection, hybrid technology can be easily absorbed into the large auto companies, leaving companies like Paice with a very limited future.

The other scenario where patents are important is the case of a failed product company. An early entrant may contribute critical technology in the early days of an industry yet lose in the “product wars.” Without manufacturing, distribution, and independent branding, such a company has no form of compensation for its contributions other than patents. It is foreclosed from all product-related strategies for recouping costs and making profits. The only way its early contributions will be recognized is through patent litigation. Patents are thus essential to eventual product market “losers” such as Blackberry in the mobile phone market. In the same way the patent system canonizes the early technological pioneers

42. *Id.* (In a list of recent auto industry patent cases, classifying Paice litigation as one of the “supplier-competitor cases” rather than one of the “patent troll cases”).

43. See Robert P. Merges, Intellectual Property Rights, Input Markets, and the Value of Intangible Assets (Feb. 9, 1999) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3327663 [<https://perma.cc/JDF8-8C7K>].

Jonathan M. Barnett, *Intellectual Property As A Law of Organization*, 84 S. CAL. L. REV. 785, 857 (2011) (“Patents enable innovators to make efficient selections of firm scope by transacting with least-cost suppliers of commercialization inputs.”); Ashish Arora & Robert P. Merges, *Specialized Supply Firms, Property Rights and Firm Boundaries*, 13 INDUS. & CORP. CHANGE 451, 470–72 (2004). A more general version of this theory says that patents are important for all new market entrants, whether they sell components or pursue a different business strategy. New entrants do not have the benefit of economies of scale, or “first-mover” advantages, or any other way to leverage the power or incumbency and large scale as ways to recoup R&D investments. New entrants must therefore lean heavily on patent protection – making patents *especially important* as an incentive for them. Because potential entrants have access to a much more limited and less effective set of alternative appropriation devices, patents may offer significantly greater marginal value as a protection device. See Jonathan M. Barnett, *Private Protection of Patentable Goods*, 25 CARDOZO L. REV. 1251, 1282 (2004).

such as Edison or Bell, Blackberry's inventors may be recognized in retrospect for their early contributions.

Put differently, though the *economic* market may be "winner take all," patent law works differently. By reconstructing the technological contributions to the ultimate winning product, it ensures that in some cases at least, an early innovator might be rewarded even though that innovator did not ultimately win in the product market. The patent system can form an ex post market that allows for a result we might call "*loser takes some.*" Because today's product "losers" were yesterday's (and perhaps tomorrow's) technological innovators, this is an important though submerged aspect of the innovative ecosystem.

3. Summary: Formation of Ex Post Markets

When a court assigns liability for patent infringement well after the defendant has adopted the technology in question, it is in effect imposing a transaction on the patent owner and adopter/infringer. We can envision this ex post market-making as follows:

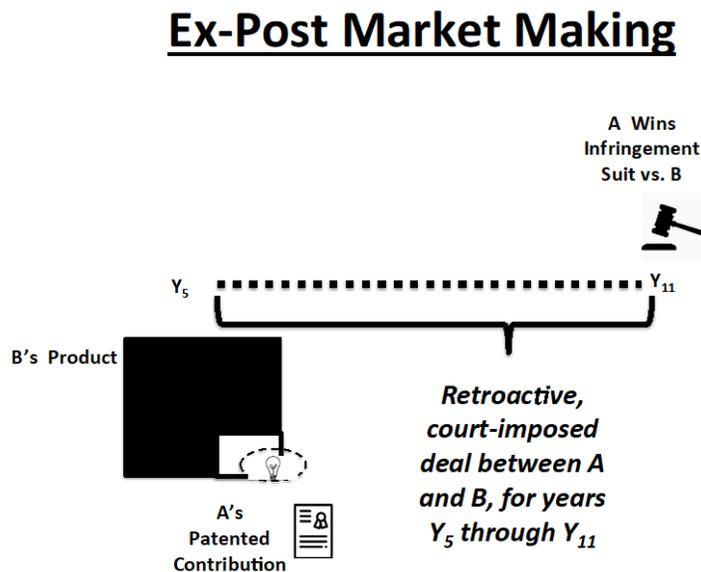


Figure 6: Patent Liability as Ex Post Market-Making

This court-imposed deal is retroactive in the sense that liability is assigned (and compensation calculated) for past infringement. Going

forward, after the infringement suit, there are several possibilities. The product company B can make a deal for future licensing of A’s patent (perhaps, for example, projecting the court-awarded damages into the future, as a royalty payment); it can design around the patented technology so as to avoid future infringement; or, if B chooses to simply honor an injunction awarded to A, B might simply remove the infringing technology from its product altogether. These options are represented in the next Figure.

Prospective Options

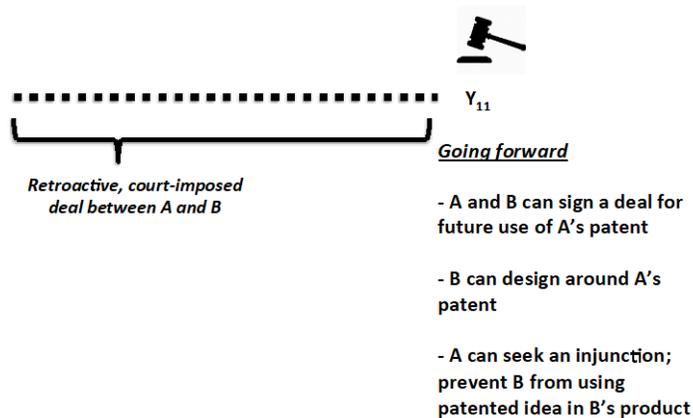


Figure 7: B’s Post-Litigation Options

IV. EX POST MARKETS VS. RENT-SEEKING: POLICING THE TROLL LINE

I have described a viable role for patent litigation—ex post market-making. I recognize that for my account to hold true, I am up against several well-entrenched ideas. First is that very little litigation adds any value from the perspective of businesspeople. This is a general view, but it runs deep, I think. Next is a close corollary: the idea that patent litigation in particular adds very little economic value. This begins with the general aversion to litigation that I described, but goes beyond. It is a view that has been heavily influenced by the patent troll wars and the associated calls for patent reform. For me to carry my case, I would have to show that the patent system has been purged of most of the defects that sustained the troll wars. And that what is left, the general and well-known costs of litigation, is outweighed by the benefits of market-making. That's a big burden. What I can do for a start is briefly list the reforms from recent years that seem to be at least reducing the incidence of troll litigation. In the process, I will describe how the post-reform patent system works to discourage rent-seeking litigation (troll cases) and thus encourage positive, value-adding litigation. I will also throw in some suggestions as to how the system might be fine-tuned even more to make it more effective at its primary value-adding function: constructing ex post patent markets. After that I can at least briefly summarize the remaining costs and benefits of litigation—the net benefit story as it stands in the post-reform era.

To begin, observe that an ex post market for a true innovation follows this pattern, in the paradigmatic case of a patented component:

Component Innovation & Compensation

1. *A* innovates with respect to some feature of technology *X*.
2. *B* produces a successful product, selling a product incorporating technology *X*.
3. *A* seeks compensation for its contribution to the *X* technology that *B* sells as part of its winning product.

This comes very close to the following scenario:

Rent-Seeking Litigation

1. *B* innovates and wins the product market competition.
2. *A* drafts a clever patent capturing some aspects of *B*'s technology, or acquires an extant patent that does the same.
3. *A* extracts rents from *B* through patent litigation.
- 4.

How do we sort out the innovation scenario from the rent-seeking one? We rely on the structure of patent doctrine and the institutions for judging patent validity. Between them—when things are working properly—patents are kept from: (1) staying in force when they should be invalid; (2) covering technologies that they have no right to cover; and (3) generating economic returns far out of proportion to the inherent value of the patented technology.

A. Policies to Prevent Rent-Seeking: Policing the “Troll Line”

In the ideal world, patent law polices the boundary between legitimacy and overstretch, between rewarding innovation and inviting rent-seeking. I describe this boundary as the “troll line”—the line that separates beneficial from harmful patents and patent enforcement.

A natural question is: how close is today’s patent system to the ideal one, one that properly draws and polices the troll line? Are there reasons to be skeptical about the ability of patent law to patrol the boundary between useless litigation and appropriate ex post compensation? These are quite difficult questions; experienced players on the patent scene might have a hard time coming to agreement. My view, however, is that although we can always improve the system, patent reform gives us tools to effectively police this line. Each of the detailed rules that comprise the dense body of patent doctrines plays a part. And many have been the subject of patent reform, either from Congress or the courts.

In the paragraphs that follow, I will briefly survey the main procedures and doctrines that come into play when a patent owner seeks to enforce it. I look at three issues: (1) how does each procedure or doctrine contribute to the proper placement of the troll line, i.e., how does each help to separate good patents from bad?; (2) what recent reforms have been enacted, and how have these reforms affected the troll line?; and (3) are there any doctrinal changes or procedural tweaks that that would help to better distinguish troll suits from legitimate enforcement?

1. Validity Procedures

The first topic is the procedures added to patent law in the America Invents Act of 2011 (AIA) for post-issuance review of patent validity at the Patent Office. These procedures are conducted by the Patent Trial and Appeal Board (PTAB), an administrative court. Most important among the new procedures is the Inter Partes Review (IPR). As one commentator says:

[T]he new inter partes review proceeding has been extraordinarily popular, with over four thousand petitions filed in its first four-and-a-half years. There are several reasons for this popularity. First, the proceedings are trial-like. The challenger can make written submissions and participate in a hearing before the PTAB, an entity created by the AIA and composed of patent lawyers and former patent examiners. Second, because of tight timelines imposed by the AIA, inter partes review concludes quickly, usually taking little more than a year.⁴⁴

It is difficult to overstate the importance of the IPR, how it has changed the dynamics of patent enforcement.⁴⁵ The most important reason is cost—an IPR is usually one-tenth of the cost of district court patent litigation⁴⁶—which in the past was the only effective way to invalidate a patent. Litigation costs create leverage for patent owners, often leading to settlements. The high cost of invalidation drove the economics of much troll litigation.⁴⁷ For a good number of years, commentators said that the US needed an administrative alternative to litigation, along the lines of European patent oppositions.⁴⁸ Now the US

44. Paul R. Gugliuzza, *Quick Decisions in Patent Cases*, 106 GEO. L. J. 619, 631 (2018).

45. Patent pros will recognize that IPRs supplanted the short-lived inter partes reexamination system, which was the forerunner to the IPR. See ROBERT P. MERGES & JOHN F. DUFFY, *PATENT LAW AND POLICY: CASES AND MATERIALS* 931–947 (7th ed. 2017).

46. Gugliuzza, *supra* note 42, at 632–33 (footnotes omitted):

The new administrative proceedings created by the AIA are a direct response to the high cost and long duration of patent litigation. The House Judiciary Committee report on the AIA explicitly states that the purpose of the new proceedings is to “provid[e] quick and cost effective alternatives to litigation.” Survey evidence indicates that inter partes review pursued through appeal costs about \$350,000—still expensive, but well below the average cost of patent litigation in court.

See also Brian J. Love et. al., *Determinants of Patent Quality: Evidence from Inter Partes Review Proceedings*, 90 U. COLO. L. REV. 67, 103–04 (2019) (footnotes omitted). (“USPTO filing fees alone for an instituted IPR are \$30,500, and median legal fees required to pursue an IPR to a final written decision are estimated to be about \$250,000.”). Recent survey data show the median cost of full patent litigation (through trial) is \$2 million for disputes of value between \$1 and \$10 million, and \$3 million for disputes of value between \$10 million and \$25 million. See Samson Vermont, *AIPLA Survey of Costs of Patent Litigation and Inter Partes Review*, PATENTATTORNEY.COM (Jan. 30, 2017), <https://www.patentattorney.com/aipla-survey-of-costs-of-patent-litigation-and-inter-partes-review/> [<https://perma.cc/VN5B-TT4W>].

47. See Ranganath Sudarshan, *Nuisance-Value Patent Suits: An Economic Model and Proposal*, 25 SANTA CLARA COMPUTER & HIGH TECH. L.J. 159 (2008).

48. See Joseph Farrell & Robert P. Merges, *Incentives to Challenge and Defend Patents: Why Litigation Won’t Reliably Fix Patent Office Errors and Why Administrative Patent Review Might Help*, 19 BERKELEY TECH. L.J. 943 (2004). For information on oppositions, see ROBERT P. MERGES & SEAGULL HAIYAN SONG, *TRANSNATIONAL INTELLECTUAL PROPERTY LAW* 35–37 (2018). According to a careful review of the data, IPRs and European oppositions are now quite similar in terms of case outcomes. See Colleen Chien, *Comparative Patent Quality*, 50 ARIZ. ST. L.J. 71, 77 (2018) (“When post-grant challenge outcomes at the EPO and USPTO are compared, the outcomes are not statistically distinguishable.”). See also Colleen Chien, Christian Helmers & Alfred Spigarelli,

has that, in the form of IPRs.⁴⁹ As one scholar concluded recently, “inter partes review is, as Congress intended, eliminating patents that appear to be of relatively low quality.”⁵⁰

In general, then, IPRs do a good deal of work in policing the troll line.⁵¹ But their very effectiveness makes them a target for attack. The attacks take advantage of the fairly loose coordination between the Patent Office and courts that are a feature of the U.S. patent system. One theory that would have eliminated IPRs altogether was rejected by the Supreme Court in *Oil States Energy Services, LLC v. Greene’s Energy Group LLC*.⁵² But the basis of this theory—that patents are property rights, and therefore immune from administrative revocation—informs a related threat to IPRs: that patent revocation is a constitutional “taking” of property, requiring full compensation to the aggrieved patentee/property holder. Several forms of mischief are at work here. One is conceptual: an

Inter Partes Review and the Design of Post-Grant Patent Reviews, 33 BERKELEY TECH. L.J. 817 (2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2601562 [<https://perma.cc/Z99V-Q35R>] (In both European opposition and post-grant U.S. reexamination, about 60% to 65% of challenged patents are either amended or rejected, and in 25% to 30% of the cases, all the claims are rejected and the patent is revoked.).

49. On IPRs, *see generally* ROBERT P. MERGES & JOHN F. DUFFY, PATENT LAW AND POLICY (8th ed., forthcoming 2021). The actual revocation rates for IPRs must be understood as a function of the two-step IPR process. A petitioner first asks for an IPR to be “instituted”; then, if the PTAB decides one or more claims may be invalid, it proceeds with the actual IPR administrative trial. And so:

The PTAB declines to institute proceedings about 30% of the time, and the parties settle roughly one-third of proceedings. So, although the PTAB renders a ruling of invalidity in most of its final decisions, less than half of the patent claims that are initially challenged reach that stage. Of the 70,060 total claims challenged in inter partes review in the first four-and-a-half years of the proceeding’s existence, only 16,688 (24%) were ruled invalid. Gugliuzza, *supra* note 42, at 631 (footnotes omitted).

50. Love, Miller, & Ambwani, *supra* note 44, at 68.

51. IPRs are not a perfect substitute for district court invalidations, however. In an IPR, only novelty and obviousness are considered. And only two categories of prior art may be consulted: patents and printed publications. Because there are a wide variety of invalidity grounds other than 102 and 103, and because there are more types of prior art other than patents and publications, litigation is a necessary adjunct. Patent validity proceeds in three stages: initial examination (a quick, imperfect first cut), *see* Michael Carley, Deepak Hegde & Alan Marco, *What is the Probability of Receiving a U.S. Patent?*, 17 YALE J.L. & TECH. 203, 209 (2015) (overall 56% success rate on patent applications); IPRs (an adversarial, yet limited, second look); and full-blown district court litigation (an expensive and fine-grained analysis). It makes sense in this stepwise process that more obscure prior art, which is more expensive to discover, comes into play only in district court litigation. The financial stakes are apt to be higher, so a greater expenditure of resources on locating invalidating prior art makes sense at this stage. *See* Stephen Yelderman, *Prior Art in the District Court*, 95 NOTRE DAME L. REV. 838 (2019) (harder to find prior art involving obscure references such as modestly distributed publications and evidence of prior use or sale (“activity” prior art) plays a prominent role in invalidating patents in district court litigation).

52. *Oil States Energy Servs., LLC v. Greene’s Energy Corp.*, 137 S. Ct. 2239 (2017).

absolutist view of property rights at odds with the nature of patents.⁵³ Another is more pragmatic: these challenges threaten to undermine the efficiency gains that have been made with the creation of IPRs. Formalistic talk of constitutional property is all well and good, but it is essential that courts do not lose sight of the basic purpose of IPRs. To effectively help police the troll line, the PTAB must be free to do its job.

Another potential problem area with respect to IPRs relates to standing. In many cases, a patent challenger has an obvious, palpable concern about a competitor's patent. In such a case, not only can the challenger file an IPR; they can also appeal an IPR final decision to the Federal Circuit. But where a challenger does not have enough of a direct, immediate threat, no such appeal may be available after a challenge that fails.⁵⁴ U.S. federal court standing doctrine blocks it.⁵⁵ Because it is important to open patent challenges as widely as possible, this doctrine ought to be interpreted broadly. Otherwise the loss of an appeal right could hinder some challengers, which would reduce the benefits of IPRs.

2. Validity Doctrines

Whether via an IPR or district court litigation, the essential gatekeepers to the patent system are the primary validity doctrines: subject matter, novelty, nonobviousness, enablement/written description, and claim definiteness. Patent reform has touched each of these. With the

53. See Robert P. Merges, *What Kind of Rights are Intellectual Property Rights?*, in THE OXFORD HANDBOOK OF INTELLECTUAL PROPERTY LAW 4–7 (Rochelle Dreyfuss & Justine Pila eds., 2017). Cf. *Ruckelshaus v. Monsanto Co.*, 467 U.S. 986 (1984) (commercial trade secrets can be protected by mandated disclosure, under a takings claim). *But see* Adam Mossoff, *Patents as Constitutional Private Property: The Historical Protection of Patents Under the Takings Clause*, 87 B.U. L. REV. 689 (2007); Gregory Dolin & Irena D. Manta, *Taking Patents*, 73 WASH. & LEE L. REV. 719, 720 (2016) (“The way to remedy these [constitutional] failings is for the government either to change its procedures or provide just compensation to the patent owners that received patents from the PTO before the enactment of the AIA.”); Gregory Dolin, *Yes, the PTAB Is Unconstitutional*, 17 CHI.-KENT J. INTEL. PROP. 457 (2018).

54. See *JTEKT Corp. v. GKN Auto. LTD.*, 898 F.3d 1217, 1221 (Fed. Cir. 2018) (Patent challenger has no standing to appeal adverse IPR decision because its engineers’ “declarations do not establish that its planned product would create a substantial risk of infringing [any] claims [of the challenged] patent or likely lead to charges of infringement . . .”). *But see* *E.I. DuPont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1004–05 (Fed. Cir. 2018) (Patent challenger in an IPR had standing to appeal since it showed that it was a competitor of the patentee, and had built a plant that was “capable of infringing” the challenged claims, that the patentee had alleged before the Board that the challenger had copied the patent, and that further, the patentee had refused to grant the license under the relevant patent).

55. The requirement for federal court jurisdiction under Article III of the U.S. Constitution calls for a “case or controversy.” In patent law, this means the patent owner must threaten a potential defendant in a concrete, material way. A vague or general concern that a patent *might* be enforced is not enough. See *MedImmune, Inc. v. Genentech, Inc.*, 127 S. Ct. 764 (2007).

exception of novelty, standards have been tightened over the past 10 to 15 years. The Supreme Court, in particular, has visited almost all of these requirements in one case or another. And on every occasion, it has made it easier to invalidate patents. Sometimes, much easier. A quick review will show why these primary validity doctrines have become stalwart sentinels guarding the integrity of the troll line.

The Supreme Court has made it much easier to very quickly dispense with a patent for failing to cover an invention that falls within patent law's established subject matter categories: processes, machines, manufactures, and compositions of matter. This usually happens when a patent claims something at such a high level of generality that it is overly conceptual and broad; or when something already exists in nature and is claimed in its basic form, instead of as part of a larger invention that uses the natural thing to produce a specific effect.⁵⁶

Despite criticism of the logic and substance of these § 101 decisions, they have undoubtedly added a powerful new deterrent along the troll line. The chief contribution of the new § 101 case law is that it encourages what might be called a “quick-look” on patent validity. Procedurally, courts deploy § 101 at the very outset of litigation. Of all the ways to invalidate a patent, § 101 has come to have one chief virtue: it's the cheapest. As one experienced observer says,

[T]he number of pleadings-stage dismissals on eligibility grounds has dramatically increased since the beginning of the Supreme Court's recent string of decisions. Although district courts sometimes grant motions to dismiss without prejudice, . . . most of those dismissals are with prejudice—they are, in other words, the final word on patent validity as far as the district court is concerned.⁵⁷

56. John M. Golden, *Remedies and Procedure: Patent Law's Continuing Frontiers*, 17 CHI.-KENT J. INTEL. PROP. 290, 292 (2018) (footnotes omitted) (“The [Supreme] Court has made . . . dramatic interventions on questions of subject-matter eligibility—i.e., the types of things, such as genetic sequences or computer programs—that may be patented.”). Golden points out, however, that “[w]hile the Court's decisions relating to the patentability of genetic sequences and medical diagnostic methods have been disruptive for substantial industry sectors, they have not quashed patenting in pharmaceuticals and biotechnology and appear to have left patenting in other fields of technology largely untouched.” *Id.* (footnote omitted).

57. Gugliuzza, *supra* note 42, at 653. Gugliuzza goes on to say:

[S]ummary judgment in discovery-intensive patent cases is much more expensive than a motion to dismiss. Thus, one arguably coherent policy justification for the eligibility requirement is that, as a “coarse-grained filter” for patentability, it provides a means for quickly and cheaply wiping out patents that are so likely to be invalidated under other requirements of patentability that discovery is not warranted.

Gugliuzza, *supra* note 42, at 655 (footnotes omitted), citing John M. Golden, *Patentable Subject Matter and Institutional Choice*, 89 TEX. L. REV. 1041, 1058 (2011). For an argument that the Patent

But § 101 does not impact all types of patents equally. Though software patents are a favorite of troll plaintiffs,⁵⁸ all manner of patents lend themselves to the potential for litigation aimed at rent-seeking. Other validity requirements must then come into play to separate valuable patents from the rest. This is where recent changes to the nonobviousness requirement, § 103, come into play.⁵⁹

a. Nonobviousness

In 2007, the Supreme Court raised the standard of nonobviousness,⁶⁰ making it more difficult to acquire a patent at the Patent Office and defend its validity later. This decision makes it easier to prove that a combination of prior art references renders an invention obvious, i.e., unpatentable. *KSR Int'l Co. v. Teleflex Inc.* also adopted what many feel is the proper way of considering whether a new invention is trivial or significant—a focus on the state of predictability or uncertainty just prior to creation of

Office should have more say in setting § 101 standards for the courts see Melissa F. Wasserman, *The Changing Guard of Patent Law: Chevron Deference for the PTO*, 54 WM. & MARY L. REV. 1959 (2013). One renowned patent scholar points out that court challenges under § 101 are small in number compared to the total number of patent applications the Patent Office deals with. See Arti K. Rai, *Improving (Software) Patent Quality Through the Administrative Process*, 51 HOUS. L. REV. 503, 516 (2013):

Regardless of whether courts can successfully use the [101] test within the relatively small number of cases they have to adjudicate, a sophisticated approach to Section 101 is unlikely to be a useful tool in the mine run of cases that [patent] examiners must address in an average time allotment of about twenty to forty hours [per patent application, in the Patent Office]. Although a crude and underinclusive . . . [version of the 101] test should have some utility, patentable subject matter doctrine has limited potential at the initial examination stage.

58. See U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-13-465, INTELLECTUAL PROPERTY: ASSESSING FACTORS THAT AFFECT PATENT INFRINGEMENT LITIGATION COULD HELP IMPROVE PATENT QUALITY, August, 2013, <https://www.gao.gov/assets/660/657103.pdf> [<https://perma.cc/6NV6-C5T7>], at p. 22, Figure 6 (over 90% of “patent monetization entity” (often, troll) litigation involves software patents). See also Colleen V. Chien, *From Arms Race to Marketplace: The Complex Patent Ecosystem and Its Implications for the Patent System*, 62 HASTINGS L.J. 297, 304–05 (2010) (describing rise of software patents, and subsequent growth in litigation).

59. Novelty is also an important screening doctrine, but the content of the novelty requirement has been stable for many years. The only recent development of note did not raise the novelty standard, it only maintained the status quo. See *Helsinn Healthcare S.A. v. Teva Pharm. USA, Inc.*, 139 S. Ct. 628 (2019) (maintaining and carrying over pre-2011 case law on the definition of prior art categories in use since the 19th century); cf. Robert P. Merges, *Priority and Novelty Under the AIA*, 27 BERKELEY TECH. L.J. 1023 (2012) (advocating for this approach).

60. *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007).

the new invention.⁶¹ The changed standard is evident from the post-*KSR* case law:

The data indicate that prior to *KSR*, when the Federal Circuit reached a final determination on the question of obviousness, the court concluded that the patent was obvious 43% of the time in appeals arising from the district courts and [the International Trade Commission, an alternative patent enforcement forum for imported products]. After *KSR*, the court reached a conclusion of “obvious” in appeals arising from these tribunals 57% of the time. This difference is statistically significant; that is, at the most commonly accepted level of statistical significance $p < .05$, one can conclude that it is not due to random chance alone.⁶²

Because the Federal Circuit decides appeals from the Patent Office as well, the same pattern is observed with respect to the validity of patent applications under § 103:

Prior to *KSR*, the Federal Circuit concluded that the subject matter of these appeals was obvious 83% of the time; after *KSR*, the Federal Circuit concluded that they were obvious 96% of the time. During the five years following *KSR*, the Federal Circuit concluded that the patent was obvious in all but four appeals arising from the Patent Office in which it reached a final determination on the issue of obviousness.⁶³

61. *Id.* at 417 (“If a person of ordinary skill can implement a predictable variation [of the prior art], § 103 likely bars its patentability.”). See generally Robert P. Merges, *Uncertainty and the Standard of Patentability*, 7 HIGH TECH. L.J. 1 (1992).

62. Jason Rantanen, *The Federal Circuit’s New Obviousness Jurisprudence: An Empirical Study*, 16 STAN. TECH. L. REV. 709, 738 (2013) (footnote omitted). See also Golden, *supra* note 54, at 291–92 (“The United States Supreme Court [in *KSR*] appears to have caused an uptick in the stringency of patent law’s demand that an invention be nonobvious in order to be patentable.”); Jennifer Nock & Sreekar Gadde, *Raising the Bar for Nonobviousness: An Empirical Study of Federal Circuit Case Law Following KSR*, 20 FED. CIR. B.J. 369 (2011).

63. Rantanen, *supra* note 60, at 738. See also Calvin M. Brien, *An Empirical Analysis of Patent Validity in Inter Partes Reviews Through the Lens of KSR*, 46 AIPLA Q.J. 413, 435 (2018) (showing that pre-*KSR* patents were subject to a lower and less stringent standard of nonobviousness) (footnotes omitted):

In the . . . data set [covering PTAB decisions whether to institute an IPR], 26.7% of the pre-*KSR* patents survived obviousness scrutiny at the institution stage, while 37.8% of the post-*KSR* patents survived such scrutiny. This supports the hypothesis that pre-*KSR* patents should survive obviousness challenges less often than post-*KSR* patents. Regarding the final written decision data, although a higher percentage of post-*KSR* patents survived IPR obviousness challenges, the difference between these percentages is low: 1.1% (85.2% minus 84.1%). This low percentage difference contrasts with the much higher percentage difference seen in the institution decision data: 11.1% (73.3% minus 62.2%). The insignificant difference between the validity percentages for pre-*KSR* and post-*KSR* patents after institution is predictable because the institution decision is a patentability determination. In other words, after institution and long before a final decision is made, the PTAB has already made a determination that the challenged patent is likely invalid.

b. Disclosure Doctrines

In what might be called the early years of the Troll Wars, the purchase of low-quality patents, whose sole function was rent extraction, gave patents and patent litigation a bad name among people who care about real innovation.⁶⁴ One aspect of patent law that makes this strategy possible is that sometimes patents claim more than they realistically teach, or disclose. It is the job of disclosure-related doctrines to defeat this strategy, but those doctrines needed some tightening to properly respond to the troll problem.

Three inter-related doctrines are named in § 112 of the Patent Act: enablement, written description, and claim definiteness. Though written description has expanded greatly in recent years, it produces few invalidations that would not have occurred before. This is because it largely duplicates the traditional work of the enablement doctrine. In a recent study of patent invalidity cases, covering the period from 2011 until mid-2017 (a total of 1,542 patent validity determinations), patent invalidations due to failure to meet the written description requirement totaled 59, while those invalidated due to enablement totaled 43.⁶⁵ But there is little to separate them, and like the formative case in this area, it seems many if not most decided under one provision could as equally have been decided under the other.⁶⁶ In any event, detailed empirical data show that software patents—again, a favorite of troll plaintiffs—are the most frequently invalidated patents under enablement and description.⁶⁷ These

Therefore, the final outcome of an IPR is highly predictable after institution, regardless of what obviousness law (i.e., pre-*KSR* or post-*KSR*) was applied during original examination.

64. See, e.g., Robert P. Merges, *The Trouble with Trolls: Innovation, Rent-Seeking, and Patent Law Reform*, 24 BERKELEY TECH. L.J. 1583, 1587 (2009).

65. See Yelderman, *supra* note 51, at 19.

66. *Ariad Pharm., Inc. v. Eli Lilly and Co.*, 598 F.3d 1336 (Fed. Cir. 2010) (en banc).

67. See John R. Allison & Lisa Larrimore Ouellette, *How Courts Adjudicate Patent Definiteness and Disclosure*, 65 DUKE L.J. 609, 647–48 (2016) (footnotes omitted):

On enablement, patents employing the oldest technology of all, mechanics, scored higher [on validity scores] than those in any other primary technology area, and software scored the lowest. In the software area, it may come as a surprise that the non-business-method software patents were more likely to be invalidated than those covering business models and techniques. Unlike the rest of the software class, business methods were ranked almost as high as biotech and above optics in their likelihood to survive scrutiny.

On written description, patents in the electrical- and mechanical-technology areas switched places, the former being the most likely to withstand challenges. The mean written-description outcome for software business methods was the worst mean outcome for any technology on any § 112 issue, meaning that software-business-method patents were very likely to be invalidated for lack of written description. Non-business-method software and software as a whole also fared poorly on written description.

requirements under § 112 do a fair amount of the work of weeding out the over-broad patents often associated with troll litigation.

The indefiniteness requirement is even more helpful. There is little doubt that this test has been tightened in recent years. The Supreme Court itself did much of the work, by eliminating a quite forgiving test developed by the Federal Circuit and substituting a more demanding standard.⁶⁸ Open-ended claim language that permitted patents to read on or cover a wide array of embodiments was much beloved by patent trolls: it gave them the opportunity to purchase a broad patent issued in earlier times and assert it against later-emerging technologies. For obvious reasons, this facilitated a good bit of rent-seeking. The Supreme Court's new test has had the expected result: more patents are being invalidated these days.⁶⁹

In one specific field, however, the Federal Circuit, not the Supreme Court, gets credit for requiring more definite claims. Broad invention elements claimed in “means plus function” format are permissible in any field but seem to be very popular in software patents. The Federal Circuit has invalidated a number of software claims having means plus function elements. Patent drafters had been trying to claim broadly by reciting such an element but had, in many cases, failed to provide detailed algorithms, pseudo-code, or other structural guidance in the patent specification. Reciting a vague “black box” software component is not enough to make a means plus function claim definite under the Patent Act.⁷⁰ The bottom

68. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120 (2014).

69. See Christa J. Laser, *A Definite Claim on Claim Indefiniteness: An Empirical Study of Definiteness Cases of the Past Decade with A Focus on the Federal Circuit and the Insolubly Ambiguous Standard*, 10 *CHI-KENT J. INTELL. PROP.* 25, 32 (2010) (“54.55% of all final Federal Circuit claim indefiniteness cases [in the study] found claims definite and 45.45% of final cases found claims indefinite.”).

70. See, e.g., *Aristocrat Techs. Austral. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328 (Fed. Cir. 2008) (“means for controlling” element indefinite in light of specification that simply shows a vague software flow chart that includes a “control means” component); *Blackboard, Inc. v. Desire2Learn, Inc.*, 574 F.3d 1371, 1384 (Fed. Cir. 2009) (“means for assigning” a specified role for users of a software platform, which controls the level of access the system grants to each user, is indefinite in light of flowchart showing a vague “access control means” component). Cf. Allison & Ouellette, *supra* note 65, at 655–56 (footnote omitted) (arguing that their case data show that means plus function claims fare poorly across all fields):

[A] claim with an MPF [means plus function] element was far more likely to succumb to an indefiniteness challenge One might think that this result is driven by recent software-patent cases . . . , which embraced the use of indefiniteness to invalidate overbroad MPF software claims. However, . . . we found the same negative and highly significant coefficients on the MPF variable. We thus think this is not [a software]-specific result.

line is that open-ended software claims that cover a broad function are very often invalidated—which takes away a favorite tool of patent trolls.⁷¹

Overall, the data present a unified picture. The requirements of § 112, whose purpose is to make sure that patent claims are commensurate with the overall contribution the invention makes, help to cut down considerably on rent-seeking litigation. As one study put it:

Operating companies' success rates in adjudicated cases is more than twice as high as NPEs: operating companies won definitive rulings 30.6% of the time, compared to only 14.4% for NPEs. That difference is statistically significant at a high level of confidence. In fact, NPEs did worse than operating companies on most of the outcomes represented in our dataset. . . . [W]e found statistically significant results for: invalidity based on claim indefiniteness (found 10.5% of the time it was ruled upon against operating companies, but 31.7% of the time against NPEs), [and] invalidity based on inadequate disclosure (found 16.8% of the time it was ruled upon against operating companies, but 75% of the time against NPEs)⁷²

3. Infringement Doctrines

Validity doctrines, as we just saw, are important in cutting back on enforcement for non-innovative and overbroad patented inventions. A second set of doctrinal changes has also reined in rent-seeking. Doctrinal changes over the past 10 to 15 years have made it less likely that a firm, which in fact contributed very little, can win an infringement suit by asserting that its patents claims cover or “read on” profitable products sold by others. Even if a patent survives the many validity challenges available to a defendant, the patent owner must still prove infringement. This can be difficult—even more difficult than defending validity. Several doctrines within the law of infringement contribute to this difficulty.

First is the “doctrine of equivalents,” which in the past was used to stretch patent claims beyond their literal wording when courts thought that was the fair thing to do. Though this doctrine lives on in principle, it is rarely used these days; this makes patents claims narrower on average

71. Allison & Ouellette, *supra* note 65, at 647–48 (“[P]atents in the mechanical-, electrical-, chemistry-, biotechnology-, and optics-technology fields were most likely to withstand claim-indefiniteness challenges, with software having fared less well, and software’s business-method subset being the most likely to be invalidated.”). On patent trolls’ preference to assert software patents, see John R. Allison, Mark A. Lemley & David L. Schwartz, *How Often Do Non-Practicing Entities Win Patent Suits?*, 32 BERKELEY TECH. L.J. 237, 263 (2017). (“22.8% of operating company cases litigated to judgment involved software patents, while a whopping 65.9% of NPE [non-practicing entity, i.e., troll] suits did.”).

72. Allison, Lemley & Schwartz, *supra* note 69, at 269.

than they used to be.⁷³ Second, at least in some cases, the Federal Circuit has shown some sensitivity to the use of patent claim interpretation as an instrument of rent-seeking. In a series of cases, it has refused to extend a claim obviously drafted to capture “generation 1” technology to include “generation 2” or “generation 3” of the same technology.⁷⁴ This takes dead aim at rent-seeking strategies: it is almost a tautology that using generation 1 teachings to capture the value of generation 2 and 3 represents an attempt to extract wealth that was not truly earned.⁷⁵

Empirical data show the difficulties in proving infringement, especially in the (troll-heavy) area of software patents. One study says:

[A]cross all technologies, the chance of a patent being held not infringed was significantly higher than the chance of it being held invalid. That was true in every technology area, but the result was particularly striking in the optics and software industries, in which more than two-thirds of all the cases we observed included a finding of noninfringement. Overall, there were almost twice as many noninfringement rulings (348) as invalidity rulings (188). The difference in infringement and validity rates in software may shed some light on debates about software. . . . [I]t

73. See, e.g., *Gemalto S.A. v. HTC Corp.*, 754 F.3d 1364, 1369 (Fed. Cir. 2014) (owner of patent claiming use of high level programming with microcontroller failed to establish infringement under doctrine of equivalents). See generally John Allison and Mark Lemley, *The (Unnoticed) Demise of the Doctrine of Equivalents* 59 STAN. L. REV. 955 (2007). But see Dennis Crouch, *Doctrine of Equivalents: On the Rise Again*, PATENTLY-O (Feb. 21, 2013), <http://patentlyo.com/patent/2013/02/doctrine-of-equivalents-on-the-rise.html> [<https://perma.cc/HS29-J7HG>]. See generally Jason Rantanen, *The Malleability of Patent Rights*, 2015 MICH. ST. L. REV. 895, 954 (2015) (arguing that the survival of the doctrine of equivalents proves the malleability of patents over time).

74. This is a pattern I have observed, as opposed to a formal rule or doctrine. See, e.g., *On Demand Mach. Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1340 (Fed. Cir. 2006) (US Patent 5,465,213, drafted in 1990 to cover on-demand printing of single copies of books in special kiosks installed in bookstores, did not cover large-scale remote printing companies that prints books on demand in response to customer orders, such as Amazon.com (one of the defendants). “[T]he focus of the [plaintiff’s] patent is immediate single-copy printing and binding initiated by the customer and conducted at the customer’s site. The [patent claim at issue] . . . cannot eliminate these constraints in order to embrace the remote large-scale production of books for publishers and retailers.”); *Walker Dig., LLC v. Microsoft Corp.*, No. CV 09-7514 PSG PJWX, 2011 WL 61618 (C.D. Cal. Jan. 3, 2011), aff’d, 484 F. App’x 496 (Fed. Cir. 2012) (summary judgment for defendant on plaintiff’s patent claiming the ability to prepare a browser search that runs “in the background” while a user operates a software program (such as Microsoft Word) “in the foreground”; patent application filed in 1998 envisioned preparation and launch of search term completely within a self-contained and separate browser program, while later software permits browser search preparation in a program separate from but tightly integrated with the browser, such as in contemporary versions of Microsoft Office).

75. Cf. Peter S. Menell, Matthew D. Powers & Steven C. Carlson, *Patent Claim Construction: A Modern Synthesis and Structured Framework*, 25 BERKELEY TECH. L.J. 711, 738 (2010) (“[T]he meaning of scientific and technical terms can change significantly during the life span of a patent. In the field of digital technology, for example, change can occur unbelievably rapidly given the exponential rate of advance in computer technology. Litigation over patent claims can occur multiple technological generations after the patent claim term was drafted.”).

may be that software patent holders are overasserting their patents in litigation, rather than overclaiming in the claim-drafting sense.⁷⁶

Infringement, then, presents a significant set of issues on the border between beneficial patents and those that would merely extract wealth without adding anything of economic value.⁷⁷

4. Remedies

Some companies litigate patents as part of broader strategic competition (such as the Apple-Samsung mobile phone “wars”). Other companies use patents to police market entry, prevent competition from forming, or other corporate goals. But for trolls, litigation is not a tactic, it is a business model. For these patent owners, the remedies available in litigation (and the settlements dictated by those remedies) are the entire point of the game. Companies that make and sell goods and products—the usual targets of troll litigation—understood this early on. So, it is no surprise that one of the first major issues raised in troll-related patent reform was the law of remedies.

The major reform blow came in 2006 with the *eBay* case.⁷⁸ This spelled the end of the automatic injunction rule adopted in the early 1980s by the Federal Circuit. What makes *eBay* one of the most important Supreme Court patent cases in a century is its recognition that trolls use injunctions to extract excess value from defendants in patent cases. Though nominally not central to the Court’s holding, the discussion of “undue leverage” in Justice Kennedy’s concurrence is the intellectual heart of the opinion:

An industry has developed in which firms use patents not as a basis for producing and selling goods but, instead, primarily for obtaining

76. John R. Allison, Mark A. Lemley & David L. Schwartz., *Our Divided Patent System*, 82 U. CHI. L. REV. 1073, 1102–03 (2015).

77. I should point out that under one interpretation, the recent § 101 cases I discussed earlier are mostly about claim breadth and thus indirectly therefore about infringement. Under this view, 101 returns courts’ attention to the overall contribution made by the invention. This holistic or “gist of the contribution” approach was common in the era before formal claims even emerged in US patent law in the nineteenth century. See Andres Sawicki, *The Central Claiming Renaissance*, 103 CORNELL L. REV. 645, 645 (2018):

In our modern peripheral claiming system, the claim language is the near-exclusive guide to the patent’s boundaries. But in its earliest days, our patent system pursued a central claiming approach, in which the inventor’s actual work determined the patent’s scope. The [Supreme] Court’s eligibility [i.e., § 101] cases focus on the inventor’s actual contribution to the field, precisely as a central claiming inquiry would. And they can be better understood once this return to central claiming is revealed.

78. *eBay Inc. v. MercExchange L.L.C.*, 547 U.S. 388 (2006).

licensing fees. . . . For these firms, an injunction, and the potentially serious sanctions arising from its violation, can be employed as a bargaining tool to charge exorbitant fees to companies that seek to buy licenses to practice the patent. . . . When the patented invention is but a small component of the product the companies seek to produce and the threat of an injunction is employed simply for undue leverage in negotiations, legal damages may well be sufficient to compensate for the infringement and an injunction may not serve the public interest.⁷⁹

We see here a clear-eyed understanding of the rise of patent trolls (“. . . [a]n industry has developed. . .”), and a sure grasp of the role of injunctions in facilitating this rise (“exorbitant fees” caused by “undue leverage”). Though some criticize *eBay* as a violation of the sanctity of property rights,⁸⁰ I and others commend the opinion for its pragmatism.⁸¹ Theory and concepts aside, *eBay* has both (1) significantly cut back on the incentive to bring troll litigation, and (2) maintained the availability of the injunctive remedy in the strong majority of cases in which it is warranted. The post-*eBay* injunction grant rate is 75%.⁸²

Though an injunction can be used to obtain a monetary settlement, the more direct monetary remedy in patent cases is damages. For trolls, litigation is strictly a monetary affair. Damages doctrine is thus a key focus for patent reform aimed at reducing litigation. The overall trend here might be described as “rationalization,” meaning an increase in the use of more precise analytic tools to rein in excessive damage awards. The emphasis is on developing more precise ways to measure the actual

79. *Id.* at 396–97 (Kennedy, J., concurring; joined by Stevens, J., Souter, J., and Breyer, J.).

80. Richard A. Epstein, *The Disintegration of Intellectual Property? A Classical Liberal Response to a Premature Obituary* 62 *STAN. L. REV.* 455, 494 (2010) (“Nothing in the traditional principles of equity requires that radical revision of the right to exclude that *eBay* seems to invite”).

81. Merges, *supra* note 51:

[Some say *eBay* means patents are no longer property rights.] The truth is otherwise: there are common and fairly frequent cases involving real property rights in which an injunction is not issued in favor of the property owner. . . . [I]n each case, violation of a small magnitude right would, if met with injunctive relief, result in a legal remedy worth a huge amount of money. The reward, in other words, is highly disproportional to the magnitude of the violation. This is precisely the situation in which injunctions are denied in patent cases. It just so happens that, at least under conditions prevalent between 2000 or so and 2010, this small right/huge reward scenario was more common in patent law than in real property cases. But the fact that this situation was more common with respect to patent rights than real property rights does not in any way undermine the status of patents as property.

See also ROBERT P. MERGES, *JUSTIFYING INTELLECTUAL PROPERTY* (2011), at Chapter 6 (“The Proportionality Principle”), pp. 159 ff.

82. Ryan T. Holte & Christopher B. Seaman, *Patent Injunctions on Appeal: An Empirical Study of the Federal Circuit’s Application of eBay*, 92 *WASH. L. REV.* 145, 203 (2017).

economic loss suffered by a patent owner as a result of infringement. Progress has definitely been made, mostly (so far) in the form of ridding patent law of outdated and simplistic damages doctrine that often contributed to overcompensation, and that was in any event always highly imprecise. So, for example, courts have discarded a venerable but discredited “rule of thumb” that royalties for past infringement should be set at roughly 25% of the infringer’s revenue.⁸³ The Federal Circuit has also ended the practice of basing an estimated royalty on the use of sample licensing agreements from an industry when those agreements were not truly comparable to the infringing situation.⁸⁴ Although courts are still wrestling with more accurate ways to assess damages,⁸⁵ the emphasis on accuracy assures continued vigilance against systematic overcompensation. The overall message is: rent seekers need not apply.

5. Procedural Rules

The main reason litigation can be harmful is cost. Patent litigation is particularly costly, because many technologies are complex and because the law itself is an intricate jumble of rules that must be disentangled and applied. And patent litigation in the U.S. takes place in federal courts—famous for their embrace of a full-throated (and therefore expensive) commitment to due process.

Cutting back on cost therefore entails reform of procedure as well as of legal substance. As mentioned, the “quick look” nature of recent § 101 cases turns them into a procedural innovation, though masked as substance. The same is true—in reverse—of a critically important procedural reform from 2018. The Supreme Court’s decision in *TC Heartland L.L.C. v. Kraft Foods Group Brands L.L.C.*⁸⁶ was ostensibly about procedure—namely, the law of venue—determining which U.S. district court can hear a particular case. But it was really about reining in

83. Stuart Graham, Peter Menell, Cark Shapiro & Tim Simcoe, *Final Report of the Berkeley Center for Law & Technology Patent Damages Workshop 15 August 2016*, 25 TEX. INTELL. PROP. L.J. 115, 124 (2017) (“There is a broad consensus among economists that there was little evidentiary support for the now-discarded 25% Rule of Thumb as it appears to have been commonly applied in the United States.”).

84. See generally Jonathan S. Masur, *The Use and Misuse of Patent Licenses*, 110 NW. U.L. REV. 115 (2015).

85. See, e.g., *VirmetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1331–1332 (Fed. Cir. 2014) (rejecting use of Nash bargaining framework, a conceptual tool used by economists, in calculating patent damages). See generally, MERGES & DUFFY, *supra* note 43, at 836–40 (Note on “Contemporary Approaches to Patent Damages”, discussing Nash bargaining, a statistical analysis technique called conjoint analysis, etc.).

86. *TC Heartland L.L.C. v. Kraft Foods Grp. Brands L.L.C.*, 137 S. Ct. 1514 (2017).

a “renegade court” that had leveraged a liberal venue rule to aggrandize its patent docket to ludicrous proportions.⁸⁷ Thus a court in a region with modest economic activity became the epicenter of patent troll litigation.⁸⁸ *TC Heartland* put an end to this by stringently tightening venue in patent cases. The rule is couched in procedural terms, but its impact was substantive: the district court in question had minimized and avoided most aspects of patent reform to protect its patent-intensive litigation docket.⁸⁹ By moving cases out of this district, *TC Heartland* shifted the substantive balance of U.S. patent law. It is no longer disproportionately influenced by a pro-patent, pro-litigation court.

While reform of the venue rule was the most pressing topic in procedural reform, many smaller-scale changes have been adopted in an attempt to streamline patent litigation. Many of these are described in the influential *Patent Case Management Judicial Guide*, produced by the Federal Judicial Center and given to all judges in patent cases.⁹⁰ Individual federal districts have responded with detailed “Local Rules” that also work to provide an efficient, cost-effective litigation structure specifically adapted to patent cases.⁹¹

87. See J. Jonas Anderson, *Reining in A “Renegade” Court: TC Heartland and the Eastern District of Texas*, 39 CARDOZO L. REV. 1569 (2018).

88. Robert G. Bone, *Forum Shopping and Patent Law—A Comment on TC Heartland*, 96 TEX. L. REV. 141, 144 (2017) (describing “forum selling by federal district courts” to attract troll litigation, seen as beneficial to the court’s local economy).

89. Brian J. Love & James Yoon, *Predictably Expensive: A Critical Look at Patent Litigation in the Eastern District of Texas*, 20 STAN. TECH. L. REV. 1, 25–26 (2017):

[W]e review evidence that judges in the Eastern District of Texas have generally ruled in ways that have minimized the effect of patent reform measures passed by Congress and changes in the law articulated by higher courts. We find that East Texas judges are disproportionately unlikely to stay cases pending post-grant challenges, to require that patentees litigate individual cases against individual defendants, to grant early motions to dismiss on patentable subject matter grounds, and to award attorney’s fees to prevailing parties.

90. Peter S. Menell, Lynn H. Pasahow, James Pooley, Matthew D. Powers, Steven C. Carlson, Jeffrey G. Homrig, George F. Pappas, Carolyn Chang, Colette Reiner Mayer, & Marc David Peters, *PATENT CASE MANAGEMENT JUDICIAL GUIDE* (3d ed. 2016), <https://www.fjc.gov/content/321534/patent-case-management-judicial-guide-third-edition> [<https://perma.cc/JW3L-P3W3>]. The Federal Judicial Center is an official branch of the U.S. court system responsible for judicial training.

91. Pauline M. Pelletier, *The Impact of Local Patent Rules on Rate and Timing of Case Resolution Relative to Claim Construction: An Empirical Study of the Past Decade*, 8 J. BUS. & TECH. L. 451, 455 (2013) (footnotes omitted) (“[T]he strict initial disclosure requirements and predictable scheduling of claim construction reflected in the majority of local patent rules yields efficient and merits-motivated case resolution—i.e., once claims are construed, parties know where they stand. By extension this should lower the uncertainty associated with litigation and make it more predictable.”). Cases that proceed under these local rules get to the “heart” of patent litigation – the meaning of claim terms, and thus the question of infringement – more efficiently:

B. *Rolling Up the Loose Ends of Patent Reform*

Taken all together, the reforms I described have fundamentally reshaped the landscape of patent litigation. Many, if not most, were motivated by a desire to cut back on excessive (troll) litigation. They represent an impressive policy response to a challenging chapter in U.S. patent law.

The system is still far from perfect. The biggest opportunity for future reform may be in tighter integration between the Patent Office and the courts. Due to the long history of judicial independence, and the separation of powers principle, courts are not required to stay (or suspend) district court litigation when patent validity is challenged in an IPR at the Patent Office. This can be wasteful. A more efficient approach would be to prevent court cases from proceeding until after the IPR is complete.⁹²

Another reform frontier is administrative fees in the Patent Office. We have just scratched the surface in this important area. Despite some persuasive modeling by economists over the years,⁹³ those who shape patent policy have paid very little attention to the potential power of patent application fees, renewal fees, and other administrative fees as a mechanism to screen valuable from less valuable inventions and flush the less valuable ones out of the patent system.⁹⁴

V. CONCLUSION

In a perfect world, it seems there would be no litigation. Patent boundaries (and validity) would be crystal clear; damages would be perfectly predictable; and all patent conflicts would end with a willing, bilateral license. To paraphrase Grant Gilmore: the more efficient the

Data analyzed in this study reveals that a relatively small percentage of cases—only ten percent—proceed to a decision on claim construction and, of those that do, a majority are resolved within a year of that milestone. Regarding the impact of local patent rules on claim construction, this study observes that, on average, more cases proceed to a decision on claim construction in jurisdictions with local patent rules, fourteen percent, than in jurisdictions without them, eight percent.

Id. at 456.

92. For a suggestion providing for even tighter integration, see Lauren Cohen, John M. Golden, Umit M. Gurun & Scott Duke Kominers, “Troll” Check? *A Proposal for Administrative Review of Patent Litigation*, 97 B.U. L. REV. 1775 (2017).

93. Especially Suzanne Scotchmer, *On the Optimality of the Patent Renewal System*, 30 RAND J. ECON. 181 (1999).

94. See David Fagundes & Jonathan S. Masur, *Costly Intellectual Property*, 65 VAND. L. REV. 677, 679–80 (2012); Jonathan S. Masur, *Costly Screens and Patent Examination*, 2 J. LEGAL ANALYSIS 687, 715 (2010) (proposing greater attention to the cost of acquiring IP rights as a way to screen out less valuable contributions).

society, the fewer lawsuits there will be. In Pareto Heaven there will be no litigation, and the lion will lie down with the lamb.⁹⁵

But foresight is not perfect, attention and effort are limited, and time marches fast in the world of new technologies. All these conspire to render perfect market-making a distant, utopian dream. The reality is messier. In the technology domain it is inevitable, and maybe desirable, that people will put off some deal-making for tomorrow.

When tomorrow comes, and the dust has at least partially settled on the race for a new technology, a surprising economic institution comes into play—patent litigation. After product winners have emerged, patent litigation can sort through who were the real contributors: which inventors and companies contributed crucial technologies and component designs, helping in the success of the new products? That patent litigation, and the patent system generally, is out of sync with the rapid-fire timing of innovation—that’s old news. What is new is an appreciation that this asynchronicity might have some hidden benefits. By decoupling patent disputes from technical and commercial cycles, patent law allows industries to burst forth at breakneck speed—with the promise that compensation for important contributors will take place. It just takes place later.

But litigation—to *advocate* litigation! Is this really necessary to construct an ex post market? In this case, it appears the answer is yes. Real-time market-making can actually entail higher costs. And no rational economic actor, having gained a strong market position in real time, would go back and fully compensate all those who helped but were not compensated for it. Ok, in a few cases, maybe. But what about the enormous costs? Isn’t litigation almost always enormously expensive and wasteful?

Expensive, yes. But patent reform over the recent past goes a long way toward eliminating one large source of social waste, rent-seeking. Any patent left standing these days after an IPR, or especially after litigation, probably represents a reasonably important technical contribution. Or, at any rate, an invention that satisfies the legal requirements for patentability to a fairly high degree of certainty. Of course, not all patents justify the expense of an IPR challenge; therefore, it can’t be safely said that all patents sold in portfolio sales or acquired in an M&A deal are of certifiable high quality. But the availability of IPRs, as well as all the more stringent doctrinal adjustments under patent reform,

95. GRANT GILMORE, AGES OF AMERICAN LAW 110–11 (1977) (“The better the society, the less law there will be. In Heaven there will be no law, and the lion will lie down with the lamb.”).

has undoubtedly reduced the incidence of rent-seeking through patents. The mere threat of an IPR, after all, will be enough to curb the least justifiable uses of patents to extract big chunks of unearned rents.

Here is what I have been leading up to. The cumulative weight of recent reform ought to affect our assessment of patent litigation and ex post market-making. If, as I believe, reform has made rent-seeking via patents less likely and less profitable, then that is a good reason not to oppose patent litigation on principle. Rent-seeking via patents has become harder and less likely. It follows that from now on, we might expect litigation to be more a result of reasoned choices and less a matter of pure rent-seeking.

Ideally, market exchanges for all production-related inputs take place in real time. But with a complex and tangled input such as new inventions and their associated patents, this timing is often not realistic. In this special case, an idiosyncratic economic institution has emerged. Patent litigation, at its best, helps form markets for important inventive inputs. But it does so ex post—after product markets have taken shape, and at least begun to mature. This temporal decoupling permits early contributors to get their due, even if they are not manufacturers, but component suppliers; or even if they are “failed” product companies. Patent litigation both sets the record straight regarding how an industry took form and provides some assurance that even in “winner take all” product markets, important early contributors who lose the primary race might get some share of the proceeds. As market-making goes, litigation is expensive, and far from perfect. But it does at least allow for a considered set of judgments about which inventions really contributed to a new technology or industry. It slows down the tape of a fast-moving game and hands out some awards to players who might have been overlooked in the heat of the action. In this way it contributes to a balancing of accounts. It enables an industry to take shape at breakneck speed. But it also enables the making of markets that make sense, given more time to consider the facts. Many inventors and companies want to win the big prize of product competition. But a smaller prize, in the form of compensation in the ex post patent market, surely beats none at all.