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Patent Law and the Two Cultures

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A half century ago, author and physicist C.P. Snow warned of a “gulf of mutual incomprehension” between the liberal arts and sciences. Snow’s “Two Cultures” thesis is particularly relevant to patent law, a realm where law and science intersect. Drawing on Snow’s framework, this Article addresses challenges that arise when lay judges must engage, understand, and ultimately pass judgment on complex technologies. It first argues that technological subject matter imposes significant cognitive burdens on generalist judges. It then explores the “cognitive miser” model whereby lay persons adopt heuristics and defer to expertise to limit their engagement with technology. Drawing from this psychological model, this Article then explores the unique role of formalism in patent doctrine. Advancing an information cost theory of Federal Circuit jurisprudence, this Article argues that formalistic patent doctrine mitigates the degree to which judges must engage technological subject matter. Formalism truncates difficult technical inquiries, thus helping to mediate the intersection of law and science.

The Article then identifies a countervailing trend in recent Supreme Court patent decisions. It is well-established that the Court has substantively narrowed patent rights. Less appreciated, however, is the Court’s systematic preference for contextually-sensitive, holistic standards over inquiry-truncating, formalistic rules. This so-called “holistic turn” promises to increase the degree to which lay judges must engage technologically complex subject matter. To address resulting cognitive burdens, this Article offers prescriptions for blending the economizing virtues of rules with the flexibility and contextual sensitivity of standards. It concludes by exploring the cultural differences of the Federal Circuit and the Supreme Court as well as their implications for patent doctrine.

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“Patent litigation is like the neurosurgery of litigation: it is hard scientifically and it is hard legally.”¹

INTRODUCTION

The Hon. James F. Holderman, chief judge of the Northern District of Illinois, sees a fair number of patent cases. As such, he is no stranger to advanced technologies, having presided over cases involving wireless portable communication devices,² anti-theft systems,³ and wavelength division multiplexed optical communication systems.⁴ Recently, he had this to say about patent disputes:

Patent litigation is different. It is more complicated, more time-consuming and more mentally taxing because typically the patent being litigated is a successful advancement of some science or technology. So, the judge has to understand that background just to get the factual basis of the problem and then deal with the legal aspects.⁵

These challenges form the subject of this Article.

As a general matter, lawyers and science don’t mix. This fact of legal life reflects a broader epistemological schism best captured in an influential 1959 lecture by C.P. Snow, entitled “The Two Cultures.” By invoking “culture,” Snow did not refer to ethnic, religious, or national groups. Rather, he sought to describe a deep intellectual divide between literary and scientific cultures. Reflecting on his background as an author and physicist, Snow warned of a dangerous “gulf of mutual incomprehension” between the liberal arts and sciences. Snow’s dichotomy is, of course, a gross generalization. But in its stark duality, the “Two Cultures” captures an anxiety readily apparent to many lawyers when confronting scientific complexity. While Snow did not directly address patent law, his metaphor is highly salient to the patent system, a realm where law and science intersect.

Drawing on the “Two Cultures,” this Article explores challenges inherent in a system where lay judges must engage, understand, and ultimately pass judgment on complex technologies. Much patent scholarship focuses on the important question of how to structure exclusive rights to maximize innovation. However, the institutional, cultural, and psychological dimensions of patent adjudication—which are critical to a well-functioning patent system—have received comparatively little attention. This

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6 CARNEGIE COMMISSION ON SCIENCE, TECHNOLOGY, AND GOVERNMENT, SCIENCE AND TECHNOLOGY IN JUDICIAL DECISION MAKING: CREATING OPPORTUNITIES AND MEETING CHALLENGES *20 (March 1993) (“At the moment, the parallel paths of scientists and lawyers usually obey the rules of Euclidean geometry—they do not intersect—even though both disciplines not infrequently ponder the same subjects. And when their paths do cross, the result is often misunderstanding, rather than constructive communication.”) [hereinafter CARNEGIE COMMISSION].
8 Id. at 4.
9 Snow acknowledged the reductionist character of his thesis. Id. at 9. But see Cynthia M. Pyle, The Two Cultures and Renaissance Humanism, 23 INTERDISC. SCI. REVIEWS 121, 129 (2008) (suggesting that conceptual dichotomies “may well be fundamental to human thought”). Of course, there is not one scientific culture, but many; the theoretical physicist may feel quite removed from the field biologist. Furthermore, scientific and technological cultures are distinct, as academic scientists may share little in common with garage inventors. Id. at 121. But see SNOW, supra note 7, at 67. Similarly, there is a vast array of “literary intellectuals,” and much social science straddles the literary and scientific realms. Pyle, supra, at 125, 27. For additional criticisms of the “Two Cultures” thesis, see John Hultberg, The Two Cultures Revisited, 18 SCI. COMM. 194, 207 (1997); Benjamin R. Cohen, Science and Humanities: Across Two Cultures and Into Science Studies, 25 ENDEAVOR 8, 11 (2001); Jose van Dijck, After “The Two Cultures,” Toward a “(Multicultural)” Practice of Science Communication, 25 SCI. COMM. 177 (2003). My aim is not to categorically defend Snow’s thesis, but to apply it as a helpful (but contested) lens for viewing the patent system.
10 Cf. SNOW, supra note 7, at 22 (“Intellectuals, in particular literary intellectuals, are natural Luddites.”).
11 See Sheila Jasanoff, Law’s Knowledge: Science for Justice in Legal Settings, 95 AM. J. PUB. HEALTH S49, S51 (2005) (characterizing law and science as “clashing cultures”). It bears emphasizing that Snow, a UK citizen, was largely critiquing the intellectual specialization of British education. See Hultberg, supra note 9, at 197, 199, 209; Cohen, supra note 9, at 8. The foils to his scientists were not lawyers per se, but a broader class of “literary intellectuals.” Nevertheless, the cultural split between literary and scientific intellectuals that Snow describes is one that patent law must try to reconcile.
Article seeks to bridge that gap. It proceeds on the premise that no matter how elegantly policymakers craft patent law, if generalist judges lack the capacity to administer it, the patent system cannot fulfill its objectives. In so doing, it sheds new light on the ways in which doctrine can mediate (and complicate) the intersection of legal and scientific cultures.

This Article proceeds in six parts. Part I argues that patented technologies impose significant cognitive burdens on lay actors—particularly district court judges—in the patent system. Many judges doubt their ability to comprehend the patented inventions before them. Patent commentators and empirical studies suggest that this anxiety is well-founded. Policymakers and scholars have proposed a number of mechanisms to address the cognitive demands of patent adjudication, but none is entirely satisfactory.

Part II exploits an underutilized resource for understanding the difficulties of patent adjudication: the psychology of technological engagement. Surveying the psychological literature, this Part first confirms that complex technologies impose significant cognitive burdens on lay individuals. It goes on to examine the prevailing “cognitive miser” model wherein individuals adopt heuristics and defer to expert opinion to reduce information costs associated with technological engagement.

Part III draws from these psychological findings to offer an information cost theory of Federal Circuit patent doctrine. It is well-established that Federal Circuit patent doctrine is highly formalistic. What is less appreciated is the work that formalism performs in mediating technological engagement by generalist judges. Examining several areas of patent doctrine, I argue that formalism is an inherently “inquiry truncating” methodology that reduces the degree to which lay judges must engage technological subject matter. Thus, for example, the Federal Circuit’s historically formalistic approach to nonobviousness shielded judges from having to make certain technologically demanding inquiries about patented inventions. In this sense, formalism reflects a “cognitive miser” model in which lay actors can economize on the costs of engaging unfamiliar technologies.

Part IV then reveals an underappreciated, countervailing trend at the Supreme Court. Starting about a decade and a half ago, the Supreme Court has more aggressively asserted its appellate jurisdiction over the Federal Circuit, reversing several significant lines of precedent. Scholars have rightly highlighted the important substantive impact of these decisions, which tend to constrain patent rights. However, I argue that recent Supreme Court decisions also exhibit a significant and underappreciated methodological shift. In short, the Court is systematically favoring “holistic” standards over formalistic rules in a variety of areas of patent doctrine. These information-demanding standards

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13 I focus on judges because of their centrality to patent adjudication. While much of this Article’s psychological analysis applies as well to jurors, their unique role in patent litigation warrants separate attention.
14 The Court of Appeals for the Federal Circuit is a quasi-specialized court that hears appeals in patent matters. See infra notes 115-121.
tend to enhance the degree to which district courts judges must grapple with technology and technological context.

Part V examines the implications of the Supreme Court’s holistic turn. It first observes that Supreme Court opinions impose high information cost externalities on district court judges. It then explores how the Court may internalize those externalities. Drawing from foundational concepts in patent law itself, this Article proposes applying “enablement” principles to Supreme Court patent opinions. By considering and “internalizing” the difficulties of technological engagement, the Supreme Court can produce doctrine that is clearer, more bounded, and easier to apply. The result will be patent doctrine that combines the economizing virtues of rules with the flexibility and contextual sensitivity of standards.

Part VI concludes by examining the cultural differences of the Federal Circuit and the Supreme Court. Returning to the theme of the Two Cultures, it argues that Federal Circuit formalism arises in significant part from that court’s specialized authority over patent law and its day-to-day proximity to patent litigation. It further argues that Supreme Court holism stems from that court’s generalist outlook and its relative insulation from the complexities of technology and patent litigation.

This Article makes several contributions. It provides novel descriptive theories for longstanding Federal Circuit jurisprudence as well as the Supreme Court’s recent forays into patent law. Applying information cost analysis, it offers prescriptions for drafting Supreme Court opinions that will improve the administration of patent law. In a broader sense, this Article argues for pluralizing the resources brought to bear on patent scholarship. While patent scholarship has profited handsomely from law and economics and empirical studies,15 this Article shows that the broad field of “science and technology studies” (STS)—encompassing the history, philosophy, sociology, and psychology of science and technology—can illuminate many features of the innovation architecture.16 While the “objective” natures of science and patent doctrine seem to resist cultural analysis, this Article insists that cultural concerns pervade the realms of science, technology, and patent adjudication.

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While this Article focuses on patent law, its analyses extend to the ever-growing intersection of law and science. As Justice Breyer has noted, “society is becoming more dependent for its well-being on scientifically complex technology, so, to an increasing degree, this technology underlies legal issues of importance to all of us.” The role of legal doctrine—and particularly, formalism—in managing cognitive burdens has ramifications for a host of legal fields, including biomedical ethics, toxic torts, environmental law, and scientific evidence. This study in patent law thus provides a compartmentalized forum for exploring issues of relevance to the wider legal and technological communities.

I. TECHNOLOGY AND COGNITIVE BURDENS IN THE PATENT SYSTEM

A. Generalist Judges and Technological Anxiety

The intersection of law and science is fraught with anxiety. Judge William Schwarzer, speaking generally about scientific evidence, states:

The context in which [science and technology issues] arise varies widely, but generally they share one characteristic. They challenge the ability of judges and juries to comprehend the issues—and the evidence—and to deal with them in informed and effective ways. As a result, they tend to complicate the litigation, increase expense and delay, and jeopardize the quality of judicial and jury decision making.

Similarly, the Carnegie Commission on Science, Technology, and Government noted “widespread allegations that the judicial system is increasingly unable to manage and adjudicate science and technology (S&T) issues.” In a famous case involving the unauthorized commercialization of a patient’s spleen cells, Justice Mosk of the California Supreme Court questioned the court’s ability to understand the medical facts at hand. Judge Thomas Penfield Jackson felt ill-equipped to understand the technical details of the

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21 Carnegie Commission, supra note 6, at *9.
22 According to Justice Mosk,
As far as I know, no member of this court is trained as a molecular biologist, or even as a physician; without expert testimony in the record, therefore, the majority are not competent to explain these arcane points of medical science any more than a doctor would be competent to explain esoteric questions of the law of negotiable instruments or federal income taxation, or the rule against perpetuities.

Moore v. Regents of the University of California, 793 P.2d 479, 522 (Cal. 1990) (Mosk, J., dissenting).
Microsoft antitrust case over which he presided. More recently, Justice Scalia scoffed at subtleties of atmospheric science in an important case involving global warming.

These examples, culled from scientific evidence, medical research, antitrust, and environmental law, reveal challenges inherent to the intersection of law and science. These challenges are particularly acute in patent litigation, where generalist judges handle cases involving highly complex technologies. As Justice Breyer observes, “Patent law cases can turn almost entirely on an understanding of the underlying technical or scientific subject matter.” This Part focuses on the unique challenges facing generalist judges who adjudicate patent cases.

Anxiety over lay adjudication of patent disputes goes to the very origins of the U.S. patent system. Thomas Jefferson, a leading architect of that system, once observed that for judges, the task of determining the validity of a patent “is but little analogous to their course of reading, since we might in vain turn over all the lumberly volumes of the law to find a single ray which would lighten the path of the mechanic or the mathematician.”

Since that time, judges have frequently doubted their own ability to adjudicate patent cases. In a case involving extracted and purified adrenaline, the venerable Judge Learned Hand once famously remarked, “I cannot stop without calling attention to the extraordinary condition of the law which makes it possible for a man without any knowledge of even the rudiments of chemistry to pass upon such questions as these.”

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23 Michael Brick, *Technology; When the Judge Can’t Really Judge*, N.Y. TIMES, Sept. 11, 2000, at .
24 Oral argument for Massachusetts v. Environmental Protection Agency, 549 U.S. 497 (2006), included the following exchange:

MR. MILKEY: Respectfully, Your Honor, it is not the stratosphere. It’s the troposphere.
JUSTICE SCALIA: Troposphere, whatever. I told you before I’m not a scientist.
(Laughter.)
JUSTICE SCALIA: That’s why I don’t want to have to deal with global warming, to tell you the truth.
Transcript at 22-23.
25 Several states have considered introducing specialized courts to focus on technologically complex cases. *See*, e.g., Maryland Business and Technology Court Task Force Report, available at http://www.courts.state.md.us/finalb&treport.pdf.
26 The Patent and Trademark Office (PTO), a specialized administrative agency, processes patent applications. However, once the PTO has granted a patent, parties generally rely on district courts to enforce their rights, either by suing another party for infringement or seeking a judicial declaration of patent invalidity or noninfringement.
29 Letter from Thomas Jefferson to Mr. Isaac M’Pherson (August 13, 1813), in *6 WORKS OF THOMAS JEFFERSON* 181 (Wash. ed.).
Trial courts must often rely on experts to learn complex new technologies. 31 According to Judge Patti Saris of the District of Massachusetts, “I have heard trial judges claim that they dislike patent litigation, partly because it is hard.” 32 Even Supreme Court justices have recognized the unique challenges of patent adjudication. 33

In many respects, the complexities of patent doctrine itself, which is rather arcane, exacerbate judicial engagement with technology. 34 For example, the patent concept of nonobviousness is particularly hard to grasp. This requirement holds that an invention must not have been obvious to a “person having ordinary skill in the art” (“PHOSITA”) at the time of invention in order to qualify for a patent. 35 The statutory standard is explicitly framed relative to a technical artisan, not to a reasonable person or even a trained judge. 36 Referring to “originality,” a historical precursor to nonobviousness, Justice Frankfurter remarked that “so long as the Congress . . . makes the determination of originality a judicial function, judges must overcome their scientific incompetence as best they can.” 37 The canonical case interpreting the modern nonobviousness requirement, Graham v. John Deere, also notes the difficulties of adjudicating nonobviousness. 38 While the subject matter of patent cases is often technologically complex, patent doctrine itself renders this a particularly difficult area of law to apply. 39

32 O’Malley et al., supra note 1, at 682 (statement of Judge Saris).
33 See, e.g., Marconi Wireless Telegraph Co. of America v. United States, 320 U.S. 1, 60, 61 (1943) (Frankfurter, J., dissenting in part) (“It is an old observation that the training of Anglo-American judges ill fits them to discharge the duties cast upon them by patent legislation.”); Blonder-Tongue Labs., Inc. v. Univ. of Ill. Found., 402 U.S. 313, 331 (1971) (“[P]atent litigation can present issues so complex that legal minds, without appropriate grounding in science and technology, may have difficulty in reaching decisions.”).
39 Professor Arti Rai’s observations on patent examination by the PTO are equally applicable to courts: “Proper evaluation requires understanding not only the science in the area in which the patent is sought but also the manner in which the patent statute applies to the science.” Arti K. Rai, Growing Pains in the Administrative State: The Patent Office’s Troubled Quest for Managerial Control, 157 U. PA. L. REV. 2051, 2052 (2009) [hereinafter Rai, Growing Pains].
Commentators have also questioned the ability of generalist judges to understand patented technologies.40 One study conducted by then-Professor Kimberly Moore (now a Federal Circuit judge) focused on claim construction, the process by which judges interpret the claims that define the scope of a patented invention.41 It found that district courts improperly construed claim terms in 33% of cases appealed to the Federal Circuit.42 These errors required reversing or vacating district court judgments in 81% of those cases.43 In a follow-up study, Professor Moore found that the reversal rate for appealed claim terms from 1996-2003 was 34.5%.44 Of course, improper claim construction may arise from a number of factors besides poor comprehension of technology. Federal Circuit reversals may reflect vagaries in the law of claim construction or poor drafting by patent attorneys. Nevertheless, the high reversal rate “creates doubt over the abilities of district court judges to adjudicate complex technical patent cases.”45 Professor David Schwartz has extensively studied district court claim construction and found no evidence that increased experience by judges significantly improves outcomes.46

A brief foray into copyright law further illustrates the difficulties posed by technological subject matter. Like patent law, copyright law requires judges to draw difficult lines between protectable and nonprotectable subject matter. The most notorious of these distinctions is the idea-expression dichotomy,47 by which copyright protection only extends to the particularized “expression” of a work (and minor variations of it) and not to general “ideas.”48 The principal expositor of the idea-expression dichotomy, Judge

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41 Moore, District Court Judges, supra note 36; see 35 U.S.C. § 112 ¶ 2.
42 Moore, District Court Judges, supra note 36, at 2. As she acknowledges, Moore’s assumption that Federal Circuit determinations of claim construction are “correct” is not always true. Id. at 17-18. While the Federal Circuit exhibits some inconsistencies in its own claim constructions, Moore reasonably concludes that high reversal rates suggest that district courts are incorrectly interpreting a significant proportion of patent claims.
43 Id. at 2.
44 Kimberly A. Moore, Markman Eight Years Later: Is Claim Construction More Predictable?, 9 LEWIS & CLARK L. REV. 231, 233 (2005) [hereinafter Moore, Markman]. The reversal rate for means-plus-function claims, which tend to be more technical, is even higher at 39.3%. Id. at 242-43.
48 Kurtz, Speaking to the Ghost, supra note 47. Thus, for example, Shakespeare could have copyrighted the text of Romeo and Juliet but not the general idea of a romance between star-crossed lovers.
Learned Hand, fully acknowledged that the test is inherently arbitrary. Nevertheless, he felt comfortable drawing such distinctions, evidently regarding himself as “a person having ordinary skill in the art to which the subject matter pertains.” As Professor John Shepard Wily argues, “These confident judgments bespeak both familiarity with literary tradition and the judge’s faith in his own powers of literary analysis.” While difficult line drawing is intrinsic to adjudication, judges are more comfortable doing so when the relevant subject matter—literary texts—hews closer to the familiar realm of legal analysis.

However, even within copyright, technical complexity poses special challenges for lay judges. While copyright traditionally covers books, paintings, and other familiar media, extending copyright protection to software introduced palpable discomfort for courts. Software has strained existing copyright doctrines, such as the substantial similarity test for determining infringement. Arnstein v. Porter, a case involving sound recordings by Cole Porter, articulates the general rule that fact finders should determine the “substantial similarity” of protected and allegedly infringing works from the perspective of the ordinary layperson, without the benefit of expert testimony. However, in Computer Associates v. Altai, the Second Circuit allowed expert testimony to inform the substantial similarity determination for copyrighted software. In doing so, it noted “the reality that computer programs are likely to be somewhat impenetrable to lay observers—whether they be judges or juries—and, thus, seem to fall outside the category of woes contemplated by those who engineered the Arnstein test.”

Of course, any suggestion that lay judges routinely misunderstand complex technologies must be taken with a grain of salt. Many district court judges are quite comfortable with scientific subject matter. Returning to patent law, forum shopping and

49 45 F.2d at 122; see Nash v. CBS, 899 F.2d 1537, 1540 (7th Cir. 1990) (noting that Judge Hand’s test is “not a ‘test’ at all. It is a clever way to pose the difficulties that . . . does little to help resolve a given case”).
50 Wiley, supra note 40, at 161.
51 Id. at 162.
52 Of course, this is a claim about copyright jurists’ comfort with line-drawing, not necessarily their accuracy. In the absence of objective standards, it is difficult to assess the accuracy of judges’ application of the idea-expression dichotomy and related doctrines.
53 See NATIONAL COMMISSION ON NEW TECHNOLOGICAL USES OF COPYRIGHTED WORKS, FINAL REPORT (1978).
54 Traditionally, infringement analysis consists of two prongs: 1) determining whether the defendant copied from the plaintiff, and 2) if so, whether the copied material was “substantially similar” to the plaintiff’s protected expression.
55 154 F.2d 464, 468 (2d Cir. 1946).
56 982 F.2d 693 (2d Cir. 1992).
57 982 F.2d at 713.
regional differences have produced a highly uneven distribution of patent litigation around the country. Therefore, some districts have developed significant expertise in patent cases, and judges there may be well-versed in cutting-edge technologies. However, the “average” district judge receives only a few patent cases per year and handles one patent trial every seven years. As noted, many district court judges express discomfort with complex technologies, and district courts misinterpret claims in a third of cases appealed to the Federal Circuit. Additionally, experimental studies have confirmed the existence of a hindsight bias that skews determinations of nonobviousness. Finally, empirical studies indicate that, if anything, patents and the patent system are growing in complexity. All of this portends a future where district court judges will continue to struggle to understand patented inventions.

While this Article focuses on the technological anxieties of district court judges, a brief consideration of juries corroborates this phenomenon. Even outside of patent law, critics have questioned jurors’ ability to understand scientific evidence. These concerns are amplified in patent cases, which are suffused with complicated scientific facts. Judges, commentators, and practitioners have all questioned the ability of juries to resolve technological disputes. These concerns underlie proposals to eliminate juries from patent cases and establish specialized trial courts for such disputes.


61 See Moore, District Court Judges, supra note 36, at 2.

62 Mandel, Patently Non-Obvious, supra note 40.


64 The share of litigation involving juries has been on the rise. See Allan N. Littman, The Jury’s Role in Determining Key Issues in Patent Cases: Markman, Hilton Davis and Beyond, 37 IDEA 207 (1997); Rai, Engaging Facts and Policy, supra note 28, at 1092; HERBERT F. SCHWARTZ, PATENT LAW & PRACTICE 130 (2d ed. 1995).

65 CARNEGIE COMMISSION, supra note 6, at *9. Courts have even considered a “complexity exception” to the Seventh Amendment guarantee of a trial by jury in scientifically complicated cases. In re Japanese Electronic Product Antitrust Litigation, 631 F.2d 1069, 1079-80 (3d Cir. 1980); Brewer, supra note 36, at 1673-76.


67 See Judicial Panel Discussions on Science and the Law, 25 CONN. L. REV. 1127, 1144 (1993) ("Honest to God, I don’t see how you could try a patent matter to a jury. Goodness, I’ve gotten involved in a few of these things. It’s like somebody hit you between the eyes with a four-by-four. It’s factually so complicated.") (statement of Judge Alfred V. Covello).

68 Wiley, supra note 40, at 144 (“Laypersons are easily awed by technological matters unimpressive to those trained in a particular field.”)


71 Rai, Specialized Trial Courts, supra note 66, at 897. Again, the role of juries in copyright cases offers an illuminating contrast. Substantial similarity, the basic standard of copyright infringement, is traditionally assessed from the perspective of the ordinary observer. However, the Third Circuit noted, “The ordinary
district judges possess specialized legal training, they are generally similar to lay persons in terms of technological sophistication. Ultimately, lay actors in the patent system, including district court judges, experience difficulties in understanding the technologies at the heart of patent cases.  

B. Traditional Proposals to Ameliorate Cognitive Burdens

The difficulties of generalist judges adjudicating patent cases have spurred numerous proposals for reform. Unfortunately, all have clear limitations. One obvious approach is to enhance the technical capacity of judges through training and education. Indeed, the Federal Judicial Center provides training to district court judges in scientific matters. However, providing effective education for time-strapped judges can be quite difficult. Furthermore, given the specialized nature of scientific knowledge, training in particular disciplines would be necessary on a case-by-case basis.

More ambitiously, commentators have recommended appointing district court judges with scientific expertise. Addressing legal areas beyond patent law, Professor Scott Brewer has proposed a “two hat” system in which judges trained in both law and scientific methodology would evaluate the admissibility of scientific expert testimony. However, while scientific methodology is largely transcendent, most of the difficulties of patent law arise from field-specific knowledge; a judge trained in biotechnology might know very little about computer science. In addition, Congress has in fact considered creating “patent expert” judges in various districts. However, the prospects of implementing and expanding such a program are uncertain. At the far end of the spectrum, commentators have advocated creating “science” courts comprised of scientifically-trained judges and juries. Such aggressive institution-building would, of course, constitute a significant reform and would give rise to serious concerns over undue judicial specialization.

Other proposals focus not on enhancing the technical capacity of district court judges per se, but on making expert resources readily available to them. For example,
district courts sometimes employ special masters with scientific expertise. However, this “extraordinary” intervention is quite rare. Furthermore, the range of functions performed by special masters is quite narrow, usually confined to managing discovery and claim construction. As such, special masters do not represent a promising broad-based solution to address cognitive burdens in the patent system. Furthermore, while Federal Circuit judges routinely employ scientifically-trained clerks, it is highly unlikely that district court judges would prioritize this attribute in hiring decisions.

Rather than focusing on information processors—the judges who handle patent cases—other proposals focus on simplifying information inputs themselves. Theoretically, courts and/or Congress could attempt to simplify the technical content of patents. For example, a “plain language” requirement for patent applications could reduce the use of confusing jargon. However, given the highly technical nature of cutting-edge inventions, esoteric terms of art are simply indispensable. In addition, such a “plain language” requirement conflicts with longstanding patent doctrine. In large part, the target audience of patents is not the lay reader (or generalist judge) but the PHOSITA. As such, use of technical terms is altogether appropriate. Furthermore, even if the language of patents were simplified, their surrounding technological context would still remain quite challenging. Given the inherent complexity of technology, the limitations of language, and the doctrinal standard for evaluating patents, simplifying informational inputs is not a promising solution.

This survey reveals that prevailing proposals are limited in their scope and effectiveness. However, this Article reveals deeper, systemic mechanisms by which the patent system facilitates the intersection of legal and technological cultures. To explore these mechanisms, it is useful to first consider the psychology of technological engagement.

II. THE PSYCHOLOGY OF TECHNOLOGICAL ENGAGEMENT: INFORMATION COSTS AND THE COGNITIVE MISER

The previous Part argued that science and technology impose special difficulties on generalist judges handling patent cases. This Part sheds new light on this phenomenon by examining the psychology of technological engagement. Studies confirm that technological complexity imposes significant cognitive burdens on
laypersons;\textsuperscript{87} these burdens impair both learning and performance.\textsuperscript{88} Psychological research further reveals that laypeople generally operate as “cognitive misers” who seek to minimize these burdens.\textsuperscript{89} Two mechanisms by which laypeople economize on information costs are heuristics and deference to expert authority. Because little research directly addresses the psychology of patent adjudication, the relevance of the following studies to patent law is necessarily inferential. Nevertheless, they reveal the strong tendency for lay persons to mitigate the “costliness” of technological engagement.

Traditional decision theory, as well as much law and economics scholarship, rests on the premise of objective human rationality.\textsuperscript{90} However, recent studies in behavioral law and economics challenge this theoretical construct.\textsuperscript{91} Among the most significant departures from rationality is the widespread use of heuristics to streamline (and sometimes distort) decision making.\textsuperscript{92} Heuristics are cognitive shortcuts that economize the selection and processing of information.\textsuperscript{93} They particularly ease decision making in situations of uncertainty.\textsuperscript{94} Heuristics such as the representativeness, availability, and anchor-and-adjust biases are well-documented in the psychological literature.\textsuperscript{95} Notably, the use of heuristics has been shown in judges.\textsuperscript{96}

Heuristics are particularly salient to evaluating new technologies.\textsuperscript{97} Studies focusing on nanotechnology, stem cell research, and biotechnology reveal that lay people typically function as “‘cognitive misers’ or ‘satificers’ who only collect as much or as

\begin{itemize}
  \item \textsuperscript{87} While definitions are contested, studies indicate a high level of “technophobia” throughout the general population. M.J. Brosnan & S.J. Thorpe, \textit{An Evaluation of Two Clinically-Derived Treatments for Technophobia}, 22 COMPUTERS IN HUM. BEHAV. 1080, 1081(2006) (defining technophobia as computer anxiety and noting that a third of all individuals in various studies experience such anxiety).
  \item \textsuperscript{88} Stephanie Gore, \textit{“A Rose by Any Other Name”: Judicial Use of Metaphors for New Technologies}, 2003 J.L. TECH. & POL’Y 403, 414-15.
  \item \textsuperscript{89} Kovera & McAuliff, \textit{supra} note 19, at 575 (“[O]nly when people have both the motivation and the ability to process information will they engage in systematic processing.”); cf: Hui Liu & Susanna Priest, \textit{Understanding Public Support for Stem Cell Research: Media Communication, Interpersonal Communication and Trust in Key Actors}, 18 PUB. UNDERSTAND. SCI. 704, 704 (2009).
  \item \textsuperscript{90} See Amos Tversky & Daniel Kahneman, \textit{Judgment under Uncertainty: Heuristics & Biases}, 185 SCIENCE 1124, 1130 (1974).
  \item \textsuperscript{93} See Chris Guthrie et al., \textit{Inside the Judicial Mind}, 86 CORNELL L. REV. 777, 780 (2001).
  \item \textsuperscript{94} See Kovera & McAuliff, \textit{supra} note 19, at 575; Benedetto De Martino et al., \textit{Frames, Biases, and Rational Decision-Making in the Human Brain}, 313 SCIENCE 684, 684 (2006). Even experienced researchers adopt heuristics. Tversky & Kahneman, \textit{supra} note 90, at 1130. At least some biases, including the framing effect, appear to have a neurological basis. De Martino et al., \textit{supra} at 686.
  \item \textsuperscript{95} See, e.g., Tversky & Kahneman, \textit{supra} note 90.
  \item \textsuperscript{96} See generally Guthrie et al., \textit{supra} note 93; see id. at 783 (“[J]udges make decisions under uncertain, time-pressured conditions that encourage reliance on cognitive shortcuts that sometimes cause illusions of judgment.”); Stempel, \textit{supra} note 27, at 795.
\end{itemize}
little information about a given issue as they think is necessary to make a decision." 98

Heuristics such as value orientations, media interpretations, general attitudes toward science, and estimations of trust play key roles in forming opinions of new technologies. 99

One illustration of the “cognitive miser” model that is particularly relevant to adjudication is the use of metaphors to understand new technologies. 100 For example, judicial opinions have analogized cyberspace to physical space, applying traditional doctrines such as trespass to chattels to virtual environments. 101 While analogies may simplify the task of understanding, they may also misrepresent the technology at hand. 102 Interestingly, this tendency to gloss over scientific complexity parallels in many ways the tendency of mainstream accounts to simply science itself. 103

Another manifestation of the cognitive miser model is deference to expert authority. Rather than wrestle with understanding a complex technology, many people simply seek out expert opinions. Epistemologists suggest that deference to expertise is a rational means for the non-expert to obtain technical “knowledge;” 104 psychological research on public understanding of science confirms this phenomenon. One study found that American public opinion concerning biotechnology was “to some extent, ‘pre-shaped’ by a strong deference to scientific authority, a basic value predisposition cultivated by the nature of the American educational system.” 105 Similarly, when evaluating the risks of this technology, individuals placed more importance on choosing expert institutions to trust rather than generating their own probabilistic accounts of harm. 106 Interestingly, deference to scientific authority is greater in older, highly

99 Broussard & Nisbet, supra note 97, at 27; M.C. Nisbet et al, Framing Science – The Stem Cell Controversy in an Age of Press/Politics, 8 HARV. INT’L J. PRESS-POLITICS 36 (2003); cf. van Dijck, supra note 9 (noting the media’s significant role in science communication); Scheufele & Lewenstein, supra note , at 664-65.
100 Gore, supra note 88.
102 Gore, supra note 88, at 448; Mark A. Lemley, Place and Cyberspace, 91 CAL. L. REV. 521, 528-29 (2003).
103 Science textbooks often present a linear view of scientific progress that obscures historical and epistemological discontinuities. THOMAS KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (3d ed. 1996). Furthermore, contrary to the popular notion of a coherent scientific method, science often proceeds anarchically. PAUL FEYERABEND, AGAINST METHOD 9 (1993). Similarly, scientific discovery and authorship, though often taken for granted, are highly contested social constructs. See Mario Biagioli, The Instability of Authorship: Credit and Responsibility in Contemporary Biomedicine, 12 J. FED. AM. SOCS. EXPERIMENTAL BIO. 3, 11 (1998); Gerd Gigerenzer, From Tools to Theories: A Heuristic of Discovery in Cognitive Psychology, 98 PSYCH. REV. 254 (1991); FELDMAN, supra note 85, at 95, Sheila Jasanoff, What Judges Should Know about the Sociology of Science, 32 JURIMETRICS J. 345, 346 (1992) (“Investigations into the social structure and operation of science have revealed a picture of scientific knowledge that is distant indeed from the logically coherent, internalist accounts of the philosopher.”).
105 Broussard & Nisbet, supra note 97, at 28-29.
106 Id. at 33.
educated males—a demographics that characterize a substantial number of federal district court judges.

Although one must draw inferences with caution, psychological research on obedience demonstrates a strong general tendency to defer to scientific authority. In the 1960s, Stanley Milgram conducted controversial experiments in which volunteers were directed to “shock” a dummy test subject who responded incorrectly to exam questions. These everyday individuals, upon the quiet urging of a lab coat-wearing supervisor, routinely administered shocks that elicited cries of pain from the subject. Follow-up studies showed that deference to supervisors stemmed both from their position of control as well as their perceived technical expertise. Although subject to multiple interpretations, Milgram viewed these behaviors as illustrating strong “obedient tendencies” toward scientific authority.

Turning to law, deference to scientific expertise is particularly relevant to lay assessments of scientific evidence. As Professor Brewer notes, “Lacking the information necessary to make cogent independent judgments about which of the competing scientific experts to believe, nonexpert legal decision makers choose among the experts by relying on such indicia of expertise as credentials, reputation, and demeanor.” Again, rather than grapple with the difficulties of understanding scientific evidence, lay persons tend to seek out and trust expert authority.

In sum, when confronted with complex technologies, many non-experts commonly adopt simplifying heuristics and defer to expert authority. Judges are not immune to these tendencies, and legal education may even reinforce them. My aim is not to normatively assess these mechanisms so much as it is to describe them; the “cognitive miser” model is adaptive in some senses and potentially distorting others. These studies, however, raise the provocative question of whether this “cognitive miser” model is reflected in the patent system. I explore this question in the next Part, with particular reference to formalism.

III. AN INFORMATION COST THEORY OF FEDERAL CIRCUIT PATENT DOCTRINE: FORMALISM AND TECHNOLOGICAL ENGAGEMENT

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107 Id. at 38-39.
109 Thomas Blass, The Milgram Paradigm After 35 Years: Some Things We Now Know About Obedience to Authority, 29 J. APPLIED SOC. PSYCH. 955, 963 (1999).
110 Milgram, Behavioral Study of Obedience, supra note 108, at 376, 378. See also Stanley Milgram, Some Conditions on Obedience and Disobedience to Authority, 18 HUM. RELATIONS 57 (1965).
111 Brewer, supra note 36, at 1538.
112 For general observations on the tendency of legal actors to defer to scientific expertise, see FELDMAN, supra note 85, at 37-48.
113 Legal education, unlike training in psychology and medicine, cultivates a deterministic approach to problem-solving in which statistical and probabilistic reasoning plays a relatively small role. Darrin R. Lehman et al., The Effects of Graduate Training on Reasoning, 43 AM. PSYCHOLOGIST 431, 438, 441 (1988); Kovera & McAuliff, supra note 19, at 584.
This Part draws from prevailing psychological principles to present an information cost theory of patent doctrine. It focuses on the well-recognized formalistic nature of Federal Circuit patent jurisprudence. It argues that such formalism operates as a heuristic that lowers the cognitive burdens associated with lay adjudication of technology. While familiar concerns such as uniformity and consistency often justify formalism, this Part argues that formalism is particularly salient to mediating the intersection of legal and technological cultures.\(^{114}\)

As a prelude, it is useful to first explore a central institution in the development of formalistic patent doctrine: the Court of Appeals for the Federal Circuit.\(^{115}\) In the late 1970s and early 1980s, Congress became increasingly concerned over differences among the regional circuit courts in the substance and application of patent law.\(^{116}\) To enhance national uniformity, as well as to address other structural deficiencies,\(^{117}\) Congress enacted the Federal Courts Improvement Act of 1982.\(^{118}\) The Act created the Court of Appeals for the Federal Circuit, which merged the Court of Claims and the Court of Customs and Patent Appeals. The Act defines the Federal Circuit’s jurisdiction substantively rather than geographically; it hears appeals in patent, trademark,\(^{119}\) tariff and customs law, technology transfer regulations, and government contract and labor disputes.\(^{120}\) Notwithstanding this broad jurisdiction, patent cases comprise about 35% of the Federal Circuit’s docket.\(^{121}\)

\(^{114}\) As Professor Arti Rai observes, “though few scholars have alluded to the Federal Circuit’s tendencies towards de novo fact finding and bright-line rules, they have not discussed whether this behavior may be justified by the court’s dependence on inferior decisionmakers of questionable competence in the realms of fact finding and factually oriented policy application.” Rai, Engaging Facts and Policy, supra note 28, at 1039. This Article seeks to fill this void.


\(^{119}\) In the trademark realm, the Federal Circuit only hears administrative appeals, not appeals arising from litigation.

\(^{120}\) Dreyfuss, The Federal Circuit, supra note 115, at 4. Congressional reports explicitly emphasized that, due to its broad jurisdiction, the Federal Circuit is not a “specialized” court. H.R. REP. NO. 312, at 19.

The formalistic nature of Federal Circuit patent doctrine is widely-recognized.\textsuperscript{122} As Professor Jay Thomas has pointed out, Federal Circuit case law is characterized by “adjudicative rule formalism,” which relies on bright-line rules instead of flexible standards.\textsuperscript{123} Federal Circuit jurisprudence has actually become more formalistic over time; where it once employed tests considering “all the facts and circumstances,” the court now considers only discrete sets of factors.\textsuperscript{124} Furthermore, rules have become “leaner” in that they involve fewer components.\textsuperscript{125} While the Federal Circuit’s formalistic jurisprudence promotes predictability and certainty in patent adjudication,\textsuperscript{126} it has also attracted criticism as undermining innovation policy.\textsuperscript{127} Interestingly, the Federal Circuit tends to be formalistic not only in its substantive doctrine, but also in its reasoning. Federal Circuit opinions are relatively “acontextual” and rarely cite to empirical and economic scholarship.\textsuperscript{128}

Before proceeding, it is useful to clarify what I mean by formalism, a concept subject to many connotations.\textsuperscript{129} For the purposes of this Article, I define formalism as “decisionmaking according to rule.”\textsuperscript{130} Formalist jurisprudence involves identifying and articulating bright-line rules as opposed to broader, more flexible standards. Notably, the primacy of rules “screen[s] off from a decisionmaker factors that a sensitive decisionmaker would otherwise take into account.”\textsuperscript{131} Formalist adjudication is thus truncated. It relies on a limited set of hard-edged rules (preferably fewer rather than more) and excludes “extraneous” considerations in reaching decisions. As should be clear, the distinction between formalism and holism also intersects with the traditional


\textsuperscript{123} Thomas, supra note 122, at 776.

\textsuperscript{124} Id. at 773.

\textsuperscript{125} Id. at 773-74.

\textsuperscript{126} Holbrook, \textit{Supreme Court’s Complicity}, supra note 122, at 1. Professor Holbrook further explores how Supreme Court patent jurisprudence both supports and diverges from this formalistic trend. \textit{Id.}; Holbrook, \textit{Substantive versus Process-Based Formalism}, supra note 122.

\textsuperscript{127} Rai, \textit{Engaging Facts and Policy}, supra note 28, at 1040 (“[T]he Federal Circuit has substituted formalist decisionmaking for the fact-specific, policy-oriented analysis that is required by the open-ended language of the patent statute.”).

\textsuperscript{128} Dreyfuss, \textit{Continuing Experiment}, supra note 115, at 780-81; Nard, \textit{Scholarship}, supra note 15.

Interestingly, the Federal Circuit also tends to be formalistic in its understanding and application of science. See Feldman, supra note 85, at 30 (providing examples from molecular biology).


\textsuperscript{130} Schauer, supra note 129, at 510.

\textsuperscript{131} Id. at 510.
legal dichotomy between rules and standards.\textsuperscript{132} Formalism according to rule generally eschews discretionary, flexible standards.

This Part sheds light on the underappreciated role of formalism in mediating technologically complex legal disputes. It thus adds a novel dimension to the traditional debate on the merits and demerits of formalism, a topic of significant academic interest.\textsuperscript{133} From one perspective, the Federal Circuit’s adoption of formalistic jurisprudence could be understood as part and parcel of that court’s aim to unify patent law and make it more predictable. However, I argue that formalism is performing more work than initially meets the eye. In particular, I contend that formalism helps reduce information costs associated with lay engagement with technology.\textsuperscript{134} Formalism truncates and circumscribes legal inquiries, thus decreasing the extent to which lay judges must engage technologically challenging subject matter. I illustrate this principle by examining four central concepts in patent law: claim construction, prosecution history estoppel, nonobviousness, and remedies.

A. Claim construction

Claim construction offers a prime example of Federal Circuit formalism. All patents conclude with one or more claims, which are highly stylized sentences “particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.”\textsuperscript{135} It is often said that claims define the “metes and bounds” of an invention. Accordingly, claim construction—interpreting the meaning and scope of claims—often determines the outcome of patent litigation.\textsuperscript{136} Over the past several decades, two competing approaches to claim construction have emerged within the Federal Circuit: “hypertextualism” and “pragmatic textualism.”\textsuperscript{137} Hypertextualism is “highly formalistic.”\textsuperscript{138} It focuses on the language of the claims rather than on extrinsic evidence, such as dictionary definitions, industry custom, and general scientific


\textsuperscript{133} See supra note 129; Kennedy, supra note 129, at 1688 (characterizing the “two great social virtues of formally realizable rules” as restraint of official arbitrariness and certainty); Thomas, supra note 122, at 774-75; Kelly Casey Mullally, Patent Hermeneutics: Form and Substance in Claim Construction, 59 FLA. L. REV. 333, 368 (2007). Again, discussions of formalism often intersect with the debate over rules versus standards. See Louis Kaplow, Rules Versus Standard: An Economic Analysis, 42 DUKE L.J. 557, 577 (1992); id. at 622; Schlag, supra note 132, at 383-90 (exploring the “Rules v. Standards Dialectic”).


\textsuperscript{135} 35 U.S.C. § 112.


\textsuperscript{137} Nard, Claim Interpretation, supra note 80. Professors Polk Wagner and Lee Petherbridge identify a different methodological split, which they characterize as “procedural” versus “holistic.” Procedural claim construction is a fairly formalistic and follows an established hierarchy of interpretative aids. Holistic claim construction is more free-form and case-specific, and it does not necessarily follow a strict hierarchy of interpretive sources. Wagner & Petherbridge, supra note 45, at 1111, 1133-34.

\textsuperscript{138} Nard, Claim Interpretation, supra note 80, at 5.
principles, to determine their meaning. Pragmatic textualism places more weight on extrinsic evidence in construing claims. Through a series of cases since the mid 1990s, the Federal Circuit has gradually moved toward the hypertextualist rather than pragmatic textualist approach to claim construction.

Without wading into the debate over which approach is superior, I wish simply to highlight that hypertextualism decreases the degree to which district court judges must engage technological context. Whether characterized as a merit or demerit, hypertextualism partially insulates the district court judge (in the first instance, and later, appellate judges) from difficult, technologically-intensive inquiries. As Professor Kelly Mullally observes, “A formalist approach [to claim construction] strictly limits the universe of permissible interpretative sources. By contrast, a substantive approach allows a decision maker to consider a broader information set to determining meaning.” Hypertextualism “truncates” claim construction by de-prioritizing extrinsic, highly technical information sources such as scientific treatises, expert testimony, and industry norms.

From one perspective, of course, this makes the judge’s job more difficult: she may desire more context and information to guide her interpretation of patent claims. Furthermore, for pragmatic textualists, the PHOSITA operates as a valuable interpretive

139 Id. at 5 (“[Hypertextualism] stresses textual fidelity and internal textual coherence, but eschews extrinsic evidence as an interpretive tool, portraying its use as ‘rarely, if ever, proper’) (internal citations omitted).
140 Id. at 6.
141 In Markman v. Westview Instruments (Markman II), the Supreme Court affirmed the Federal Circuit’s decision that claim construction is a question of law to be resolved by judges rather than juries. 517 U.S. 370 (1996). Following Markman II, the Federal Circuit seemed to favor intrinsic sources of evidence in claim construction. See Vitronics Corp. v. Conceptronics, Inc., 90 F.3d 1576, 1583 (“[W]here the public record [i.e., claims, written description, and prosecution history] unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper.”); see Nard, Claim Interpretation, supra note 80, at 19. But see Paul R. Michel, Assuring Consistency and Uniformity of Precedent and Legal Doctrine in the Areas of Subject Matter Jurisdiction Entrusted Exclusively to the U.S. Court of Appeals for the Federal Circuit: A View from the Top, 58 Am. U. L. Rev 699, 766 (2009) (challenging some popular interpretations of Vitronics). Vitronics thus represented a victory for hypertextualism over pragmatic textualism. However, several subsequent Federal Circuit decisions placed intrinsic and extrinsic evidence on equal footing. See, e.g., Fromson v. Antec Printing Plates, Inc., 132 F. 3d 1437 (Fed. Cir. 1997); see Nard, Claim Interpretation, supra note 80, at 26. The Federal Circuit tried to resolve this debate in its en banc opinion in Cybor v. FAS Technologies, which held that claim construction is a question of law to be reviewed de novo on appeal; this holding suggested a diminished role for extrinsic evidence in claim construction. 138 F. 3d 1448 (Fed. Cir. 1998) (en banc). However, in Texas Digital Systems, Inc. v. Telegenix, Inc., the court espoused consulting dictionaries first before considering the specification and prosecution history. 308 F.3d 1193, 1201-04 (Fed. Cir. 2002); see Mullally, supra note 133, at 354. Finally, in Phillips v. AWH Corp., another en banc decision, the Federal Circuit held that judges were to first consult intrinsic evidence (e.g., the claims themselves, specification, and prosecution history) before turning to extrinsic evidence (e.g., dictionaries, treatises, expert testimony). 415 F.3d 1303, 1317 (Fed. Cir. 2005) (en banc). See also Wagner & Petherbridge, supra note 45, at 1112, 1148 (noting that the Federal Circuit is becoming more rules-based and that it favors proceduralism over holism).
142 See Nard, Claim Interpretation, supra note 80, at 40 (“Unlike pragmatic textualism with its emphasis on context and consequences, hypertextualism fosters a disconnect between claim interpretation and industry practices.”).
143 See Mullally, supra note 133, at 340.
tool because "the artisan has knowledge of the underlying assumptions present in his technological community and is sensitive to the facts on the ground."\textsuperscript{144}

However, from another perspective, the formalism embodied in hypertextualism is cognitively economical. Delineating the metes and bounds of an abstract invention is an inherently difficult task;\textsuperscript{145} this difficulty is compounded by the technological subject matter at hand. However, in a formalistic approach to claim construction, a judge need not master an entire body of unfamiliar technical material. Rather, she can focus primarily on information sources internal to the patent and its prosecution, notably the words of the patent itself. For example, a judge construing what "permanently affixed" means in a claim relating to in-line roller skates need not invest considerable energy to fully comprehend what an ordinary artisan of in-line skating would understand that term.\textsuperscript{146} Rather, she can rely primarily on her own interpretation of such claims based on the text before her. Formalism thus lowers the information costs associated with claim construction by limiting the universe of technical sources that judges must consult.\textsuperscript{147}

Federal Circuit formalism reduces technological engagement in other areas of patent doctrine beyond claim construction. The following Sections explore this phenomenon in prosecution history estoppel, nonobviousness, and remedies. As we will see, many of these doctrines have been recently modified or overturned by the Supreme Court, a development I explore at length in Part IV. These doctrines, however, reveal the generally formalistic character of Federal Circuit jurisprudence and the tendency of formalism to reduce judicial engagement with technology.

B. Prosecution history estoppel

Prosecution history estoppel further illustrates the Federal Circuit's formalistic jurisprudence. This rather technical doctrine requires a bit of explanation. A patentee's exclusive rights are normally defined by the literal language of patent claims. However, under the so-called doctrine of equivalents, the scope of a patentee's exclusive rights can extend beyond the literal claims to "equivalents" thereof.\textsuperscript{148} While the doctrine of

\textsuperscript{144} Nard, Claim Interpretation, supra note 80, at 6; Mullally, supra note 133, at 340.
\textsuperscript{146} See K-2 Corp. v. Saloman S.A., 191 F.3d 1356, 1370 (Fed. Cir. 1999) ("[T]his court does not even consider the meaning an ordinary in-line skate artisan would attach to 'permanently.'") (Rader, J., dissenting). The formalist nature of claim construction has also promoted a formalistic style of claim drafting. Patent claims tend to be long, detailed, and quite formalistic. Mullally, supra note 133, at 373. As Professor Mullally notes, "formalist drafting implicitly recognizes the tension inherent in a generalist judge interpreting words from a specialized, technical standpoint. It is an effort to ease the obstacles facing judges in trying to stand in the place of a person of ordinary skill in the art." \textit{Id.} at 374.
\textsuperscript{147} Notably, it represents but one of several judicial strategies for doing so. Many judges resist requests to construe multiple terms in multiple claims, require parties to select representative claims for interpretation, and impose significant limits on briefing claim construction. Mark A. Lemley, \textit{The Changing Meaning of Patent Claim Terms}, 104 MICH. L. REV. 101, 114 (2005).
\textsuperscript{148} The doctrine of equivalents thus "casts around a claim a penumbra which also must be avoided if there is to be no infringement." Autogiro Co. of America v. United States, 384 F.2d 391 (Ct. Cl. 1967).
equivalents effectively expands the scope of patent rights, it is subject to several limiting principles. One of these is prosecution history estoppel, which limits assertion of the doctrine of equivalents based on representations made by the patentee during patent prosecution (the administrative process of obtaining a patent). The most important kind of representation is a “narrowing amendment,” by which the patentee decreases the scope of her asserted right based on negotiations with the PTO. The underlying theory of prosecution history estoppel is that if a patentee disclaimed particular subject matter during prosecution, she should not be able to “reclaim” that subject matter via the doctrine of equivalents. She is, in other words, estopped from doing so.

The Federal Circuit, sitting en banc, addressed the relationship between the doctrine of equivalents and prosecution history estoppel in *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd.* (“Festo VI”). Among its several holdings, the court held that when prosecution history estoppel applied, it operated as a complete bar against any claim of equivalence for an amended element. This holding resolved an intracircuit split within the Federal Circuit. Some lines of doctrine had favored a “flexible” bar, which would allow the patentee to assert some equivalents of a modified claim element even when prosecution history estoppel applied. However, the *Festo VI* majority sided with a separate line of doctrine advocating a “complete” bar. Thus, the Federal Circuit held that when prosecution history estoppel applied to an amended claim element, the patentee categorically forfeited all equivalents to that element.

As commentators and even Federal Circuit judges have recognized, *Festo VI* is highly formalistic. It creates a simple bright line rule: when estoppel applies, the patentee forfeits all equivalents to an element in question. The complete bar thus eliminates the need for a “speculative inquiry” into the range of equivalents that survive a

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151 234 F.3d 558 (Fed. Cir. 2000) (en banc) (“Festo VI”). In that case, Festo had two patents on an improved magnetic rod cylinder and sued SMC for infringement. SMC’s magnetic rod cylinder did not fall within the literal claims of Festo’s patents, so Festo asserted infringement under the doctrine of equivalents. SMC countered by arguing prosecution history estoppel. During patent prosecution, Festo had narrowed its claims regarding the composition and design of the magnetic rod cylinder. Based on these amendments, SMC asserted that Festo was estopped from asserting any equivalent of the elements in question.

152 The decision actually included five en banc questions and answers. 234 F.3d at 566-78.

153 *Festo VI*, 234 F.3d at 574-75.

154 See, *e.g.*, *Hughes Aircraft Co. v. United States*, 717 F.2d 1351 (Fed. Cir. 1983).


156 *Thomas, supra* note 122, at 783-86; *Holbrook, Supreme Court’s Complicity, supra* note 122, at 5; *Festo VI*, 234 F.3d at 620 (characterizing the majority’s decision as creating a “new bright line rule”) (Linn, J., concurring-in-part, dissenting-in-part).
narrowing amendment. Tellingly, the Federal Circuit justified its complete bar on workability grounds. Commenting on a stylized example, it stated that “it is impossible . . . for the public or the patentee to determine the precise range of equivalents available under the flexible bar approach.”

While the formalistic nature of the complete bar is well-recognized, this Article highlights its underappreciated effect of decreasing technological engagement by judges. Quite simply, the complete bar limits the range of technological inquiries that judges must perform. While infringement under the doctrine of equivalents is a question of fact, the application of prosecution history estoppel is a question of law for courts to decide. Under a flexible bar, determining the precise range of allowable equivalents when prosecution history estoppel applies is notoriously difficult. Under such a flexible bar, estoppel would apply “only where the court concluded that a person skilled in the art would reasonably believe that the patentee had surrendered subject matter during prosecution.” Accurate application of the flexible bar thus requires a court to understand the state of knowledge of an expert artisan, industry practice, and technical differences between the original claims in an application and amended claims.

The complete bar avoids these technical inquiries. Under the complete bar, the mere fact that prosecution history estoppel applies to a particular element means that no equivalents are allowed. The complete bar thus lowers information costs associated with adjudicating prosecution history estoppel. To be sure, multiple mechanisms contribute to this result. The use of a rule instead of a standard in and of itself tends to simplify adjudication. However, the streamlining effects of rules have greater purchase in the context of technologically complex subject matter. In this sense, formalism helps accommodate the inherent limitations of lay assessments of technology.

C. Nonobviousness

The Federal Circuit’s traditional approach to nonobviousness has also been decidedly formalistic. As noted, a new technology may not be patented if it “would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” The nonobviousness requirement thus prevents patenting inventions that are only trivial variations of the prior art. While other statutory requirements, such as novelty and utility, are relatively easy to satisfy,

157 Festo VI, 234 F.3d at 577.
158 Festo VI, 234 F.3d at 575.
159 Festo VI, 234 F.3d at 577.
161 Thomas, supra note 122, at 784.
162 Cf. Nard, Claim Interpretation, supra note 80, at 72-73.
163 As noted, the Supreme Court has subsequently modified the Federal Circuit’s approach to nonobviousness. See infra Part IV.E.
nonobviousness represents “the ultimate condition of patentability.”\(^{167}\) As such, it is frequently the basis for denying patent applications and invalidating issued patents in litigation.\(^{168}\)

While the nonobviousness requirement is substantively important, it is also very difficult to apply.\(^{169}\) A half century ago, the Supreme Court established a broad standard for nonobviousness in *Graham v. John Deere Co.*\(^{170}\) Within the *Graham* framework, the ultimate question of patent validity—and nonobviousness—is a question of law for courts to decide.\(^{171}\) However, factual considerations inform this legal determination.\(^{172}\) These factual considerations include: the scope and content of the prior art, the differences between the prior art and the claims at issue, and the level of ordinary skill in the art.\(^{173}\) Furthermore, so-called “secondary considerations,” such as the commercial success of the patented invention, may be relevant to determining nonobviousness.\(^{174}\) This framework takes the form of a broad standard rather than a set of precise rules, and commentators have criticized that it does not provide much guidance at all.\(^{175}\) Further complicating nonobviousness inquiries, such determinations are made from the perspective of a PHOSITA, not a reasonable person or ordinary judge. Another difficulty of determining nonobviousness has to do with *timing*, and it is here that the Federal Circuit developed quite a formalistic approach.

One of the principal challenges of assessing nonobviousness is hindsight bias.\(^{176}\) Nonobviousness is evaluated at the time of *invention*, which can be long before a court determines the validity of a litigated patent.\(^{177}\) Such determinations are therefore subject to hindsight bias, the tendency for technological innovations to appear obvious in hindsight.\(^{178}\) For example, attaching wheels to carry-on luggage may seem obvious now, but for decades the baggage industry lacked such an advance. Hindsight bias is particularly relevant to “combination inventions” that combine existing elements—such as wheels and luggage—in a novel manner.

\(^{167}\) *See* NONOBVIOUSNESS—THE ULTIMATE CONDITION OF PATENTABILITY (John F. Witherspoon ed. 1980).

\(^{168}\) *See* John Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 25 AIPLA Q.J. 185, 206 (1998) (finding that by far the largest number of invalidity determinations were made on the basis of obviousness as compared to other grounds) [hereinafter Allison & Lemley, *Empirical Evidence*].

\(^{169}\) *See* Harries v Air King Prods. Co. 183 F.2d 158, 162 (2d Cir. 1950) (Hand, C.J.) (characterizing nonobviousness “as fugitive, impalpable, wayward, and vague a phantom as exists in the whole paraphernalia of legal concepts”).


\(^{171}\) 383 U.S. at 17.

\(^{172}\) 383 U.S. at 17.

\(^{173}\) 383 U.S. at 17.

\(^{174}\) 383 U.S. at 17-18.

\(^{175}\) *See*, e.g., MERGES & DUFFY, supra note 165, at 663.

\(^{176}\) Mandel, *Patently Non-Obvious*, supra note 80.

\(^{177}\) *See* Allison & Lemley, *Empirical Evidence*, supra note 168, at 1198 (noting that, on average, it takes more than twelve years from the filing of a patent application until final judgment of an enforcement action, and an even longer time from the date of invention).

\(^{178}\) In re Dembiczak, 175 F.3d 994 (Fed. Cir. 1999).
To guard against hindsight bias, the Federal Circuit developed the so-called teaching, suggestion, and motivation (TSM) test. Although the contours of the TSM test are subject to debate, in essence it holds that an invention will only be considered obvious if there was some recognizable teaching, suggestion, or motivation to combine the various elements that comprise it. In the absence of such a teaching, suggestion, or motivation, the invention is considered nonobvious and thus eligible for patenting.

Empirical analysis shows that the Federal Circuit historically utilized the TSM test in 45% of nonobviousness analyses.

The Federal Circuit’s TSM test is highly formalistic. While the Supreme Court’s Graham framework establishes a broad standard, the TSM test attempts to impose bright-line rules on the nonobviousness inquiry. In recent years, the formalistic TSM test has attracted significant criticism for producing inaccurate outcomes. In the absence of an identifiable teaching, suggestion, or motivation to combine references, seemingly obvious inventions will satisfy the TSM test. Thus, scholars have warned that the TSM test allowed too many inventions to pass the threshold of nonobviousness.

A less appreciated facet of the TSM test is that it limits the range of technologically challenging inquiries that a court must make. Quite simply, the TSM test truncates the nonobviousness inquiry. Is a phenol formaldehyde resin used to form metal castings in the foundry industry obvious or nonobvious?

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180 Dembiczak, 175 F.3d at 1001 (reversing a finding of obviousness regarding a garbage bag painted to look like a jack-o’-lantern).

181 Petherbridge & Wagner, supra note 179, at 2055. But see Holbrook, Possession, supra note 179, at 170 (stating that the Federal Circuit has made the TSM test “effectively determinative of the obviousness in question”).

182 Thomas, supra note , at 789-92; Holbrook, Substantive Versus Process-based Formalism, supra note 122, at 128 n.22.

183 See, e.g., In re Sang Su Lee, 277 F.3d 1338 (Fed. Cir. 2002) (rejecting use of “common knowledge and common sense” to find a motivation of combine).

184 See, e.g., Katherine J. Strandburg, Protecting the Competitive Baseline with a Robust Nonobviousness Standard, 155 U. PA. L. REV. PENNUMBRA 100, 101 (2006). But see Petherbridge & Wagner, supra note , at 2090-91 (finding no apparent effect of the TSM test on the likelihood of the Federal Circuit to affirm and little to no apparent effect on the likelihood of the court to reach a particular obviousness disposition).

185 See Dreyfuss, Institutional Identity, supra note 115, at 797.

186 See Ashland Oil, Inc. v. Delta Resins & Refractories, 776 F.2d 281 (Fed. Cir. 1985).
the foundry industry at the time of invention as well as the quantum of innovation separating the claims at issue from the prior art. The TSM test, however, provides a shortcut by focusing attention on teachings, suggestions, or motivations to combine; the absence of a TSM weighs heavily toward a determination of nonobviousness. In this sense, the TSM test functions as a heuristic that streamlines patent adjudication.

Of course, it may seem curious to characterize the TSM test—which specifically directs courts to consider contextual factors—as a “truncating” or “limiting” inquiry. However, the key here is that the TSM test invites courts to consider a finite set of factors—namely a teaching, suggestion, or motivation to combine—and to look no further. Once the court determines that a party challenging a patent has not shown one of these factors, the court may end its inquiry. By eschewing additional context, the test allows district court judges to operate as cognitive misers.\(^{187}\)

D. Remedies

Federal Circuit formalism also extends to the law of patent infringement remedies. Typically, a patentee who prevails in an infringement suit seeks to permanently enjoin the defendant. Determination of injunctive relief sounds in equity and ordinarily requires a court to consider a host of contextual factors.\(^{188}\) However, the Federal Circuit developed a formalistic jurisprudence that essentially established a simple syllogism: if infringement, then injunction. This bright line rule culminated in MercExchange, L.L.C. v. eBay, Inc., which articulated a “general rule . . . that a permanent injunction will issue once infringement and validity have been adjudged.”\(^{190}\)

Historically, patent courts took a less categorical approach to injunctive relief.\(^{191}\) For example, courts have denied injunctions in cases when ongoing infringement of a medically-related patent would best serve public health.\(^{192}\) Additionally, courts have denied injunctions where the “balance of convenience” favored the defendant\(^{193}\) and where the patentee did not manufacture the patented product while the defendant did.\(^{194}\) Notably, these decisions arose from regional circuit courts, which had jurisdiction over...
patent appeals prior to the establishment of the Federal Circuit in 1982. The Federal Circuit has taken a more bright-line approach to patent infringement remedies. While the Federal Circuit has recognized instances where denying an injunction is appropriate, its “general rule” until recently has been that an injunction will follow a determination of infringement.

While the Federal Circuit’s formalistic approach is subject to various substantive criticisms, I wish to highlight its underappreciated impact on reducing technological engagement by district court judges. As we will see, the equitable determination of injunctive relief can implicate a wide range of contextual factors. For example, such an inquiry can consider the role of a patented component in a broader technology or the manufacturing practices of the patentee. Furthermore, injunctive relief can hinge on judicial assessments of the “importance” of a patented invention to society at large. This bright line rule forecloses many of these difficult inquiries, some of which are highly technological. It thus offers a shortcut that dramatically reduces the information costs of determining infringement remedies.

E. Summary

This Part has shed new light on the widely-recognized formalistic nature of Federal Circuit jurisprudence. It is well-established that the Federal Circuit favors bright-line rules over broad standards; this tendency manifests itself in doctrinal areas as diverse as claim construction, prosecution history estoppel, nonobviousness, and remedies. Less appreciated is the impact of formalism on the cognitive burdens of district court judges. This Part has argued that Federal Circuit formalism is inherently “inquiry truncating” and that it limits the degree to which judges must understand technologies and their context.

Whether intentionally or not, the Federal Circuit’s formalistic jurisprudence reflects a cognitive miser model of technological engagement. As we have seen, lay persons often adopt heuristics to reduce the information costs of grappling with

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195 See, e.g., Richardson, 868 F.2d at 1247 (“It is the general rule that an injunction will issue when infringement has been adjudged, absent a sound reason for denying it.”) (citing W.L. Gore Associates, Inc. v. Garlock, Inc., 842, F.2d 1275, 1281 (Fed. Cir. 1988)).
196 See, e.g., Rite-Hite Corp v. Kelley Co., Inc. 56 F.3d 1538, 1547 (Fed. Cir. 1995) (“If patentee’s failure to practice a patented invention frustrates an important public need for the invention, a court need not enjoin infringement of the patent.”); Roche Prods., Inc. v. Bolar Pharm. Co., 733 F.2d 858, 865-66 (Fed. Cir. 1984) (remanding to consider the public health impact of enjoining infringement of a patented pharmaceutical).
197 MercExchange, 401 F.3d at 1338.
198 See eBay v. MercExchange, 547 U.S. 388, 396-97 (2006) (Kennedy, J., concurring) (noting the undue leverage that injunctive relief may provide to some patentees).
199 See eBay, 547 U.S. 388.
201 Other examples abound. For instance, the Federal Circuit has adopted a bright-line, formalistic approach to the public dedication doctrine, whereby subject matter disclosed in the specification but not claimed is forfeited. See Johnson & Johnson Assoc’s. v. R.E. Serv. Co., 285 F/3d 1046, 1054 (Fed. Cir. 2002); Holbrook, Possession, supra note 179, at 165.
technology. Formalism provides an analogous cognitive shortcut. Judges construing claims need not dwell on parsing complex technological context or the perspective of a PHOSITA within a hypertextualist approach to claim construction. Under historic Federal Circuit law, judges applying prosecution history estoppel need not explore the nuances of technological equivalents that survive a narrowing amendment; under the complete bar, none does. Courts determining nonobviousness can minimize their consideration of the state of technical knowledge in a particular industry by applying the TSM test. Finally, judges need not consider the nature of a technology or its social impact when applying a bright-line rule heavily favoring injunctions following patent infringement. In all of these cases, the Federal Circuit’s formalistic jurisprudence has historically limited the degree to which judges must engage and understand complex technologies.

This Part has argued that formalism has the underappreciated effect of minimizing lay technological engagement. In particular, the inquiry-truncating nature of Federal Circuit formalism creates hard-edged rules that reduce the weight and scope of technological inquiries. In the next Part, I consider whether these principles also apply to recent forays into patent law by the Supreme Court.

IV. THE SUPREME COURT’S HOLISTIC TURN

This Article has argued that the patent system imposes significant cognitive burdens on lay actors grappling with unfamiliar technologies. Additionally, it has argued that the patent system utilizes formalism to mitigate these burdens. In this Part, I explore a countervailing trend embodied in recent Supreme Court patent decisions. While the Court’s dramatic return to patent law has attracted significant attention, its methodological dimensions have gone underappreciated. This Part highlights an emerging “holistic turn” at the Supreme Court pushing back against Federal Circuit formalism. It further argues that the Court’s preference for holistic, “information consuming” standards will increase technological engagement and attendant cognitive burdens for district court judges.

A. The Supreme Court’s Return to Patent Law

Actors in the patent system reduce information costs in a number of surprising ways. Historically, the Supreme Court has done so by largely deferring on patent matters to the Federal Circuit. For a long period after the Federal Circuit’s establishment in 1982, the Supreme Court rarely reviewed that court’s patent opinions. For example, in the first ten years of the Federal Circuit’s existence, the Supreme Court only reviewed

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202 See supra Part II.
203 See generally Mark D. Janis, Patent Law in the Age of the Invisible Supreme Court, 2001 U. ILL. L. REV. 387. The legislative history of the Federal Courts Improvement Act suggests that the Supreme Court’s dormancy in patent law predated the Federal Circuit, which was created in part to “fill the void.” Id. at 395; see H.R. REP. NO. 97-312, at 22 (1981); John F. Duffy, The Festo Decision and the Return of the Supreme Court to the Bar of Patents, 2002 SUP. CT. REV. 273, 276 (2002); Wagner & Petherbridge, supra note 45, at 1115.
In a sense, this paucity of Supreme Court review reflected deference to the Federal Circuit’s expert authority. As a result, the Federal Circuit became “the de facto supreme court for patents.”

Beginning in the mid-1990s, however, this deferential stance began to change as the Supreme Court increasingly asserted its appellate jurisdiction over the Federal Circuit. In early cases from this period, the Court primarily reviewed procedural, jurisdictional, and structural issues rather than substantive patent law. However, more recently, the Court has intensified its review of substantive patent doctrine. In the past three years alone, the Court has issued major decisions on remedies, licensee standing to sue patentees, nonobviousness, the extraterritorial reach of domestic patent law, and patent exhaustion. The Court recently heard oral argument in a significant case concerning patentable subject matter. The Supreme Court’s deference to Federal Circuit jurisprudence, as well as its general indifference to patent matters, appears to be over.

204 Duffy, supra note 203, at 278.
205 See id. at 285 (“Because patent law is a fairly technical system of property rights, the Court has always . . . looked to specialized actors in the patent system to take the lead in developing the law.”). In some cases, this deference is quite explicit. In Warner-Jenkinson Co., Inc. v. Hilton Davis Chemical Co., Justice Thomas clarified the doctrine of equivalents, then stated, “With these limiting principles as a backdrop, we see no purpose in going further and micromanaging the Federal Circuit’s particular word choice for analyzing equivalence. . . . [W]e leave such refinement to that court’s sound judgment in this area of its special expertise.” 520 U.S. 17, 39 (1997).
206 Janis, supra note 203, at 387.
216 See John M. Golden, The Supreme Court as “Prime Percolator”: A Prescription for Appellate Review of Questions in Patent Law, 56 UCLA L. REV. 657, 658 (2009); Mossof, supra note 122, at 322 (“Not since 1853, when the Court decided eight patent case, has the Court engaged so intensely with the working details of the American patent system.”).
B. The Standard Interpretation: Constraining Patent Rights

The Court’s recent and significant re-entry into patent law has attracted considerable academic attention. For most observers, the Court’s aggressiveness reflects an attempt to reign in patent rights that had become too expansive under Federal Circuit jurisprudence. Above all, the turn of the millennium, widespread perceptions arose that patents may be impeding rather than promoting innovation. For example, the National Research Council and the Federal Trade Commission issued influential reports critiquing the proliferation of “undeserving” patents. For the better part of a decade, scholars have warned that patents on the “inputs” to research and development may create innovation-dampening “anticommons” and “patent thickets.” Computer and software firms have particularly criticized the difficulties of navigating patent-laden landscapes. So-called “patent trolls”—firms that assert patents but don’t produce any products themselves—have also engendered significant criticism. For the past several years, Congress has considered sweeping patent reform that would, among other proposals, expedite challenges to issued patents and curtail infringement damages. For some, these reforms reflect a response to the Federal Circuit’s alleged “pro-patentee” jurisprudence that makes it relatively easy to obtain and enforce strong patent rights.

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Against this background, the standard interpretation holds that the Supreme Court’s recent decisions aim to reign in expansive patent rights. Certainly, the Court’s patent jurisprudence over the past decade and a half fits comfortably within this thesis; the Court has made patents harder to obtain, easier to defeat, and narrower in scope. The Court has expanded “safe harbors” from patent infringement, weakened the presumption of injunctive relief following infringement, and enhanced the ability of licensees to challenge the validity of patents. It has also shored up the nonobviousness requirement, narrowed the circumstances in which overseas activities constitute infringement, and expanded the doctrine of patent “exhaustion.” Commenting on a case that was ultimately not reviewed because of procedural considerations, Justice Breyer tellingly noted that “sometimes too much patent protection can impede rather than ‘promote the Progress of Science and useful Arts.’” From the perspective of substantive patent law, the Court’s recent interventions have clearly operated to narrow patent rights.

C. A New Interpretation: Holism and Contextual Engagement

While this substantive narrowing of patent rights is indeed significant, I wish to highly an underappreciated but important methodological shift in these rulings. In parallel to constraining patent rights, the Supreme Court is systematically favoring holistic standards over formalistic, bright-line rules. Whereas the Federal Circuit’s rule-based doctrine is overwhelmingly “inquiry truncating,” the Supreme Court’s new standards compel decision makers to engage in multi-factored examinations of inventions and their technological context. In contradistinction to Federal Circuit formalism, I characterize this as the Supreme Court’s “holistic turn.”

This “holistic turn” has significant implications for the administration of patent law. Of course, any move from rules to standards may be expected to increase the difficulty of adjudication. However, this move has a particular impact on patent law, for holistic standards increase the degree to which district court judges must engage

Federal Circuit significantly more reluctant than its predecessors to affirm decisions of invalidity but consistent with predecessors in affirming decisions of noninfringement.

224 Eli Lilly & Co. v. Medtronic, Inc., 496 U.S. 661 (1990) (extending the 35 U.S.C. § 271(e) exemption to patented medical devices); Merck KGaA v. Integra Lifesciences I, Ltd., 545 U.S. 193 (2005) (extending the § 271(e) exemption to preclinical activities “reasonably related” to an informational submission to a regulatory agency).


228 Microsoft Corp. v. AT&T Corp., 550 U.S. 437 (2007).


231 While a few commentators have recognized this development, none has explored the connection between patent standards and greater technological engagement by judges. See, e.g., Mossoff, supra note 122, at 372; Rai, Growing Pains, supra note 39, at 2052 n.4.

232 See Kaplow, supra note 133, at 562-63.
technologies and technological context. In the following sections, I explore the emergence of this “holistic turn” and its implications for the intersection of legal and technological cultures. I do so by returning to three doctrinal areas discussed above: prosecution history estoppel, nonobviousness, and patent infringement remedies.233

D. Festo: A Flexible Approach to Prosecution History Estoppel

The leading edge of the Supreme Court’s recent “holistic turn” is its 2002 decision in *Festo Corp. v. Shoketsu Kinzoku Kogyokabushiki Co*.234 As described earlier, the Federal Circuit, based partly on “workability” concerns, adopted a formalistic approach to prosecution history estoppel. Under the Federal Circuit’s “complete bar,” when prosecution history estoppel applied to a claim element, it foreclosed the patentee from asserting any equivalents to that element.235 This approach is intrinsically inquiry-truncating; courts need not inquire into the specific reasons behind a narrowing amendment to determine if any equivalents survive estoppel.

On appeal, the Supreme Court rejected the complete bar and instead held that prosecution history estoppel operates as a flexible bar.236 Within this framework, even when prosecution history estoppel applies to a claim element, a patentee may still be able to assert some equivalents to that element. According to the flexible bar, determining the reach of estoppel “requires an examination of the subject matter surrendered by the narrowing amendment.”237 In announcing its flexible bar, the Court did not focus on “workability” concerns. Rather, the Court invoked the overarching purpose of prosecution history estoppel: to hold the inventor to representations made during prosecution and reasonable inferences arising from them.238 The Court established a presumption whereby patentees bear a burden of showing that a particular narrowing amendment did not surrender a particular equivalent in question.239 The Court offered three examples where a narrowing amendment would not necessarily surrender a particular equivalent:

The equivalent may have been unforeseeable at the time of the application; the rationale underlying the amendment may bear no more than a tangential relation to the equivalent in question; or there may be some other reason suggesting that

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233 See supra Parts III.B.-D.
235 See supra Part III.B.
236 This comprised the second of two holdings. The Supreme Court also affirmed the Federal Circuit’s ruling that any narrowing amendment made to comply with the Patent Act—not only those to avoid the prior art—could trigger prosecution history estoppel. Festo VII, 535 U.S. at 736.
237 Festo VII, 535 U.S. at 737.
238 Festo VII, 535 U.S. at 737-38.
239 Festo VII, 535 U.S. at 740.
the patentee could not reasonably be expected to have described the insubstantial substitute in question.  

The Supreme Court’s approach to prosecution history estoppel is decidedly holistic. It rejects the Federal Circuit’s bright-line, inquiry truncating rule in favor of a flexible standard. The Court’s test is attentive to context: it demands that courts scrutinize the particular equivalent asserted and ask why a patentee made a narrowing amendment. For example, the foreseeability inquiry requires a deep examination of a technical field. A judge must determine what would have been unforeseeable to a PHOSITA at the time that a patentee made a narrowing amendment. Such an inquiry requires an expansive understanding of the element in question, the state of the art at a particular time, and how that art could be reasonably expected to evolve. This multifaceted inquiry is a far cry from the Federal Circuit’s economical complete bar.

To be sure, one must assess the Supreme Court’s decision in Festo with a proper sense of proportion. As Professor Thomas notes, the Court largely vindicated the Federal Circuit’s restrictive approach to the doctrine of equivalents; the three avenues by which patentees may rebut the presumption of estoppel are “slender” indeed. Furthermore, upon remand and in subsequent cases, the Federal Circuit has narrowly construed the “tangentialness” and “some other reason” prongs, and the Supreme Court has not disturbed those rulings. In a broader sense, Professors John Allison and Mark Lemley argue that changes in rules governing the doctrine of equivalents have had little impact on actual cases and even less effect on cases involving prosecution history estoppel. However, in complicating prosecution history estoppel analysis, the Court nevertheless exhibited a significant methodological shift.

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242 See Wagner, Reconsidering Estoppel, supra note 150, at 169 (2002) (“[T]he choice between strong and flexible versions of estoppel is a debate about rules versus standards.”).
243 This context, however, may reveal some unsettling arbitrariness. Empirical studies show that the number of amendments made during prosecution varies meaningfully across different PTO examiners as well as technological categories. Douglas Lichtman, Rethinking Prosecution History Estoppel, 71 U. Chi. L. Rev. 151 (2004).
244 This test has garnered support from various judges and commentators. See, e.g., Festo IX, 344 F.3d at 1359 (Rader, J., concurring); Matthew J. Conigliaro et al., Foreseeability in Patent Law, 16 Berkeley Tech. L.J. 1045 (2001).
245 Thomas, supra note 122, at 786.
247 Festo IX, 344 F.3d at 1370.
248 Allison & Lemley, Doctrine of Equivalents, supra note 234, at 957.
Notably, the Court’s holistic approach to prosecution history estoppel invites greater technological engagement by district court judges. As revealed in the Festo remand, rebutting the presumption of prosecution history estoppel requires a deep examination of technological facts.\(^{249}\) As a preliminary matter, the Federal Circuit held that this determination is a question of law to be determined by a court, not a jury, thus placing this burden squarely on district court judges.\(^{250}\) The Federal Circuit then proceeded to flesh out the three instances identified by the Supreme Court where a patentee could rebut the presumption of estoppel. Regarding the first option, the Federal Circuit noted, “By its very nature, objective unforeseeability depends on underlying factual issues relating to, for example, the state of the art and the understanding of a hypothetical person of ordinary skill in the art at the time of the amendment.”\(^{251}\) Accordingly, courts may consider expert testimony and other extrinsic evidence in pursuing these inquiries.\(^{252}\) Second, the Federal Circuit also held that courts may consider expert testimony in determining the “tangentialness” of an equivalent.\(^{253}\) Finally, the Federal Circuit preserved the possibility that courts could consider extrinsic evidence to determine whether there was “some other reason” for why a patentee could not have been expected to have described a particular equivalent when making a narrowing amendment.\(^{254}\)

As cases and commentators have demonstrated, the foreseeability inquiry is highly factually intensive.\(^{255}\) For example, in *Robert Bosch GmbH and S-B Power Tool Co. v. Japan Storage Battery Co., Ltd.*, the plaintiff asserted infringement of its patented power drills under the doctrine of equivalents; the defendant countered by asserting prosecution history estoppel.\(^{256}\) In determining the scope of estoppel, the district court had to examine the state of the art of power drilling as well as the technical differences between the patented and accused drills. Ultimately, it concluded that it “was foreseeable to one of skill in the art of two speed planetary transmissions that levers of a different geometric shape—like the segmented, octagonal levers used in the Bosch PG1 gearset—could be used instead of the smoothly curved lever described in” JSB’s patent.\(^{257}\) Such engagement with technological facts is characteristic of the “foreseeability” prong of prosecution history estoppel.

Inquiries into the “tangentialness” exception can be similarly technologically demanding. Within this framework, patentees are more likely to rebut the presumption of

\(^{249}\) Festo IX, 344 F.3d at 1367.
\(^{250}\) Festo IX, 344 F.3d at 1367.
\(^{251}\) Festo IX, 344 F.3d at 1369; id. at 1377 (“In applying the foreseeability exception, the trial court must assess the factual record of events during prosecution, the factual contents of custom and usage of terms in the relevant art, the factual level of ordinary skill in the art, and the factual understanding of a person of ordinary skill at the time of invention.”) (Rader, J., concurring).
\(^{252}\) Festo IX, 344 F.3d at 1369.
\(^{253}\) Festo IX, 344 F.3d at 1370.
\(^{254}\) Festo IX, 344 F.3d at 1370.
\(^{256}\) 223 F. Supp. 2d 1159 (C.D. Cal. 2002).
\(^{257}\) 223 F. Supp. 2d at 1171.
estoppel when making amendments not aimed at avoiding prior art\textsuperscript{258} and when making amendments to avoid nonanalogous prior art.\textsuperscript{259} Conversely, courts have rejected rebuttals because of lack of information in the record\textsuperscript{260} and because the prior art avoided by the narrowing amendment was similar to the alleged equivalent.\textsuperscript{261} These considerations impose heavy burdens on district courts, which must determine what constitutes prior art, what constitutes nonanalogous art, and whether a particular prior art reference is similar to an equivalent in question.

While the Federal Circuit’s complete bar reduces information costs, the Supreme Court’s flexible bar substantially raises them. The Court’s holistic standard does so in large part because it compels greater judicial engagement with technological facts.\textsuperscript{262} In so doing, it exacerbates tensions arising from the intersection of legal and technological cultures. As we will see, wide-ranging technological inquiries and increased information costs are characteristic of the Court’s recent holistic turn.

E. \textit{KSR}: A Commonsense Approach to Nonobviousness

The Supreme Court’s treatment of nonobviousness further illustrates its preference for holistic standards over formalistic rules. As discussed, one of the primary difficulties of determining nonobviousness is hindsight bias.\textsuperscript{263} To ameliorate this bias, the Federal Circuit developed the TSM test, which requires courts to identify some teaching, suggestion, or motivation to combine the elements of an invention before characterizing it as obvious.\textsuperscript{264} This formalistic test streamlines and truncates nonobviousness determinations.

In \textit{KSR v. Teleflex}, the Supreme Court repudiated the Federal Circuit’s formalistic application of the TSM test.\textsuperscript{265} In that case, the Court concluded that an adjustable gas pedal combined with an electronic throttle sensor was obvious.\textsuperscript{266} In so doing, it reversed the Federal Circuit, which had relied on the TSM test to vacate the district court’s ruling


\textsuperscript{261} See, e.g., Business Objects, S.A. v. Microstrategy, Inc., 393 F.3d 1366 (Fed. Cir. 2005); Rhodia Chimie v. PPG Industries, 402 F.3d 1371 (Fed. Cir. 2005).

\textsuperscript{262} The difficulties of the Supreme Court’s “flexible bar” are further compounded by one of the central challenges of claim construction: such determinations are made from the perspective of a PHOSITA, not a reasonable person or ordinary judge. \textit{See supra} note 36.

\textsuperscript{263} \textit{See supra} notes 176-177 and accompanying text.

\textsuperscript{264} \textit{See supra} Part III.A.3.


\textsuperscript{266} \textit{Id}. 35
of obviousness.\textsuperscript{267} Noting that the TSM test captured a “helpful insight,” the Court nevertheless characterized the Federal Circuit’s application of the test as a “rigid and mandatory formula[ ]” incompatible with prior precedents.\textsuperscript{268} Revealing its holistic preferences, the Court stated that the “nonobviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation.”\textsuperscript{269} In particular, the Court criticized the TSM test for artificially truncating the nonobviousness inquiry.\textsuperscript{270}

In its place, the Court articulated a holistic approach to nonobviousness. Drawing on prior case law, notably \textit{Graham v. John Deere},\textsuperscript{271} the Court advocated a “functional,” “expansive and flexible approach” to nonobviousness.\textsuperscript{272} The Court criticized the Federal Circuit’s overemphasis on explicit (i.e., written) teachings, suggestions, or motivations to combine, noting that the “diversity of inventive pursuits and of modern technology counsels against limiting” the nonobviousness analysis to such factors.\textsuperscript{273} The Court further observed that some designs may be too obvious to be described in writing\textsuperscript{274} and that sometimes, subtle motivations such as market demand may render a new combination obvious.\textsuperscript{275} Accordingly, the Court clarified that courts “need not seek out precise teachings” to conclude that a particular invention is obvious.\textsuperscript{276}

Paralleling its holistic vision of nonobviousness, the Court also elaborated an expansive vision of the PHOSITA. The PHOSITA embodied in the Federal Circuit’s TSM test exhibits rather impoverished inventive capacity.\textsuperscript{277} In the absence of some discernible teaching, suggestion, or motivation to combine elements in the prior art, courts should presume that a PHOSITA would not do so (and thus that a particular combination is nonobvious). In \textit{KSR}, however, the Supreme Court emphasized that “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” This more expansive notion of the PHOSITA lessens reliance on precise teachings to conclude that an invention is obvious, “for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.”\textsuperscript{278} \textit{KSR} thus invites judges to take a broader view of the inventive endeavor and to recognize a basal level of “technical creativity” that pervades specialized arts.

While \textit{KSR} has attracted significant attention, it is again important to take a step back to consider what exactly, if anything, it has changed. To be sure, commentators,\textsuperscript{279}

\begin{flushleft}
\textsuperscript{268} 550 U.S. at 418, 419.
\textsuperscript{269} 550 U.S. at 419.
\textsuperscript{270} 550 U.S. at 419 (“But when a court transforms the general principle into a rigid rule that limits the obviousness inquiry, as the Court of Appeals did here, it errs.”).
\textsuperscript{272} 550 U.S. at 415.
\textsuperscript{273} 550 U.S. at 420.
\textsuperscript{274} 550 U.S. at 419.
\textsuperscript{275} 550 U.S. at 419.
\textsuperscript{276} 550 U.S. at 418.
\textsuperscript{277} \textit{Cf.} Eisenberg, \textit{Obvious to Whom?}, supra note 36, at 891.
\textsuperscript{278} 550 U.S. at 418.
\textsuperscript{279} Petherbridge & Wagner, supra note 179, at 2104-05.
\end{flushleft}
the Federal Circuit, and the PTO have suggested that KSR largely affirmed existing approaches to nonobviousness. However, as a doctrinal matter, rigid application of the TSM test is no longer appropriate. Furthermore, in addition to its substantive impact, KSR is important as yet another demonstration of the Supreme Court’s holistic turn.

The Supreme Court’s rejection of the formalistic TSM test and embrace of a flexible standard promise to increase cognitive burdens on district courts judges. In short, the Court has “broadened the scope of the obviousness inquiry.” For district courts, the Court’s holistic framework is both liberating and intimidating. The Court’s expansive notions of nonobviousness and the PHOSITA parallel a greater role for judicial “common sense” in determining the obviousness of inventions. District courts are no longer shackled to a narrow version of the TSM test, and they have freer rein to find inventions obvious based on amorphous factors such as industry dynamics and market demand. The Supreme Court’s holistic shift thus puts district court judges, and their cognitive faculties, squarely at the heart of the nonobviousness inquiry.

As part and parcel of this shift, the Court’s holistic framework opens up a wide array of technological factors to consider in determining nonobviousness. As KSR notes, “Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art. . . .” Far from the inquiry-truncating TSM test, where a judge could focus on a narrow range of fairly tangible information, the Supreme Court’s holistic framework invites broad engagement with technological context.

In very concrete ways, KSR expands directs courts’ inquiries into the prior art. In its approach to KSR, the Federal Circuit had discounted the relevance of a particular prior art reference, the Asano patent, which tended to render obvious the patented invention at issue. According to the Federal Circuit, because the Asano patent did not address the same technical problem that the KSR patentee sought to address, it was not a reference that a PHOSITA could be expected to consider. Therefore, it could not provide a teaching, suggestion, or motivation to combine. However, the Supreme Court expanded the range of inquiry, stating that “any need or problem known in the field” can motivate a

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280 While KSR was pending at the Supreme Court, the Federal Circuit issued two opinions arguably anticipating and responding to the Court’s reconsideration of the TSM test. See Dystar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co., 464 F.3d 1356, 1367 (Fed. Cir. 2006); Alza Corp v. Mylan Labs., Inc., 464 F.3d 1286, 1291 (Fed. Cir. 2006); see 550 U.S. at 421-22.

281 See Margaret A. Focarino, USPTO Deputy Commissioner for Patent Operations, Memorandum, Supreme Court decision on KSR Int’l Co., v. Teleflex, Inc., May 3, 2007 (emphasizing that the Court did not wholly disavow the TSM test).


283 550 U.S. at 421.

284 550 U.S. at 418.

285 Notably, the Asano patent had not been considered by the PTO when it granted the patent at issue in KSR. 550 U.S. at 420.

PHOSITA to create a particular invention. When considering the functionality of the Asano patent, the Court concluded that it rendered the patented invention obvious.  

Early case law reveals the technologically and factually expansive nature of the KSR framework. Asyst Technologies, Inc. v. Empak, Inc. offers a particularly illuminating example because the district court proceedings spanned the Supreme Court’s consideration of KSR. In Asyst, Asyst accused Jenoptik of infringing its patented methods for tracking articles during the manufacture of integrated circuits. Jenoptik moved for summary judgment, asserting that Asyst’s patented methods were obvious. Applying pre-KSR case law, the district court denied Jenoptik’s motion for summary judgment, and a jury subsequently found Asyst’s patents valid and infringed. The Supreme Court then decided KSR, and the district court considered Jenoptik’s post-trial motion for judgment as a matter of law in light of the Court’s new guidance on nonobviousness.

A crucial issue was whether a particular reference, the Hesser patent, fell within the scope of relevant prior art. The jury implicitly found that it did not because Hesser was not aimed at the same technical problem as Asyst’s patented methods. However, applying KSR’s more expansive notion of the PHOSITA’s creative faculties, the district court ruled that the Hesser patent did comprise relevant prior art. Having included this prior art reference in its analysis, the district court went ahead to compare the Hesser patent to Asyst’s claims and concluded that the Hesser reference was similar enough to render Asyst’s methods obvious. The KSR framework thus expanded the universe of prior art the district court had to consider and compelled detailed technical examinations of that prior art and the claims at issue. In so doing, KSR helped raise the information costs of adjudicating nonobviousness.

Once again, the Supreme Court’s preference for a holistic standard over formalistic rules promises to increase technological engagement by generalist judges. KSR expands the universe of technologically relevant inquiries that judges should make while providing them with little concrete guidance on how to do so.

F. eBay: An Equitable Standard for Injunctive Relief

The Supreme Court’s holistic trend is also evident in its approach to patent infringement remedies. For many years, the Federal Circuit had followed a “general rule . . . that a permanent injunction will issue once infringement and validity have been
adjudged.” As discussed, this formalistic, inquiry-truncating rule establishes a neat syllogism: if infringement, then injunction (absent exceptional circumstances). However, in 2006, the Supreme Court rejected this formalistic approach in eBay Inc. v. MercExchange, L.L.C.

In eBay, the Supreme Court replaced the Federal Circuit’s formalistic rule with an equitable standard. Writing for the majority, Justice Thomas held that the decision to grant or deny injunctive relief rests within the discretion of the district court, consistent with traditional equitable principles. Within this framework,

A plaintiff must demonstrate: (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction.

eBay is a simple holding with profound implications. The decision ended the practice of virtually automatically granting an injunction upon a finding of infringement and introduced a multi-factor test to determine the appropriateness of injunctive relief.

The case has sparked voluminous commentary regarding its substantive impact on patent strength. On the one hand, commentators have suggested that eBay may affect everything from the market power of patent trolls to the public availability of intellectual infrastructure. On the other hand, Chief Justice Roberts predicted in his eBay concurrence that district courts would continue to issue injunctions in the overwhelming majority of cases. Empirically, the eBay standard has in fact changed the status quo. In the first 30 cases applying eBay, district courts issued permanent injunctions 77% of the time, compared to 85% for pre-eBay cases. In addition to its substantive impact, however, the case offers another significant illustration of the Supreme Court’s holistic turn.

Contrary to the Federal Circuit’s per se rule, the eBay standard greatly increases the information costs of determining patent infringement remedies. Again, any move from a bright-line rule to a flexible standard will likely increase information costs and

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295 See supra Part III.D.
297 Id. at 391.
298 Doctrinally, courts have read eBay as removing the presumption of irreparable harm upon a finding of patent infringement. See, e.g., Automated Merchandising Systems v. Crane Co., Nos. 2009-1158, -1164 (Fed. Cir., Dec. 16, 2009); IMX Inc. v. LendingTree, LLC, 469 F. Supp. 2d 203, 224 (D. Del. 2007).
301 547 U.S. at 388 (Roberts, C.J., concurring).
cognitive burdens. These effects, however, are significantly amplified given the technologically complex subject matter falling within the scope of this standard.

_eBay_ compels greater technological engagement in two ways. First, in the most immediate sense, it directs judges to evaluate the nature of a technology and its context when determining the appropriateness of injunctive relief. For example, in _eBay_’s other concurrence, Justice Kennedy instructed courts to consider “the nature of the patent being enforced and the economic function of the patent holder.” In particular, courts should consider whether a patented technology comprises but one component of a broader invention as well as the business practices of the patentee seeking an injunction. In a broader sense, fastidious application of the _eBay_ framework invites judges to examine an invention’s impact on the market, competitive landscape, and “social welfare,” broadly defined. Under the Federal Circuit’s per se rule, remedies analysis rarely involved such inquiries.

Second, _eBay_ shifts more emphasis to another, highly technical inquiry: determining damages. Increased denials of injunctive relief will lead more patentees to seek ongoing royalties for prospective, continued infringement. District courts, of course, cannot avoid the difficulties of determining damages, which are the only remedy available for _past_ infringement occurring before an injunction. However, valuing technologies and calculating damages—particularly on a prospective basis—tend to be highly complex, multifactor analyses. In a tautological sense, the difficulties of calculating damages are reflected in the _eBay_ standard itself: the fact that damages are difficult to quantify is a factor weighing in favor of simply granting an injunction.

Determining ongoing royalties in light of _eBay_ raises several difficult questions. For example, should courts calculate royalties as if they were to continue in perpetuity, or as if they are expected to cease at some time in the future? Ordinarily, damages calculations are based on a “hypothetical negotiation” between the patentee and the infringer. While such negotiations traditionally took place against the backdrop of property rule enforcement of the patent, the value of the patent is somewhat discounted

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305 _eBay_, 547 U.S. at 396 (Kennedy, J., concurring).
307 See _FELDMAN, supra_ note 85, at 41-48 (highlighting the technical difficulties judges encounter when performing economic analysis).
309 Ellis et al., _supra_ note 191, at 446.
310 _Id._ at 469.
now because of the availability of liability rule protection.\textsuperscript{311} These inquiries, while not themselves technological in nature, exacerbate the difficulty of protecting technological assets with liability rules. In short, \textit{eBay} has complicated damages calculations while also making them more common.\textsuperscript{312}

Early cases following \textit{eBay} demonstrate the difficult, technologically-intensive inquiries now facing district courts. True to Justice Kennedy’s direction, courts now assess the relative “importance” of a patented component within a broader product.\textsuperscript{313} Additionally, courts now inquire into the impact of a patented invention (and an injunction against infringement) on wider societal interests, such as the availability of word processing software,\textsuperscript{314} satellite television,\textsuperscript{315} and diagnostic tests kits.\textsuperscript{316} Courts now routinely consider industry dynamics, as an injunction is more likely to issue if the patentee and infringer are direct competitors.\textsuperscript{317} However, there is no per se rule in this regard, as courts have granted injunctions even in the absence of direct competition\textsuperscript{318} as well as denied injunctions in the presence of direct competition.\textsuperscript{319} As a general matter, these kinds of competitive harms may be very difficult to quantify.\textsuperscript{320}

G. Additional Evidence of the Supreme Court’s Holistic Turn

While I have focused at length on \textit{Festo}, \textit{KSR}, and \textit{eBay} to demonstrate the Supreme Court’s “holistic turn,” such a trend is best illustrated, of course, by a holistic examination of the Court’s decisions. Other examples abound. For instance, in \textit{Merck KGaA v. Integra Lifesciences I, Ltd.}, the Court rejected the Federal Circuit’s formalistic interpretation of the 35 U.S.C. § 271(e)(1) exception to patent infringement.\textsuperscript{321} That statute exempts from infringement uses of a patented invention “reasonably related to submitting information for federal regulatory review of drugs.”\textsuperscript{322} The Federal Circuit had

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\item[\textsuperscript{312}] \textit{Cf}. Ellis et al., \textit{supra} note 191, at 465-67.
\item[\textsuperscript{313}] z4 Technologies, Inc. v. Microsoft Corp., 434 F. Supp. 2d 437 (E.D. Tex. 2006); Paice LLC v. Toyota Motor Corp., 2006 WL 2385139 (E.D. Tex. 2006); aff’d in part, vac’d in part, rem’d, Paice LLC v. Toyota Motor Corp, 504 F.3d 1293 (Fed Cir. 2007); Ellis et al., \textit{supra} note 191, at 455-56; \textit{see, e.g.}, IMX, Inc. v. Lendingtree, LLC, 469 F. Supp. 2d 203, 225 (“[D]efendant’s infringing use of plaintiff’s technology is not limited to a minor component . . . .”).
\item[\textsuperscript{314}] Z4 Technologies, 434 F. Supp. 2d 437.
\item[\textsuperscript{316}] \textit{See} Innogenetics, N.V. v. Abbott Laboratories, 578 F. Supp. 2d 1079, 1105 (W.D. Wis. 2007) (ordering an evidentiary hearing to determine the impact of an injunction on the diagnostic market).
\item[\textsuperscript{317}] Ellis et al., \textit{supra} note 191, at 442043.
\item[\textsuperscript{318}] \textit{See, e.g.}, Commonwealth Scientific and Industrial Research Organization (CISRO) v. Buffalo Technology Inc., 492 F. Supp. 2d 600 (E.D. Tex. 2007). \textit{eBay} itself held that a patentee’s status as a non-manufacturer did not foreclose the availability of injunctive relief. \textit{See eBay}, 547 U.S at 393.
\item[\textsuperscript{319}] \textit{See, e.g.}, Praxair, Inc. and Praxair Technology, Inc. v. ATMI, Inc. and Advanced Technology Materials, Inc., 479 F. Supp. 2d 440 (D. Del. 2007).
\item[\textsuperscript{320}] Ellis et al., \textit{supra} note 191, at 445, 447.
\item[\textsuperscript{321}] 545 U.S. 193 (2005).
\item[\textsuperscript{322}] The provision thus facilitates the introduction of generic drugs. 35 U.S.C. §271(e)(1).
\end{itemize}
\end{footnotesize}
created a bright-line rule limiting the exception to uses that were directly related to an FDA submission.\textsuperscript{323} The Supreme Court, however, emphasized the standard-like nature of the statute, noting that it exempts from infringement “all uses of patented compounds ‘reasonably related’ to developing information for a federal submission.”\textsuperscript{324} This emphasis on reasonableness—the prototypical flexible standard—further reflects the Supreme Court’s holistic tendencies.

In \textit{Quanta Computer, Inc. v. LG Elecs., Inc.},\textsuperscript{325} the Court established a holistic standard to govern the doctrine of exhaustion, which provides that the initial authorized sale of a patented invention terminates all patents rights in that item.\textsuperscript{326} Among its holdings, the Court established that when an item is legitimately sold that “substantially embodies” a patented invention, the patentee’s rights are exhausted.\textsuperscript{327} This flexible standard requires a court to inquire into whether a sold item embodies the “inventive” elements of a patent.\textsuperscript{328} This somewhat nebulous standard does not insist on exact identity and invites detailed examinations of patented technologies.

Finally, the Court has signaled a holistic turn in the law of patentable subject matter.\textsuperscript{329} The high water mark of the Federal Circuit’s expansive, formalistic conception of patentable subject matter came in \textit{State Street Bank v. Signature Financial Group}, which essentially equated patent eligibility with utility.\textsuperscript{330} In recent pronouncements, the Court has expressed discomfort both with the breadth of patentable subject matter and the bluntness of the inquiry.\textsuperscript{331} Interestingly, the Federal Circuit has responded by developing a test for the patentability of processes that considers more characteristics of the invention at issue, but is still rather formalistic in nature.\textsuperscript{332} The Supreme Court will address these developments in \textit{Bilski v. Kappos},\textsuperscript{333} where it may likely announce a more functional, holistic approach to patent eligibility.

\textsuperscript{323} 331 F.3d 860, 867 (Fed. Cir. 2003).
\textsuperscript{324} 545 U.S. at 206.
\textsuperscript{325} 128 S. Ct. 2109 (2008).
\textsuperscript{326} 128 S. Ct. 2115.
\textsuperscript{327} 128 S. Ct. at 2120; Todd Zubler et al., \textit{2008 Patent Law Decisions of the Federal Circuit}, 58 AM. U. L. REV. 747, 758 (2009). Professor Mossoff characterizes \textit{Quanta} as a formalistic opinion because it states a per se rule that “the initial authorized sale of a patented item terminates all patent rights to that item.” Mossoff, \textit{supra} note 122, at 373 \textit{quoting} Quanta, 128 S. Ct. at 2115; \textit{see also} Richard A. Epstein, \textit{The Disintegration of Intellectual Property} 43 (Univ. of Chi. Law & Econ., Olin Working Paper No. 423, 2008), \textit{available at} http://ssrn.com/abstract=1236273. I do not disagree with this characterization of the opinion, but I focus instead on a threshold question: what must be “sold” to trigger exhaustion? It is here that the Supreme Court endorses a flexible standard, for it requires sale of an item that “substantially embodies” a patented invention rather than exact identity.
\textsuperscript{328} 128 S. Ct. at 2120
\textsuperscript{329} See 35 U.S.C. §101 (defining patentable subject matter as “any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof”).
\textsuperscript{330} 149 F.3d 1368, 1375 (Fed. Cir. 1998).
\textsuperscript{332} See In re Comiskey, 499 F.3d 1365 (Fed. Cir. 2007), \textit{revised and superseded by} 554 F.3d 967 (Fed. Cir. 2009) (en banc); In re Bilski, 545 F.3d 943 (Fed. Cir. 2008) (en banc) (articulating the so-called “machine-or-transformation test”).
\textsuperscript{333} \textit{__} S. Ct.\textunderscore, 2009 WL 221232 (2009).
In sum, the Supreme Court’s recent forays into patent law have consistently favored holistic standards over formalistic rules. This innovation compels greater engagement between district court judges and complex technologies and their context. Whereas Federal Circuit formalism allows judges to function as cognitive misers, the Supreme Court’s holistic turn has the opposite effect.

V. DOCTRINAL INFORMATION COST EXTERNALITIES: IMPLICATIONS AND PRINCIPLES FOR MITIGATION

Returning to the central theme of this Article, the Supreme Court’s holistic turn presents a challenge. Employing holistic standards rather than formalistic rules promises to increase cognitive burdens for district court judges. In particular, “information demanding” standards compel greater judicial engagement with complex technologies. One predictable response to this development will be greater emphasis on “traditional” proposals to reduce such burdens. As we have seen, these proposals face a variety of shortcomings.

The foregoing discussion of formalism and holism, however, suggests a different approach. Rather than enhancing judicial technical expertise or simplifying the language of patents, this Part argues that patent doctrine itself can play an important role in easing lay engagement with technology. In particular, this Part offers prescriptions for crafting Supreme Court opinions so as to reduce the “costliness” of holistic standards. In so doing, it aims to blend some of the economizing virtues of rules with the flexibility and contextual sensitivity of standards.

As we have seen, the Supreme Court consistently favors broad standards that compel difficult technological inquiries by lay adjudicators. However, because of the Court’s relatively small patent docket, Supreme Court justices themselves rarely have to apply these standards. Thus the Court is free to announce broad, policy-oriented standards without considering the difficulties of applying them in myriad technological contexts. In an economic sense, the Court’s preference for standards imposes an information cost externality on district court judges. The challenge then becomes one of internalizing these externalities.

To achieve this end, this Part proposes adapting a fundamental concept from patent law itself: enablement. The enablement requirement arises from 35 U.S.C. § 112, ¶ 1, which states:

334 See FELDMAN, supra note 85, at 47 (“There has always been a trade-off in law between precision and simplicity”).
335 See supra Part I.B.
336 My claim is not that this phenomenon is unique to patent law; it is endemic whenever an appellate court announces a broad standard subject to interpretation. However, consistent with my other arguments, I contend that the information costs of broad standards are accentuated when courts must apply them to technological subject matter.
The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same...  

In patent law, enablement is an “information-forcing” rule. It compels patentees to adopt the perspective of ordinary artisans in the field and to disclose their inventions so that such parties can practice them. Patents fail the enablement requirement when, for example, a PHOSITA must engage in “undue experimentation” to make or use an invention.

This Article proposes applying enablement principles to Supreme Court patent opinions. In patent law, the enablement requirement compels patentees to teach persons of ordinary skill in the art to make and use a new invention. Similarly, patent opinions announce doctrinal innovations, and enablement principles would ensure that persons of ordinary skill in legal arts (such as judges) can apply them. Such an orientation would encourage Supreme Court justices to step into the shoes of a district court judge and to consider the day-to-day demands of applying patent doctrine to unfamiliar inventions. As in the patent context, enablement would be an information-forcing principle. In particular, it would encourage Supreme Court justices to consider, limit, and guide “costly” technological inquiries when articulating new patent law.

Applying enablement principles to Supreme Court patent opinions would reduce information costs in several ways. First, it would encourage clearer doctrinal frameworks. Vague doctrine always heightens information costs, as it expands the universe of potentially relevant legal inquiries. This phenomenon is exacerbated in patent law because of the technologically challenging subject matter at issue. Providing clear doctrine would help define and limit these inquiries. Second, an enablement orientation would encourage authoring justices to guide the application of new doctrine.

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337 35 U.S.C. § 112, ¶ 1
340 The Incandescent Lamp Patent, 159 U.S. 465 (1895); see In re Wands, 858 F.2d 731 (Fed. Cir. 1988) (articulating several factors defining “undue experimentation”).
341 Cf. Schwartz, Practice Makes Perfect, supra note 46, at 225 (noting the implicit assumption that higher courts should be able to “teach” lower courts how to apply new doctrine); Law Professor calls for ‘Dialogue’ Between Federal Circuit and Supreme Court, 78 PTCJ 792, 792 (2009) (quoting Professor Joshua Sarnoff as characterizing Supreme Court patent cases as “weak on teaching policy”) [hereinafter Law Professor Calls for ‘Dialogue’].
342 Commentators have argued that enablement also offers the best evidence that a patentee actually “possesses” a claimed invention. See Holbrook, Possession, supra note 179, at 146-60. This “possession” function is traditionally associated with the written description requirement. University of Rochester v. G.D. Searle & Co., 358 F.3d 916 (Fed. Cir. 2004); Gentry Gallery, Inc. v. Berkline Corp., 134 F.3d 1473 (Fed. Cir. 1998); In re Gosteli, 872 F.2d 1008 (Fed. Cir. 1989). Recently, the Federal Circuit cast doubt on whether the written description and enablement requirements are truly distinct. Ariad Pharmaceuticals, Inc. v. Eli Lilly & Co., No, 02-CV-11280 (Fed. Cir. Aug. 21, 2009). By analogy, I argue that enabling new patent doctrine will ensure that the Supreme Court truly “possessed” it in the first place.
with examples and explanations. If information costs are the problem, then providing more information in Supreme Court patent opinions may offer a solution. The result would be an intermediate realm between rules and standards characterized by brighter-lined tests and bounded, guided discretion.

A. Clearly Delineating and Limiting New Patent Doctrine

An important step in “enabling” patent doctrine is clearly articulating it. Unfortunately, the Supreme Court often produces rather nebulous patent doctrine. Professor Donald Chisum, a leading patent commentator, argues that the Court should “provide reasonably clear standards and make some effort to give us a standard that makes sense in terms of reality.” Frequently, the Court “creates the test, but it did not sit down and methodically construct the test and explain it to us.” As noted, the difficulties of applying nebulous standards are compounded in the patent arena, where they invite judges to engage in a wide range of technologically challenging inquiries.

Such criticisms are particularly applicable to the Court’s recent pronouncements on nonobviousness. In *KSR v. Teleflex*, the Court clearly rejected the Federal Circuit’s rigid application of the TSM test. However, it is not clear what new standard of nonobvious replaces it, if any. One can identify numerous “fleshy” statements from the Court’s opinion, but the exact holding remains elusive. In a sense, *KSR* says both

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344 Id. at 7.
346 *See* Petherbridge & Wagner, supra note 179, at 2107; Gregory N. Mandel, *Another Missed Opportunity: The Supreme Court’s Failure to Define Nonobviousness or Combat Hindsight Bias in KSR v. Teleflex*, 12 Lewis & Clark L. Rev. 323, (2008) (“Despite issuing eight opinions on the nonobviousness requirement, the Court has provided almost no guidance concerning either the degree of ingenuity necessary to meet the . . . non-obvious standard or how a decision-maker is supposed to evaluate whether the differences between the invention and the prior art meet this degree.”) [hereinafter Mandel, *Missed Opportunity*].
347 *See*, e.g., 550 U.S. at 415 (“[O]ur cases have set forth an expansive and flexible approach inconsistent with the way the Court of Appeals applied its TSM test here.”); id. at 416 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”); id. at 417 (“When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”); id. at 417 (“[A] court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions.”); id. at 418 (“Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.”); id at 418 (“[A] court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.”); id. at 420 (“[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.”); id. at 421 (“A person of ordinary skill is also a person of ordinary creativity, not an automaton.”); id. at 421 (“When there is a design need or market pressure to solve a problem and there are a finite number of identified,
too much and too little. It offers a smorgasbord of factors to consider in the nonobviousness determination, but it doesn’t present them in a systematic, prioritized, or weighted manner. Given that so much now appears to be “fair game” in determining nonobviousness, the information costs of applying this new standard are very high.

Perhaps most importantly, KSR does not precisely identify the specific types of information that should guide nonobviousness inquiries. In the Graham framework, courts should consider 1) the scope and content of the prior art; 2) the differences between the prior art and the claims at issue; 3) the level of skill in the art; and 4) secondary considerations. KSR was an opportunity to elaborate the details of that framework, but the Supreme Court largely missed this opportunity. On the contrary, KSR advances a “liberal view of sources of information relevant to an obviousness analysis.” This lack of doctrinal precision invites wide-ranging judicial inquiries into technical issues such as evolving industry trends and the creative faculties of the PHOSITA. Greater emphasis on enablement would have likely produced clearer, more limited doctrine.

The Court is in fact capable of providing greater definition. In eBay, for example, the Court provided a discrete set of factors that courts should consider in granting or denying an injunction. Arguably, the Court should have gone further to assign particular weights to the various factors. Nevertheless, by identifying a finite universe of factors to consider, the Court helped limit the range of technologically-intensive inquiries that courts must make. While standards necessarily involve high information costs, precisely defining those standards would help mitigate those costs. Thus by conscientiously fulfilling its mandate “to say what the law is,” the Court can help facilitate lay adjudication of technological disputes.

B. Guiding Technological Inquiries through Examples and Explanations

While it is useful to describe a new legal innovation, it is even more useful to teach jurists how to apply it. In addition to providing clear, bounded frameworks, an enablement orientation would encourage the Supreme Court to illustrate and explain new doctrine. Such guidance is particularly helpful in applying holistic standards to technological subject matter.

Within this enablement orientation, examples would play a key role. Commenting on patent enablement, the Federal Circuit has stated, “One of the best ways to teach a person of ordinary skill in the art how to make and use the invention is to predictably, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.”

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348 383 U.S. 1, 17 (1966).
350 547 U.S. at 391.
351 See Smith, Institutions and Indirectness, supra note 145, at 2125.
352 Kaplow, supra note 133, at 594 (“[S]tandards need not admit all considerations.”).
353 Marbury v. Madison, 5 U.S. 137, 177 (1803).
provide an example of how to practice the invention in a particular case." Providing illustrative examples in Supreme Court opinions would help district courts apply innovative patent standards. In so doing, it would limit and guide “costly” inquiries into complicated subject matter.

When the Supreme Court speaks, lower courts listen. In particular, district courts have been highly receptive to specific examples provided by the Court when applying new patent doctrine. Recall *Festo*, where the Court replaced the Federal Circuit’s complete bar approach to prosecution history estoppel with a flexible bar. In elaborating this standard, the Supreme Court offered several examples where patentees could rebut the presumption of prosecution history estoppel. As shorthand, we can refer to these as the unforeseeability, tangentialness, and “other reason” exceptions. District courts have embraced the first two—rather concrete—examples, applying prosecution history estoppel in cases involving unforeseen technologies and narrowing amendments that were tangential to an equivalent in questions. Tellingly, no reported decisions include the more nebulous “other reason” exception.

Examples play a similarly instructive role in district courts’ application of *eBay*. In his concurrence, Justice Kennedy identified several situations that warranted denying injunctive relief: cases involving nonmanufacturing entities (known pejoratively as “patent trolls”) and instances where a patented invention is only one component of a broader technology. Lower courts have seized upon both of these examples. One study shows that in almost every early post-*eBay* case where a district court denied injunctive relief, the patentee was a non-practicing entity. Additionally, in two of the six cases where a district court denied injunctive relief, the patented invention was only

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354 Phillips v. AWH Corp., 415 F.3d 1303 (Fed. Cir. 2005) (en banc). In similar fashion, the Board of Patent Appeals and Interferences has stated, “While we recognize that specific examples are not necessary to meet the requirements of Section 112, when present, they do provide good evidence that the disclosure is enabling and that the invention may be performed without undue experimentation.” In re Strahilevitz, 668 F.2d 1229 (C.C.P.A. 1982) (internal citation omitted).
355 See supra note 240.
359 547 U.S. at 396 (“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.”) (Kennedy, J., concurring).
360 547 U.S. at 396-97 (“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.”).
361 Beckerman-Rodeau, supra note 299, at 654-55.
one component of a broader technology. While further empirical work is needed, early evidence indicates that Supreme Court examples do in fact guide (and limit) lower courts’ application of new patent doctrine.

The Supreme Court’s use of examples lowers information costs in several ways. As a general matter, examples provide concrete guidance to a district court when applying a new, holistic standard. This guidance, however, assumes particular importance when the inquiries at issue involve technological subject matter. Regarding Festo, a simple admonition to determine where an “amendment cannot reasonably be viewed as surrendering a particular equivalent” invites a multitude of inquiries into the state of the art at particular times as well as the perspective of a PHOSITA. Similarly, a precisely articulated eBay framework would be more difficult to apply in the absence of illustrative examples arising in the majority opinion and concurrences. Examples add definition to this broad standard, thus limiting the range of technologically complex inquires district courts would otherwise make.

Ultimately, clearly defined frameworks coupled with illustrative examples offer a valuable blend of rules and standards. While holistic standards offer valuable flexibility and contextual consideration, they can impose high information costs. Formalistic rules are more cognitively economical, but they can be overly blunt and rigid. Focusing on doctrinal enablement would encourage the Court to articulate doctrine that is clear, limited, and accessible. In so doing, the Court can internalize the information cost externalities it normally imposes on lower courts.

C. Objections and Responses

Of course, this proposal to apply enablement principles to Supreme Court patent opinions must address several criticisms. The most obvious objection is that it is unenforceable. While the threat of losing patent protection motivates inventors to enable their inventions, no sanction will befall justices of the Supreme Court who do not enable their doctrinal innovations. Of course, reputational and professional interests in facilitating patent adjudication will hopefully motivate justices to consider enablement. Recently, the Court has shown great interest in modifying substantive patent doctrine; in order to ensure faithful application of new doctrine, the Court would be well-served to consider the methodological and cognitive implications of its pronouncements.

However, this proposal may best be understood as a prescription for exogenous parties influencing the Court. First, parties litigating before the Supreme Court, as well as amicus curiae, should consider the limitations of lay adjudicators when advocating particular interpretations of patent law. An emphasis on practical application would lead these parties to suggest clear, bounded standards as models for Supreme Court decisions. Second, more ambitiously, consideration of cognitive burdens should inform congressional discussions of patent reform. Along these lines, Chief Judge Paul Michel

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363 Festo VII, 535 U.S. at 725.
of the Federal Circuit has actively lobbied against legislative reforms that would enhance the complexity of damages calculations. As a general matter, members of Congress should consider the information costs of Supreme Court standards when reviewing various areas of patent law.

This proposed emphasis on enablement—and particularly the use of illustrative examples—is also subject to more substantive critiques. First is the obvious criticism that courts should only decide the case before them and not resolve “hypothetical” disputes. As Felix Frankfurter warned in the context of constitutional litigation, “Every tendency to deal with [legal contests] abstractedly, to formulate them in terms of sterile legal questions, is bound to result in sterile conclusions unrelated to actualities.” However, the “hypothetical” nature of an opinion is a question of degree, not kind. Certainly, a full-blown analysis of hypothetical situations not before the Court would be inappropriate. However, simply providing guiding principles does not constitute an “advisory” opinion that should trigger Frankfurter’s concerns. Thus, merely noting that courts determining injunctive relief should consider the manufacturing character of a patentee or that a patented invention is a component of a broader technology falls within the scope of appropriate judicial guidance.

This notion of advisory opinions raises the related question of whether patent disputes are binary or polycentric affairs. Many judges warn of the impropriety of extending beyond the dispute at hand to engage in “superfluous” expositions of the law. However, particularly at the level of the Supreme Court, patent litigation is not solely about the two parties paying the legal bills. Supreme Court patent rulings have enormous impact on inventors, business executives, lawyers, and courts, and providing guidance beyond the narrow confines of the parties’ facts is appropriate and even desirable.

Second, some might argue that focusing on enablement would lead the Supreme Court to overstep its institutional role in articulating patent doctrine. In the traditional paradigm, Congress enacts patent legislation, the Supreme Court provides high-level interpretation of important questions, and the Federal Circuit elaborates the details of patent law on a day-to-day level. This structure gives rise to two potential critiques. First, the Supreme Court may be overstepping its role by providing too much detail in its opinions. Because of institutional competence concerns, it may be preferable to allow the

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Federal Circuit to grapple with the nitty gritty details of patent doctrine. However, this objection merely accentuates the need for reform. If the Supreme Court is truly ill-suited to articulate patent doctrine, then it should either refrain from doing so (which has significant drawbacks) or invest the time, energy, and foresight to grapple with new doctrines and their myriad implications. Focusing on doctrinal enablement encourages precisely this type of “grappling.”

Second, some might suggest that the “defect” identified here is self-correcting. Indeed, over time, the accumulation of common law precedents may lead standards to naturally “crystallize” into brighter-line rules. Self-correction notwithstanding, there is much value to be gained from conscientious, ex ante definition of legal standards. The Supreme Court is the ultimate judicial authority on patent law, and greater sensitivity to the technological challenges of patent adjudication promises to create clearer, more administrable doctrine in the first instance.

VI. THE TWO CULTURES REFASHIONED: THE FEDERAL CIRCUIT AND THE SUPREME COURT

Ultimately, this study of the cognitive burdens of district court judges concludes by considering the relationship between two appellate courts: the Federal Circuit and the Supreme Court. This Article has used the trope of the Two Cultures to characterize generalist judges’ difficulties with technological engagement. However, the notion of the Two Cultures is relevant in another sense as well. In large part, it describes the methodological divergence of the formalistic Federal Circuit and the holistic Supreme Court. This Part concludes by exploring cultural tensions between these important institutions and their implications for patent doctrine.

The “proper” role of the Supreme Court vis à vis the Federal Circuit has attracted significant commentary. To a large degree, observers have proposed a limited role for the Supreme Court. For some, this view arises from the Court’s perceived

368 The Court itself has articulated this sentiment. See Warner Jenkinson, 520 U.S. at 39 (“With these limiting principles as a backdrop, we see no purpose in going further and micromanaging the Federal Circuit’s particular word choice for analyzing equivalence. . . . [W]e leave such refinement to that court’s sound judgment in this area of its special expertise.”).


370 There is a final objection here worth noting. While I have focused on the cognitive difficulties borne by district court judges, some would argue that this focus is misplaced. After all, courts should interpret patent doctrine to “promote the progress of useful arts,” not necessarily to ease cognitive burdens on judges. While it is certainly true that the aim of law is not to be easily administered, if it is not easily administered, it is unlikely to achieve its aims.

371 Cf. Kennedy, supra note 129, at 1710 (“[T]he arguments pro and con the use of rules have powerful overtones of substantive debates about what values and what visions of the universe we should adopt.”).


373 See Duffy, supra note 203, at 342 (suggesting that the Supreme Court should “recogniz[e] the limitations of its expertise and refrain[] from trying to lead the development of the law”).
incompetence in patent affairs. Professor Chisum characterized many Supreme Court patent decisions of the late 1990s as “weak, illogical, ambiguous, or inconsistent.”\textsuperscript{374} Professor Mark Janis has advocated a “managerial” role for the Supreme Court in which it should: 1) only review patent issues involving a compelling issue of the allocation of power among institutions and 2) confine its opinions to the rationale for intervention.\textsuperscript{375} Similarly, Professor John Duffy argues that the Court should focus on institutional issues, adhere to precedent, and refrain from leading substantive doctrinal change.\textsuperscript{376} More recently, Professor John Golden has suggested that the Court should serve as the “prime percolator” rather than the “final law sayer” for patent matters.\textsuperscript{377} Within this view, the Court should limit intervention to areas where Federal Circuit precedent has unduly “frozen” patent doctrine.\textsuperscript{378} In most of these formulations, the Supreme Court is an infrequent and modest intervener in patent affairs, leaving control largely to the Federal Circuit.

Unlike these other accounts, this Article does not propose substantive guidelines for the Supreme Court’s role in patent affairs. Rather, it proposes methodological ones.\textsuperscript{379} It accepts as a descriptive and normative matter that the Supreme Court has an important role to play in articulating patent doctrine. However, it suggests that when doing so, the Supreme Court should be aware of the “costly” standards it creates and their implications for patent adjudication by generalist judges. This proposal seeks to retain the value of a flexible, holistic approach to patent law while providing guidance to district court judges facing highly technical inquiries. This Part probes deeper to examine the cultural underpinnings of the Supreme Court’s divergence from the Federal Circuit. In so doing, it explores a connection between generalism and holism, on the one hand, and specialization and formalism, on the other.

The Supreme Court’s recent forays into patent law give rise to two somewhat paradoxical observations. First, in some sense, the Supreme Court has much more in common with district courts than those courts have in common with the Federal Circuit. Like the typical district court, the Supreme Court hears relatively few patent disputes.\textsuperscript{380} Far from being a quasi-specialized court like the Federal Circuit, the Supreme Court’s wide-ranging jurisdiction more closely parallels that of district courts. The Supreme Court’s generalist orientation thus offers a “commonsense” check on the more specialized, technically expert Federal Circuit. This perspective is most prevalent in \textit{KSR

\textsuperscript{374} Chisum, supra note 343, at 3-4.
\textsuperscript{375} Janis, supra note 203, at 408.
\textsuperscript{376} Duffy, supra note 203, at 301-05.
\textsuperscript{377} Golden, supra note 216, at 662.
\textsuperscript{378} Id. at 662.
\textsuperscript{379} See supra Part V.
\textsuperscript{380} Burk & Lemley, supra note 35, at 1196 (“The average judge may hear no more than one patent case every few years.”); S. Jay Plager, \textit{Abolish the Court of Federal Claims? A Question of Democratic Principle}, 71 GEO. WASH. L. REV. 791, 796-97 (noting that the obscurities of patent law, the complexities of new technologies, and the infrequency of patent cases make such matters particularly difficult for district court judges).
v. Teleflex, which privileges commonsense assessments of nonobviousness at the expense of technical frameworks like the TSM test.\textsuperscript{381}

In another sense, however, the Supreme Court is very distant from district courts. Unlike district court judges, justices of the Supreme Court do not manage complicated fact-finding.\textsuperscript{382} The justices rarely struggle with construing claims and determining prosecution history estoppel, nonobviousness, or the appropriateness of injunctive relief. Furthermore, the Court is largely shielded from the most complex inventions; one criterion for seeking Supreme Court review of patent cases is that the underlying technologies are relatively simple.\textsuperscript{383} As such, while injecting seemingly “commonsense” standards into patent law, the Supreme Court is significantly insulated from having to apply them in more complicated settings.

This situation represents a perfect storm for producing “costly” Supreme Court patent law. The generalist Court approaches technology as a neophyte, and it establishes broad standards in patent law. While these standards may have commonsense appeal, they create high information costs for those who must apply them. However, the Court, because of its limited docket, is largely insulated from these costs.

On a related note, the Court’s relative insulation from patent law, as well as its generalist outlook, has made it skeptical of patent “exceptionalism.” Earlier, we saw that the Federal Circuit’s traditional, bright-line approach to infringement remedies reduced technological engagement by courts. However, in \textit{eBay}, the Supreme Court clarified that the same equitable standards apply to patent injunctions as injunctions in any other context.\textsuperscript{384} Nowhere in the opinion did the Court acknowledge the higher information costs that this framework would produce. Rather, the Court was more interested in conforming patent law to broader legal doctrines and principles.\textsuperscript{385}

The Federal Circuit, which manages patent law on an everyday level, offers an illuminating contrast. The Federal Circuit’s proximity to everyday litigation provides it with a deeper appreciation of technological complexity as well as the information costs of adjudicating patent disputes. For example, the Federal Circuit’s concerns over “workability” led to its short-lived “complete bar” approach to prosecution history estoppel.\textsuperscript{386} Furthermore, as noted, Chief Judge Paul Michel has argued against patent damages reforms that would compel courts to perform difficult valuations of new

\textsuperscript{381} 550 U.S. 398, 421 (2007).
\textsuperscript{382} \textit{Cf.} Duffy, \textit{supra} note 203, at 329 ("[P]atent cases are likely to involve a great amount of technological detail that the Court is ill-suited to evaluate.").
\textsuperscript{385} \textit{See also} MedImmune, Inc. v. Genentech, Inc., 549 U.S. 118 (2007) (holding that the same standards govern declaratory actions in patent cases as apply to non-patent cases).
\textsuperscript{386} Festo VI, 234 F.3d 558 (Fed. Cir. 2000) (en banc); Wagner, \textit{Reconsidering Estoppel}, \textit{supra} note 150, at 238 (noting that the Federal Circuit is uniquely well-positioned to evaluate the effectiveness of patent doctrines).
technologies. Accordingly, the Federal Circuit’s appreciation for the demands of patent adjudication informs its formalistic, inquiring-truncating doctrine. Thus the cultural orientations of the Federal Circuit and the Supreme Court, one based on specialization and the other based on generalism, help explain their methodological preferences for formalism and holism.

This methodological divergence, however, arises from other causes as well and offers a window into the differing characters of generalist and specialized courts. Throughout this Article, I have referred to the Supreme Court’s “holistic turn” to accentuate the Court’s recent interventions in patent law. As I have indicated, however, the Supreme Court’s preference for holistic standards has a long history throughout its engagements with patent law. In some ways, this preference reflects yet another strategy for avoiding (or, more precisely, delegating) information costs; rather than clearly defining, limiting, and guiding patent doctrine, the Supreme Court announces nebulous standards that pass high information cost externalities onto others.

However, holistic standards serve other, more laudable objectives also relating to the Court’s generalist outlook. For example, Supreme Court standards facilitate a purposive, policy-oriented approach to resolving patent disputes. In contradistinction to Federal Circuit formalism, discretionary standards allow judges to consider context and implications in deciding patent cases; this flexible approach arguably better accommodates the instrumentalist character of the patent system. Furthermore, Supreme Court standards also reflect an attempt to harmonize this specialized area of law with transcendent legal principles. This holistic, “big picture” approach reflects both the Supreme Court’s generalist character as well as its position at the top of the judicial hierarchy.

On the other hand, a (quasi-)specialized court such as the Federal Circuit takes a much narrower, more technical approach to its subject. It is concerned less with big-picture coherence and more with everyday practicality; hence it emphasizes inquiry-truncating formalistic rules. Furthermore, such a specialized court is more likely to appreciate the singularity of its subject, thus trending toward doctrinal exceptionalism.

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387 Michel Letter, supra note 364.
390 See U.S. CONST. art. I, § 8, cl. 8 (granting Congress the power “To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries”); Rai, Engaging Facts and Policy, supra note 28, at 1040.
391 Law Professor calls for ‘Dialogue,’ supra note 341, at 792 (suggesting that intervention by a generalist court can lead to greater high-level consideration of how patents fit into the economy as a whole).
The result is bright-line, specialized rules that limit judicial discretion and admit fewer contextual factors.

Of course, culture is fluid, and the dynamic described here is not static. In particular, there are signs that the Federal Circuit is responding in kind to the Supreme Court’s holistic turn. For example, in In re Kubin, the Federal Circuit drew from KSR to affirm that the status of a combination as being “obvious to try” may, in some cases, render it obvious.393 In announcing its new rule, the Federal Circuit stated, “The Supreme Court’s admonition against a formalistic approach to obviousness in this context actually resurrects this court’s own wisdom” from earlier case law.394

More substantively, one sees some indication of a “holistic turn” in the Federal Circuit’s decision in In re Bilski.395 There, the Federal Circuit overruled previous doctrine establishing an expansive, relatively bright-line approach to the patentability of processes.396 Instead, the Federal Circuit announced the so-called “machine-or-transformation” test to guide patent eligibility. Characterizing Bilski as a formalistic or holistic opinion is somewhat difficult. On the one hand, the Federal Circuit’s ruling that processes are only patentable if they are attached to a machine or transform an article into a different state or thing397 smacks of bright-line rules and formalism. On the other hand, relative to precedents essentially equating patentable subject matter with utility,398 Bilski demands deeper, more holistic examinations of inventions. The Federal Circuit’s machine-or-transformation test has proven controversial,399 and the Supreme Court is currently reviewing Bilski.400 It remains to be seen whether the Court will continue its holistic turn or perhaps adopt a more formalistic approach.401 Although reflecting two divergent cultures, the Federal Circuit and the Supreme Court are locked in dialogue,402 and cultural orientations may shift over time.

**CONCLUSION**

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393 561 F.3d 1351 (Fed. Cir. 2009).
394 561 F.3d at 1359; see KSR Ruling Guides Application of ‘Obvious to Try’ Test to Biotech Claims, 77 U.S. LAW WEEK 1634, 1634 (2009).
395 In re Bilski, 545 F.3d 943 (Fed. Cir. 2008) (en banc).
396 545 F.3d at 960-61; see In re Alappat, 33 F.3d 1526 (Fed. Cir. 1994); State Street Bank & Trust Co. v. Signature Financial Group, Inc., 149 F.3d 1368 (Fed. Cir. 1998); AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352 (Fed. Cir. 1999).
397 545 F.3d at 954.
398 State Street, 149 F.3d 1368.
399 545 F.3d at 1015 (Rader, J., dissenting) (“[T]his opinion propagates unanswerable questions.”).
401 See Law Professor Calls for ‘Dialogue,’ supra note 341. Indeed, counsel for Bilski has encouraged the Supreme Court to continue its inclination to overturn “rigid and narrow” tests created by the Federal Circuit. See Tony Dutra & Anandashankar Mazumdar, Justice Hear Oral Argument on Patentability of Business Methods, 78 U.S. L. Week 3282, 3282 (2009).
402 The dialogue metaphor is a popular one for describing the relationship of these two courts. See, e.g., Castanias et al., supra note 207; Law Professor calls for ‘Dialogue,’ supra note 341.
Patent law represents a fascinating intersection of two divergent cultures: law and technology. This Article has used the trope of the Two Cultures to examine the difficulties inherent in generalist judges adjudicating technologically complex patent cases. Judges express significant anxiety over their ability to understand new technologies, and empirical evidence confirms that these anxieties are well-founded. The challenge of bridging the Two Cultures has elicited a number of policy responses, from selecting scientifically-trained judges to establishing specialized courts. This Article, however, reveals the underappreciated role of doctrine in mitigating the burdens of adjudicating technological subject matter.

In pursuing this theme, this Article has explored the psychology of technological engagement. This literature reveals that technology can impose significant burdens on lay people, who employ a variety of mechanisms to mitigate them. In particular, consistent with a “cognitive miser” model of information processing, non-experts commonly adopt simplifying heuristics and defer to technical expertise when confronting unfamiliar technologies.

Drawing from these psychological principles, this Article has presented an information cost theory of patent doctrine. It argues that the formalistic nature of Federal Circuit jurisprudence mitigates technological engagement by generalist judges. In particular, the inquiry-truncating nature of formalism limits the universe of technological facts that judges must consider in deciding patent issues.

However, the Supreme Court’s recent forays into patent law push against these principles and promise to increase information costs. While the Court’s narrowing of substantive patent rights is indeed significant, this Article highlights the Court’s underappreciated methodological shift. In a variety of doctrinal areas, the Supreme Court is consistently favoring holistic standards over bright-line, formalistic rules. This “holistic turn,” while injecting some valuable flexibility in patent adjudication, threatens to increase cognitive demands on generalist judges. From an economic perspective, Supreme Court patent standards impose information cost externalities on lower court adjudicators. To internalize these externalities, this Article seeks to apply enablement principles to Supreme Court patent decisions. By encouraging Supreme Court justices to consider and illustrate myriad applications of new patent law, an enablement orientation would help produce doctrine that is clearer and more accessible to persons of ordinary skill in legal arts.

This inquiry holds several broader implications. In a general sense, it argues for exploiting science and technology studies as a scholarly resource for understanding and improving the patent system. Additionally, it sheds new light on formalism, which plays a surprising role in mediating the intersection of lay judges and technological subject matter. Finally, this Article has explored the institutional bases for the methodological divergence of the Federal Circuit and the Supreme Court. In substantial part, the Federal Circuit’s preference for formalism relates to its specialized nature while the Supreme Court’s generalist outlook informs its preference for holistic standards. These seminal

403 See Hultberg, supra note 9, at 198.
institutions have important and differing views on patent law, and the most fruitful engagements between law and technology may arise from blending the virtues of both.