

NOT SO OBVIOUS AFTER ALL: PATENT'S NONOBVIOUSNESS REQUIREMENT, *KSR*, AND THE FEAR OF HINDSIGHT BIAS

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Over the last three decades, since the advent of the Federal Circuit in 1982, we have seen the slow demise of the nonobviousness requirement. Judicially created in the 19th century and codified in section 103 of the 1952 Patent Act, the nonobviousness requirement seeks to limit the availability of patents to those inventions “which would not be disclosed or devised but for the inducement of a patent.”¹ While patent law’s novelty requirement requires only that an invention be new – that it represent any sort of advance over the existing art – nonobviousness requires something more. However phrased, whether as “invention” in the original judicially-created version or as “nonobviousness” since its codification, the requirement asks not whether some technological advance has occurred, but whether there has been sufficient technological advance to warrant the grant of a patent. The whole point of the doctrine is to separate trivial advances from more substantial advances, and to ensure that only the latter receive patents.

Before the creation of the Federal Circuit in 1982, nonobviousness served as the primary gatekeeper for patents. An empirical study of appellate patent litigation from the 1940s through 1982 reveals that, when patent holders sued for infringement and lost, they lost approximately sixty-five percent of the time on the grounds that their patent was obvious.² With the rise of the Federal Circuit, the height of the nonobviousness hurdle has steadily declined. From 1984 through 2001, it represented the reason a patent holder lost in less than fifteen percent of cases, on average. By 2005, the doctrine had reached its nadir. In that year, when patent holders sued for infringement and lost, obviousness was the reason in less than five percent of the cases.³ While nonobviousness remained formally a requirement of patent protection, to the Federal Circuit, almost nothing was obvious.

A potential turning point arose in 2007, however, with the Court’s decision in *KSR v. Teleflex*.⁴ In its first substantive return to the nonobviousness requirement since the Federal Circuit’s advent, the Court, with one hand, rejected some of the key restrictions the Federal Circuit had placed on the obviousness doctrine, and with the other, broadened the circumstances under which obviousness could be found. Taken at face value, the Court’s decision seemed poised to reinvigorate the nonobviousness requirement.

Both anecdotal and empirical analysis of the Federal Circuit’s decisions after *KSR* suggests that the decision has had some impact. In finding patents obvious in individual cases, the Federal Circuit has cited extensively to the Court’s holding and reasoning in *KSR*. And, since *KSR*, when a patent holder loses, obviousness was the reason in nearly twenty percent of the cases. This is somewhat above the fifteen percent average for which obviousness accounted in the pre-*KSR* Federal Circuit era and well above the five percent level of losses for which obviousness accounted in 2005. The Court’s decision in *KSR* thus seems to have helped the nonobviousness requirement recover, at least somewhat, from its near-death experience.

¹ Graham v. John Deere Co., 383 U.S. 1, 11 (1966).

² See text accompanying notes []-[] *infra*.

³ See text accompanying notes []-[] *infra*.

⁴ 550 U.S. 398 (2007).

Even following *KSR*, however, the nonobviousness requirement remains a pale shadow of its former self. While the twenty percent of losses for which obviousness accounted since *KSR* is somewhat above the fifteen percent average for which obviousness accounted in the pre-*KSR* Federal Circuit era, it remains a far cry from the sixty-five percent of losses for which obviousness accounted in the pre-Federal Circuit era.

When we look for reasons behind the diminished vitality, we find *inter alia* a fear of hindsight. As articulated by the Federal Circuit, improper hindsight entails the use of an inventor's own invention against her.⁵ Having seen how the inventor solved a problem, it becomes trivial to use that solution as a road map to piece together the prior art and conclude that the solution was obvious.⁶ Over and over again, the Federal Circuit has reversed a district court's conclusion of obviousness, and accused the district court of improperly resorting to hindsight.⁷ On those occasions when a majority of a panel concludes that an invention was obvious, often we will find a dissent chiding the majority for resorting to improper hindsight.⁸ And when courts seek to justify existing doctrine or some doctrinal innovation limiting the scope of obviousness, they often insist that the limitation is necessary to prevent the use of improper hindsight.⁹

⁵ See *In re Kotzab*, 217 F.3d 1365, 1369 (Fed. Cir. 2000) (noting the importance of casting the mind back to the time of the invention to avoid the "insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher"); see also *Panduit Corp. v. Dennison Mfg. Co.*, 774 F.2d 1082, 1092 (Fed. Cir. 1985) ("In deciding the obviousness question, the district court looked to knowledge taught by the inventor Caveney, in his patents and in his testimony, and then used that knowledge against its teacher."), *vacated*, 475 U.S. 809 (1986) (vacating in a per curiam opinion for failing to explain the proper standard of review in reviewing obviousness determinations).

⁶ See *In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992) ("It is impermissible to use the claimed invention as an instruction manual or "template" to pieced together the teachings of the prior art so that the claimed invention is rendered obvious."); *Interconnect Planning Co. v. Feil*, 774 F.2d 1132, 1138 (Fed. Cir. 1985) ("The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time.").

⁷ See, e.g., *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546 (Fed. Cir. 1998) (reversing jury's finding of obviousness and concluding that in the absence of a teaching or suggestion to combine the prior art references, jury must have resorted to improper hindsight); *Monarch Knitting Mach. Corp. v. Sulzer Morat GmbH*, 139 F.3d 877, 881 (Fed. Cir. 1996) ("Defining the problem in terms of its solution reveals improper hindsight in the selection of the prior art relevant to obviousness."); *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1271 (Fed. Cir. 1991); *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1054 (Fed. Cir. 1988) ("Having carefully reviewed the record, we conclude that the district court impermissibly used a hindsight analysis in determining that the claimed invention would have been obvious and did not properly analyze and consider secondary indicia of nonobviousness."); *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 448 (Fed. Cir. 1986) (reversing district court's conclusion of obviousness and declaring it the result of "improper hindsight analysis").

⁸ See, e.g., *Bayer Schering Pharma AG v. Barr Labs., Inc.*, 575 F.3d 1341, 1351 (Fed. Cir. 2009) (Newman, dissenting) ("The evidence in this case is a better measure of obviousness than is the hindsight science of judges"); *Erico Int'l Corp. v. Vutec Corp.*, 516 F.3d 1350, 1360 (Fed. Cir. 2008) (Newman, dissenting) ("The district court considered the relative simplicity of the invention, a factor that appears to have influenced my colleagues, who with perfect hindsight find that it would have been obvious to make Erico's J-hook by combining the OBO Betterment reference, the EIA standards, and Mr. Laughlin's testimony."); *In re Omeprazole Patent Litig.*, 483 F.3d 1364, 1381 (Fed. Cir. 2007) (Newman, dissenting) ("Hindsight is not an available analytical mechanism to show obviousness.") *Para-Ordnance Mfg. v. SGS Importers Int'l*, 73 F.3d 1085, 1091 (Fed. Cir. 1995) (Archer, C.J., dissenting) ("The obviousness analysis in this case is a classic example of hindsight.").

⁹ See, e.g., *Graham v. John Deere Co.*, 383 U.S. 1, 36 (1966) (justifying relevancy of the secondary considerations on the grounds that they "may also serve to 'guard against slipping into use of hindsight,' *Monroe Auto Equipment Co. v. Heckethorn Mfg. & Sup. Co.*, 332 F.2d 406, 412 (1964), and to resist the temptation to read into the prior art the teachings of the invention in issue."); *In re Dembiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999) ("Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based

This paralyzing fear of hindsight has received academic support as well. In a series of articles, Professor Gregory Mandel has presented results from simulations that he believes demonstrate the potential for substantial hindsight bias in patent litigation.¹⁰ In his simulations, he presented one group of law students with a description of a problem to be solved, described the available prior art, and asked them if they thought a solution would be obvious (the “foresight” scenario). To a second group, he presented the same problem and prior art, and asked again if a solution would be obvious, but before asking, he added one thing: a brief description of the solution that had been discovered (the “hindsight” scenario). Finding a statistically significant and quite large difference between the percentages of respondents who found the invention obvious in the foresight and hindsight scenarios, Professor Mandel proclaimed his results proof of an equally large hindsight bias in patent litigation.

Yet, before we give in to our fear, perhaps a closer look at hindsight is in order. By its express terms, section 103 directs us to determine whether the advance at issue “would have been obvious at the time the invention was made”¹¹ While this statutory language expressly states that obviousness is to be determined at the time the invention was made, it does not expressly forbid the use of facts arising after the date of invention in making that determination. Indeed, not even the Federal Circuit prohibits the use of hindsight altogether in making obviousness determinations. To the contrary, the Federal Circuit expressly requires the consideration of facts occurring after “the time the invention was made” in making obviousness determination in the context of so-called secondary factors, such as the commercial success of a patented invention, copying by others, or its widespread licensing. These facts necessarily arise after the time of invention and thus represent hindsight, yet the Federal Circuit has emphasized that they may be some of “the most probative and cogent evidence available”¹² on the obviousness issue. Somewhat curiously, in some opinions, the Federal Circuit will insist that hindsight must not be used in one sentence, and then in the very next, insist that after-arising facts, such as commercial success, must be considered, without recognizing the apparent contradiction in the two statements.¹³

obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references.”); *In re Rouffet*, 149 F.3d 1350, 1357-58 (Fed. Cir. 1998) (“To counter this potential weakness in the obviousness construct, the suggestion to combine requirement stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness.”).

¹⁰ Gregory N. Mandel, *Patently Nonobvious: Empirical Demonstration that the Hindsight Bias Renders Patent Decisions Irrational*, 67 OHIO ST. L.J. 1391 (2006); see also Gregory Mandel, *Patently Nonobvious II: Experimental Study on the Hindsight Issue Before the Supreme Court in KSR v. Teleflex*, 9 YALE J.L. & TECH. 1 (2006-2007).

¹¹ 35 U.S.C. § 103(a) (2011).

¹² *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983); see also .

¹³ For example, in his recent *Star Scientific Inc. v. R.J. Reynolds Tobacco Co.* opinion, Judge Rader wrote:

Importantly, the great challenge of the obviousness judgment is proceeding without any hint of hindsight. Further, secondary considerations “may often be the most probative and cogent evidence [of nonobviousness] in the record.”

2011 U.S. App. LEXIS 17826, at *24. He then proceeded to reverse a jury’s verdict of obviousness based in part on the invention’s widespread acceptance and commercial success in the relevant industry. *Id.* at *29. The Court made the same mistake in *Graham v. John Deere Co.* See *Graham*, 383 U.S. 1, 36 (1966) (justifying relevancy of the secondary considerations on the grounds that they “may also serve to ‘guard against slipping into use of hindsight”).

Given its treatment of commercial success, patent law already requires us to distinguish between permissible and impermissible hindsight. While the statute requires us to determine obviousness as of the time the invention was made, facts that arise after that time¹⁴ can cast light on the question of whether the invention was obvious at the time it was made and can thus be relevant, in the broad sense Federal Rule of Evidence 401 provides.¹⁵ The fact that a patented invention goes on to prove a commercial success, after the fact, provides some evidence that it was not obvious at the time it was invented. Commercial success is not, of course, infallible evidence of nonobviousness. As others have pointed out, the inferential chain from the fact of commercial success to the question of obviousness is long, complex, and easily broken.¹⁶ Certainly, some nonobvious innovations meet with commercial success, but it's equally true that some products meet with commercial success without any underlying innovation at all. Despite the potential to mislead, we nevertheless admit evidence of commercial success and leave to the fact-finder the choice as to which inference to make.

Given that we expressly permit the use of hindsight in obviousness determinations, it is a little difficult to see why the fact-finder is forbidden to consider the patentee's own invention on that issue. If obviousness reflects a judgment as to whether an invention was substantial or trivial, was difficult or easy, for a person having ordinary skill in the art, then whether the invention at issue was hard or easy for the patentee would seem relevant. Certainly, the inferential chain from the difficulty the invention presented for the patentee to the difficulty it would have presented to a person having ordinary skill in the art is far more direct and straightforward than the inferential chain for many of the secondary considerations. If it was easy for the patentee, that suggests that it would have been easy (and hence obvious) for a person having ordinary skill in the art. If it was hard for the patentee, that suggests that it would have been hard for a person having ordinary skill in the art. Admittedly, the inferential chain is not fool-proof. A fact-finder may mistakenly infer obviousness from the fact that it was easy for the patentee, when the ease was due to the patentee's exceptional skill in the art. Or a fact-finder may mistakenly infer nonobviousness from the fact that it was hard for the patentee, when the difficulty was due to the patentee's lack of skill in the art.¹⁷

Yet, as with the secondary factors, the mere possibility of a mistaken inference should presumably not bar consideration of the inventor's own work in determining whether the

¹⁴ In a literal sense, using the patentee's own invention as evidence on the obviousness issue is not hindsight at all. The patentee's own invention is not an after arising fact. It does not arise after the date of invention, but simultaneously with it.

¹⁵ Rule 401 provides:

“Relevant evidence” means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence.

Fed. R. Evid. 401 (2011).

¹⁶ See Edmund W. Kitch, *Graham v. John Deere Co.: New Standards for Patents*, 1966 SUP. CT. REV. 293, 332 (1966) (identifying four inferential steps from commercial success to nonobviousness: (1) success is due to innovation; (2) perceived before its development; (3) efforts were made to improve patent after commercial success was perceived; and (4) that other men of art created the patent first but the patentee was the first to reduce his to development).

¹⁷ One of the co-authors has previously warned of this type of risk before. See Glynn S. Lunney, Jr., *E-Obviousness*

invention was obvious at the time it was made. As with other evidence, the question is not whether this evidence creates a risk of mistakes, in a particular case here or there, but whether it introduces a systematic bias. We should thus ask whether the use of this evidence would tend to lead a fact-finder consistently astray – to find an invention obvious, when it was really nonobvious, or to find it nonobvious,¹⁸ when it was really obvious. Unfortunately, on this question, we do not have much in the way of answers.

Professor Mandel’s work does not answer this question. He presents a foresight scenario to one group of respondents and a hindsight scenario to a second. Finding a difference between the percentages of respondents who found the invention obvious in the two scenarios, he labels the difference “bias” without any further analysis. This is improper. Bias refers not to a difference between two scenarios, but between one scenario and the true value. It may be that the inventions in his scenarios were in fact obvious, and thus the hindsight consideration of the inventor’s own solution pushed respondents in the proper direction. In that case, there would be the use of hindsight, but no bias. On the other hand, it may be that the inventions in his scenarios were in fact not obvious. In that case, the hindsight pushed his respondents in the improper direction. In which case, there would be both hindsight and bias. However, unless we know whether the inventions were obvious or not, we cannot meaningfully distinguish, based upon his work, whether the use of hindsight increased or decreased the bias that would otherwise have been present.¹⁹

Whether treated as an issue of law or fact, our decision-maker on the nonobviousness issue necessarily has imperfect information. Moreover, we ask them to judge whether the invention “would have been obvious . . . to a person having ordinary skill in the art,”²⁰ when they are in fact not such a person themselves. Given this background, it would seem that more information on the issue, rather than less, would necessarily improve our decision-maker’s ability to get the obviousness issue right. Before we condemn the use of the patentee’s own activities as impermissible hindsight, we should consider whether such information plays a legitimate informational role – legitimate in the sense that it improves our decision-makers’ ability to decide the obviousness issue consistently and correctly.

To try and answer that more difficult question, we have taken Professor Mandel’s approach and extended it. As he did, we used a survey format and students as our subjects. We divided them into groups and presented each group with a different scenario. For the first two groups, we followed Professor Mandel’s format exactly. We presented the groups with foresight and hindsight scenarios, respectively, and asked if a given invention would have been obvious to a person having ordinary skill in the relevant art. As Professor Mandel did, we found a significant and large difference between the percentages of respondents who found the invention

¹⁸ Or given patent law’s presumption of validity, to find that obviousness was not proven.

¹⁹ For his scenarios, Professor Mandel used actual cases, one involving a patent on a baseball with marks on it to indicate finger positions for various pitches, and another with a patent for a fishing lure. We could, and will, look at how the courts resolved those cases as evidence on that issue. But that, too, is not a complete answer. For the results in those cases may themselves have been driven by either an insufficient or an undue fear of hindsight bias. When we refer to a “correct” resolution of the obviousness issue, we refer to the decision that a judge would reach in order to maximize social utility given perfect information as to the costs and benefits to society of finding a given patented invention obvious or nonobvious. It is possible but unlikely that the actual judicial decisions, made with necessarily imperfect information, achieved that result. For a discussion of this and related issues, please see text accompanying notes []-[] *infra*.

²⁰ 35 U.S.C. § 103(a) (2011).

obvious between the two scenarios. In the foresight scenario, forty-eight percent of respondents found the invention obvious; in contrast, in the hindsight scenario, seventy percent of the respondents found the invention obvious. While not quite as large as the difference in obviousness Professor Mandel found in his two scenarios, these initial results essentially duplicate Professor Mandel's findings.

Having replicated Professor Mandel's results, we then created two additional scenarios in an attempt to explore the informational role hindsight seems to be playing. In our third scenario, we presented the respondents with the same prior art and the same problem to be solved as in the first two scenarios. We then told the respondents that the problem has been solved, as in the hindsight scenario. However, rather than tell the respondents the solution directly, we offered the respondents four possible solutions and told them that only one of them was the real solution, while the other three were never developed or patented. After presenting the four possible solutions, of which only one was the real solution, we then asked if each solution would have been obvious. In this "imperfect hindsight" scenario, only thirty-eight percent of the respondents found the correct solution obvious. This thirty-eight percent is not statistically different from the forty-eight percent that found the invention obvious in the foresight scenario. Thus, mere knowledge that a solution was found, while a form of hindsight, does not appear sufficient to create the hindsight difference that Professor Mandel identified.

In our fourth and final scenario, we presented a fourth group of respondents with the same prior art and the same problem to be solved. Before going any further, we then stopped and asked the respondents to write a few lines to describe briefly how they think the inventor might solve the problem. In other words, we tried to get the respondents to put themselves into the shoes of a person of ordinary skill in the art and think about the problem and how it might be solved. Rather than merely listen passively, we tried to encourage the respondents to engage actively with the problem. We then followed the pattern of the third scenario, presented the respondents with four possible solutions, told them that only one of them was the real solution, while the other three were never developed or patented, and asked if each was obvious. In this "imperfect hindsight with engagement" scenario, fifty-eight percent of respondents found the correct solution obvious. Importantly, this fifty-eight percent is statistically indistinguishable from the seventy percent who found the invention obvious in the hindsight scenario.

The results from this final scenario raise real questions regarding the very existence of a hindsight bias. Consider the following logic chain. First, our results reveal no hindsight bias in the third scenario, because its obviousness results are statistically indistinguishable from the foresight scenario results. Second, the respondents in the third and fourth scenario are provided with identical hindsight information. As a result, there should be no more hindsight bias in the fourth scenario than in the third, and if there is no hindsight bias in the third, there should be none in the fourth. Third, the obviousness results from the fourth scenario, which contain no hindsight bias, are statistically indistinguishable from the hindsight scenario, and thus the hindsight scenario should contain no hindsight bias either.

If this logic chain is correct and the obviousness results from the hindsight scenario do not contain hindsight bias, then, we need to ask, what explains the difference in obviousness results between the first and second scenarios? We are not sure. But one possibility is that providing respondents with perfect hindsight helps them to make the obviousness determination more accurately by providing them with information that more closely parallels the information that would have been available to a person having ordinary skill in the art. This, after all, was

the point of the fourth scenario, trying to get the respondents to engage with the problem and act as if they were a person of ordinary skill in the art. That the obviousness results are statistically indistinguishable between the hindsight and engagement scenarios suggests that perfect hindsight achieves the same effect as engagement. Under this interpretation, perfect hindsight does not create bias. Rather, it serves to correct the inaccuracy that would otherwise enter the obviousness determination from asking those without skill in the art to judge an invention's obviousness as if they had such skill.

While we find this to be a perfectly workable explanation for our results, we acknowledge that it is not the only possibility. Yet, at the very least, these results definitively establish that we know far less regarding the effects of hindsight, and the presence of hindsight bias, than Professor Mandel's work suggests.

This article explores these issues in turn. We begin with a brief history of the nonobviousness doctrine and present the results from our analysis of the role obviousness has played in explaining patentee losses in appellate patent litigation. As part of this, we examine the Court's decision in *KSR v. Teleflex* and its impact on obviousness determinations. We then place obviousness into a policy framework, and explain its role in a sensible patent system. Having done so, we then discuss the use of surveys and simulations to explore the role of hindsight in obviousness determinations. We begin with Professor Mandel's work, explore his key conclusions, and identify some concerns we have with his approach. We then present our work in the same area, explain the reasons behind our additional scenarios, and explore what our results mean for the use of hindsight and the presence of hindsight bias in the patent system.

I. *A Brief History of Obviousness*

A. *Obviousness: Origins and Development*

Until the 1952 Patent Act, the patent statutes expressly required only novelty and utility for patentability. Nevertheless, in the middle of the 19th century, the courts added a third requirement. Known as invention until its codification in 1952, and as nonobviousness since its codification, this third requirement asks that an invention represent not only some advance over the prior art to receive a patent, but a substantial advance.

We usually trace the genesis of the doctrine to the Court's decision in *Hotchkiss v. Greenwood*.²¹ In that case, the plaintiff sued for infringement of its patent on an improved door knob, where the improvement consisted of the use of potter's clay or porcelain for the knob, rather than one of theretofore traditional materials, such as wood or metal. Each of the elements of the invention, the clay knob, the shank and spindle, and the dovetail cavity used to connect the shank and spindle to the knob was known in the prior art, but the patentee was the first to combine those elements. In presenting the case to the jury, the plaintiff requested the following jury instruction:

although the clay knob, in the form in which it was patented, may have been before known and used, and also the shank and spindle by which it is attached may have been before known and used, yet if such shank and spindle had never before been attached in this mode to a knob of potter's clay, and it required skill and invention to attach the same to a knob of this description, so that they would

²¹ 52 U.S. 248 (1851).

be firmly united, and make a strong and substantial article, and which, when thus made, would become an article much better and cheaper than the knobs made of metal or other materials, the patent was valid, and the plaintiffs would be entitled to recover.²²

But the trial court rejected the plaintiff's proposed instruction and instead instructed the jury that:

if knobs of the same form and for the same purposes as that claimed by the patentees, made of metal or other material, had been before known and used; and if the spindle and shank, in the form used by them, had been before known and used, and had been attached to the metallic knob by means of a cavity in the form of dovetail and infusion of melted metal, the same as the mode claimed by the patentees, in the attachment of the shank and spindle to their knob; and the knob of clay was simply the substitution of one material for another, the spindle and shank being the same as before in common use, and also the mode of connecting them by dovetail to the knob the same as before in common use, and no more ingenuity or skill required to construct the knob in this way than that possessed by an ordinary mechanic acquainted with the business, the patent was invalid, and the plaintiffs were not entitled to a verdict.²³

On these instructions, the jury returned a verdict for the defendant, and the plaintiff appealed, arguing that the instruction inaccurately set forth the law. On appeal, the Supreme Court affirmed, holding that the substitution of one material, whether clay or porcelain, in the knob for the more traditional metal or wood, in the absence of something more, lacked the necessary ingenuity or invention to warrant a patent.²⁴ As the Court wrote:

[U]nless more ingenuity and skill in applying the old method of fastening the shank and the knob were required in the application of it to the clay or porcelain knob than were possessed by an ordinary mechanic acquainted with the business, there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention. In other words, the improvement is the work of the skilful mechanic, not that of the inventor.²⁵

Through the use of the word "inventor," the Court tied this third requirement for patentability to the constitutional language in Article I, section 8, clause 8, authorizing Congress to grant exclusive rights "to Authors and Inventors."²⁶ Following *Hotchkiss*, the courts for the

²² *Id.* at 264.

²³ *Id.* at 264-65.

²⁴ *Id.* at 266 ("The difference is formal, and destitute of ingenuity or invention.")

²⁵ *Hotchkiss*, 52 U.S. at 267.

²⁶ U.S. Const. art. I, § 8, cl. 8 ("The Congress shall have 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.").

next hundred years struggled to define whether an advance was sufficient in any case to constitute an invention and hence represented the constitutionally-required work of an inventor.²⁷ In 1941, the standard reached its rhetorical high point. In *Cuno Engineering Corp. v. Automatic Devices Corp.*,²⁸ the Court began by reiterating the invention requirement: “Under the [patent] statute the device must not only be ‘new and useful,’ it must also be an ‘invention’ or ‘discovery.’”²⁹ In an attempt to elaborate on the distinction between the work of the “skillful mechanic” and that of the “inventor,” the Court then suggested an alternate verbal formulation: “the new device, however useful it may be, must reveal the flash of creative genius, not merely the skill of the calling.”³⁰

In 1952, Congress enacted the new patent statute and, for the first time, codified this third substantive requirement. Rather than retain the “inventor” or “invention” language, however, Congress phrased the requirement in terms of whether the claimed invention “would have been obvious at the time it was made to a person having ordinary skill in the art to which said subject matter pertains.”³¹ In the statutory language, Congress expressly stated that an invention could be obvious even though it was new,³² and also expressly directed courts to base the obviousness determination on “the differences between the subject sought to be patented and the prior art.”³³ In the final sentence, Congress seemed to step away from *Cuno Engineering’s* rhetorical flourish, stating: “Patentability shall not be negated by the manner in which the invention was made.”³⁴ Thus, even if the result of plodding and steady progress, rather than a flash of creative genius, an invention could be nonobvious.

In 1966, the Court gave the statutory nonobviousness requirement its first definitive interpretation in *Graham v. John Deere Co.*³⁵ In interpreting the provision, the Court began by articulating the requirement’s purpose. Patents are a form of monopoly, the Court explained, and so there is a need, as Thomas Jefferson explained it, for “drawing a line between the things which are worth to the public the embarrassment of an exclusive patent, and those which are not.”³⁶ In the Court’s view, “[t]he inherent problem was to develop some means of weeding out those inventions which would not be disclosed or devised but for the inducement of a patent.”³⁷ The *Hotchkiss* condition solved this problem, by separating the trivial advances – the work of the

²⁷ See, e.g., *Thompson v. Boisselier*, 114 U.S. 1, 11; *Hicks v. Kelsey*, 18 Wall. 670; *Slawson v. Grand Street R. Co.*, 107 U.S. 649; *Phillips v. Detroit*, 111 U.S. 604; *Morris v. McMillin*, 112 U.S. 244; *Saranac Automatic Machine Corp. v. Wirebounds Patents Co.*, 282 U.S. 704; *Honolulu Oil Corp. v. Halliburton*, 306 U.S. 550; *Reckendorfer v. Faber*, 92 U.S. 347, 356-357; *Concrete Appliances Co. v. Gomery*, 282 U.S. 173; *Powers-Kennedy Contracting Corp. v. Concrete Mixing & Conveying Co.*, 282 U.S. 175 (1930); *Electric Cable Joint Co. v. Brooklyn Edison Co.*, 292 U.S. 69; *Altoona Publix Theatres v. American Tri-Ergon Corp.*, 292 U.S. 477 (1935); *Textile Machine Works v. Louis Hirsch Textile Machines, Inc.*, 302 U.S. 490; *Toledo Pressed Steel Co. v. Standard Parts, Inc.*, 307 U.S. 350.

²⁸ 314 U.S. 84 (1941).

²⁹ *Id.* at 90.

³⁰ *Id.* at 91.

³¹ 35 U.S.C. § 103(a) (2011).

³² *Id.* (“A patent may not be obtained *though the invention is not identically disclosed or described as set forth in section 102 of this title, . . .*”).

³³ *Id.*

³⁴ *Id.*

³⁵ 383 U.S. 1 (1966).

³⁶ *Id.* at 9.

³⁷ *Id.* at 11.

“skillful mechanic” that would be brought forth even without the inducement of a patent – from the substantial advances – the work of an “inventor” that would require a patent’s inducement.³⁸

The Court then rejected suggestions “that the first sentence of § 103 was intended to sweep away judicial precedents and to lower the level of patentability.”³⁹ Instead of changing the level of patentability, the Court held “the section was intended merely as a codification of judicial precedents embracing the *Hotchkiss* condition.”⁴⁰

Having set forth the purpose and background of the nonobviousness requirement, the Court then articulated a three-part inquiry for resolving the issue. First, the fact-finder must determine the scope and content of the prior art. Second, the fact-finder must ascertain the differences between the prior art and the patent claims at issue. Third, the fact-finder must resolve the level of skill in the prior art. Once the fact-finder resolve these preliminary factual inquiries, then the judge must determine as a matter of law whether the differences represent an obvious or nonobvious advance over the prior art.⁴¹ In resolving that issue, a court may also consider “[s]uch secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc. . . .”⁴²

Three years later, in *Anderson’s-Black Rock, Inc. v. Pavement Salvage Co.*,⁴³ the Court returned to the nonobviousness requirement. The patent at issue, as in the *Hotchkiss* case, took existing elements from the prior art, in this case the prior art of paving, including a radiant-heat burner and the equipment for spreading and shaping asphalt, and combined them on one chassis. The Court held that the patent claims were invalid for obviousness. In doing so, the Court reasoned that “[t]he combination of putting the burner together with the other elements in one machine, though perhaps a matter of great convenience, did not produce a ‘new or different function,’” nor any “synergistic result.”⁴⁴ It was therefore obvious. And given that it merely combined existing elements from the prior art, the invention’s commercial success, or the fact that it filled a long felt need, could not establish invention or nonobviousness. As the Court wrote:

It is, however, fervently argued that the combination filled a long felt want and has enjoyed commercial success. But those matters “without invention will not make patentability.”⁴⁵

In short, the secondary factors were secondary. If a comparison of the claims to the prior art revealed only such slight differences that obviousness was plain, then the secondary factors could not establish invention that was otherwise lacking.

In 1976, the Court reiterated these points in *Sakraida v. Ag Pro, Inc.*⁴⁶ In *Sakraida*, the patent claimed, in essence, a barn washing mechanism, consisting of a tank filled with water, an appropriately sloped floor, and drains. In the patent, the tank would suddenly release its water in

³⁸ *Id.* at 11-12.

³⁹ *Id.* at 16.

⁴⁰ *Id.*

⁴¹ *Graham*, 383 U.S. at 17.

⁴² *Id.* at 17-18.

⁴³ 396 U.S. 57 (1969).

⁴⁴ *Id.* at 60-61.

⁴⁵ *Id.* at 61 (*quoting* *A. & P. Tea Co. v. Supermarket Corp.*, 340 U.S. 147, 153 (1950)).

⁴⁶ 425 U.S. 273 (1976).

order to wash the animal wastes down the drains. As in *Hotchkiss*, each of the elements of the patented invention was found in the prior art, but the patentee claimed that he was the first to combine them to create an effective barn washing device. The Court held that the patent claims were obvious.⁴⁷ Although the Court acknowledged that the patentee's combination of the elements produced "a more striking result than in previous combinations," the Court nonetheless insisted that the combination failed to produce a "synergistic" result. Rather, "this patent simply arranges old elements with each performing the same function it had been known to perform."⁴⁸ In the end,

[t]hough doubtless a matter of great convenience, producing a desired result in a cheaper and faster way, and enjoying commercial success, Dairy Establishment "did not produce a 'new or different function'... within the test of validity of combination patents." These desirable benefits "without invention will not make patentability."⁴⁹

While this trilogy established clear guidelines and set a high bar for satisfying the nonobviousness requirement, their influence proved short-lived. In 1982, Congress created the Federal Circuit and gave it largely exclusive appellate jurisdiction over patent appeals. Before the creation of the Federal Circuit, patent litigation followed the usual course. A patentee sued in any federal district court with venue and person jurisdiction over the alleged infringer. Appeals from patent infringement litigation went to the relevant regional circuit court of appeals. With the advent of the Federal Circuit, however, essentially all appeals from patent litigation went to the Federal Circuit, rather than regional court of appeals.

While the regional circuits largely shared the Court's perception of patents as potentially undesirable monopolies and therefore vigorously enforced the nonobviousness requirement, the Federal Circuit did not. Rather, it viewed patents as simply a desirable form of property. Almost immediately, it set about re-writing the nonobviousness requirement to make it easier to satisfy.

With respect to patents claiming a combination of prior art elements, the Federal Circuit simply rejected the Court's reasoning in *Anderson's-Black Rock* and *Sakraida*. There is no meaningful category of "combination" patents, the Federal Circuit insisted, and no "synergism" or "synergistic result" requirement in the statute. As Chief Judge Markey explained:

A requirement for "synergism" or a "synergistic effect" is nowhere found in the statute . . . The reference to a "combination patent" is equally without support in the statute. . . . Reference to "combination" patents is, moreover, meaningless. Virtually *all* patents are "combination patents," if by that label one intends to describe patents having claims to inventions formed of a combination of elements.⁵⁰

Yet, even if one accepts Chief Judge Markey's argument, that still leaves the question as to when a combination of prior art elements is nonobvious. In 1984, the Federal Circuit

⁴⁷ *Id.* at 282-83.

⁴⁸ *Id.* at 282.

⁴⁹ *Id.* at 282-83.

⁵⁰ *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1540 (Fed. Cir. 1983).

answered that question in *ACS Hospital Systems, Inc. v. Montefiore Hospital*.⁵¹ The patent at issue in *ACS Hospital Systems* claimed a rental television system. Finding that the claimed invention consisted of nothing more than a combination of three well-known prior art elements, operating in an entirely traditional manner, the trial court held that the invention was obvious. On appeal, the Federal Circuit rejected the trial court's analysis as "no more than hindsight reconstruction of the claimed invention,"⁵² and held that:

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined only if there is some suggestion or incentive to do so.⁵³

In the years following *ACS Hospital Systems*, the Federal Circuit consistently required some teaching, suggestion, or motivation to be present in the prior art before prior art references could be combined.

In addition to rejecting the Court's approach to combining prior art references, the Federal Circuit was also dissatisfied with the Court's approach to the so-called "secondary considerations." Although the Court in *Graham v. John Deere Co.* had acknowledged that "[s]uch secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., ... may have relevancy" "as indicia of obviousness or nonobviousness," the Court consistently limited the role of these secondary considerations. As *Anderson's-Black Rock* and *Sakraida* reflect, the secondary considerations were insufficient to "tip the scales of patentability" where the invention as whole otherwise appeared obvious.

Again, however, the Federal Circuit disagreed with the Court's approach. As Chief Judge Markey explained, evidence of secondary considerations is often "the most probative and cogent evidence in the record" and that it "must always when present be considered."⁵⁴ In keeping with this more central role, the Federal Circuit renamed this type of evidence. No longer would it be known as "secondary considerations"; under the Federal Circuit, it became "objective evidence of nonobviousness."⁵⁵

Like the Federal Circuit's substitution of its own suggestion test for the Court's synergy approach, the Federal Circuit's increased reliance on secondary considerations tends to reduce directly the likelihood that a litigated patent will be found obvious. As Professor Edmund Kitch warned more than forty years ago, an increased reliance on secondary considerations, such as commercial success, to resolve questions of patent validity almost necessarily leads to a rule "that all patents that are litigated should be held valid."⁵⁶ As Professor Kitch explained, "it is unlikely that patents that are not commercially successful will be brought to litigation."⁵⁷ As a

⁵¹ 732 F.2d 1572 (Fed. Cir. 1984).

⁵² *Id.* at 1577.

⁵³ *Id.*

⁵⁴ *Stratoflex, Inc v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983); *see also* *Simmons Fastener Corp. v. Illinois Tool Works, Inc.*, 739 F.2d 1573 (Fed. Cir. 1984) (reversing finding of obviousness for failure to consider evidence of secondary considerations); *WL Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 1555 (Fed. Cir. 1983) (same).

⁵⁵ *See, e.g.*, *Gillette Co. v. S.C. Johnson & Son, Inc.*, 919 F.2d 720, 725 (Fed. Cir. 1990).

⁵⁶ Edmund Kitch, *Graham v. John Deere Co.*: *New Standards for Patents*, 1966 S. Ct. Rev. 293.

⁵⁷ *Id.*

result, to the extent that commercial success becomes an important factor in determining a patent's validity, the very fact that the patent is worth litigating should establish its validity.

Despite the fact that the Federal Circuit overlooked, rewrote, and in some cases, expressly rejected the Court's interpretation of the nonobviousness requirement, the Court for more than thirty years refused all invitations to reexamine the Federal Circuit's doctrinal developments.⁵⁸ As a result, the Federal Circuit's weakening of the nonobviousness requirement became, without the benefit of either congressional or Supreme Court action, *de facto* the new law of the patent land.

B. *The Court Steps In: KSR v. Teleflex*

Having rewritten the nonobviousness doctrine to its satisfaction, the Federal Circuit applied it, in an entirely routine fashion, in *KSR v. Teleflex*.⁵⁹ The patent claims at issue in *KSR* concerned an adjustable pedal assembly for use with automobiles with electronically controlled engines. The patent claimed a particular combination of three elements, already well-known in the prior art, including a support bracket, an adjustable pedal assembly, and an electronic pedal position sensor. Rather than attach the sensor to the pedal, as in the prior art, where the pedal's movement could lead to chafing of the wires connecting the sensor to the engine, the patent claim at issue placed the sensor on the non-moving support bracket.⁶⁰

On summary judgment, the trial court held that the patent claim at issue was obvious. In the trial court's view, the patent claim represented a simple combination of prior art elements. The trial court acknowledged that it was bound by the Federal Circuit's teaching, suggestion, or motivation test, but believed that the prior art contained sufficient suggestion to combine the prior art elements in the manner set forth in *Teleflex's* patent claim.⁶¹ The trial court specifically referred to a prior art patent, the Smith patent, that stated that "the pedal assemblies must not precipitate any motion in the connecting wires."⁶² From this, the trial court inferred a sufficient motivation to move the sensor from the moving pedal assembly, as in the prior art, to the non-moving support bracket, as in the patent claim at issue, in order to prevent motion in the connecting wires. Although the patentee touted his invention's commercial success, the trial found the "evidence [of commercial success] insufficient to overcome Defendant's strong showing of obviousness."⁶³

On appeal, a panel of the Federal Circuit reversed. Although the panel acknowledged that each of the elements of the patent claim were readily found in the prior art, the panel insisted that the prior art failed to provide the necessary motivation to combine those elements in the

⁵⁸ Between the Federal Circuit's creation in 1982 and the Court's decision *KSR v. Teleflex Co.* in 2007, the only Federal Circuit obviousness decision the Court reviewed was *Dennison Mfg. Co. v. Panduit Corp.*, 475 U.S. 809 (1986). In that case, after a bench trial, the district court held that the patent claims at issue were obvious. The Federal Circuit, on appeal, reversed the district court, without explaining which parts of the obviousness determination were factual and hence subject to review only for clear error and which parts of the determination were legal. After granting certiorari, the Court, without the benefit of briefing or oral argument, summarily reversed the Federal Circuit. In a *per curiam* opinion, the Court directed the Federal Circuit to explain whether the clear error rule insulated all or part of the trial court's obviousness decision. *Id.* at 811.

⁵⁹ *Teleflex Inc. v. KSR Int'l Co.*, 298 F. Supp. 2d 581 (E.D. Mich. 2003), *rev'd*, 119 Fed. Appx. 282 (Fed. Cir. 2005), *rev'd*, 550 U.S. 398 (2007).

⁶⁰ *KSR Int'l Co.*, 550 U.S. at 409-10.

⁶¹ *Teleflex Inc.*, 298 F. Supp. 2d at 594-95.

⁶² *Id.*

⁶³ *Teleflex Inc.*, 298 F. Supp. 2d at 596.

particular manner claimed.⁶⁴ In its opinion, the panel began by laying out broadly the sort of teaching, suggestion, or motivation that would suffice to combine elements from separate prior art references, assuring us that:

[t]he reason, suggestion, or motivation to combine prior art references may be found explicitly or implicitly: 1) in the prior art references themselves; 2) in the knowledge of those of ordinary skill in the art that certain references, or disclosures in those references, are of special interest or importance in the field; or 3) from the nature of the problem to be solved, leading inventors to look to references relating to possible solutions to that problem.⁶⁵

Yet, as was typical for the Federal Circuit, the panel's application of the teaching, suggestion, or motivation test proved far narrower and less flexible than this initial statement might suggest. In the panel's view, the prior art's suggestion to minimize movement in order to reduce wire chafing was directed at reducing wire chafing, not at reducing the size and complexity of pedal assemblies. Because it was aimed at a different problem, it could not provide the necessary motivation to move the sensor from pedal to bracket.⁶⁶ The panel dismissed another key prior art reference, the Asano patent, that contained each element of the claim at issue except the sensor, for a similar reason. It too was directed at solving a different problem, and so it also could not provide the necessary motivation.⁶⁷

There was nothing particularly unusual or surprising in the panel's narrow and rigid reading of the teaching, suggestion, or motivation test. To the contrary, it was entirely typical of the manner in which the Federal Circuit applied the test. And the panel certified the decision as suitable for resolution without a published opinion.

Yet, on June 26, 2006, the Court granted certiorari,⁶⁸ and on April 30, 2007, reversed.⁶⁹ In its opinion, the Court began with a gentle reminder to the Federal Circuit that the Court's earlier decisions in *Anderson's-Black Rock* and *Sakraida* remained valid and binding law on the circuit court.⁷⁰ Quoting from its *Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.* opinion, the Court emphasized that:

[n]either the enactment of § 103 nor the analysis in *Graham* disturbed this Court's earlier instructions concerning the need for caution in granting a patent based on the combination of elements found in the prior art. For over a half century, the Court has held that a "patent for a combination which only unites old elements with no change in their respective functions . . . obviously withdraws what already is known into the field of its monopoly and diminishes the resources available to skillful men."⁷¹

⁶⁴ *Teleflex Inc.*, 119 Fed. Appx. at 288-89.

⁶⁵ *Id.* at 285.

⁶⁶ *Id.* at 288.

⁶⁷ *Id.* at 288.

⁶⁸ *KSR Int'l Co. v. Teleflex, Inc.*, 548 U.S. 902 (2006).

⁶⁹ *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007).

⁷⁰ *Id.* at 416.

⁷¹ *Id.* at 415-16.

The Court then went on to note the “synergism” standard set forth in *Anderson’s-Black Rock*, and to derive from its earlier cases the following principle: “The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”⁷²

Nevertheless, the Court acknowledged that “a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.”⁷³ The Court further recognized the truth of Chief Judge Markey’s observation in *Stratoflex*, and admitted that “inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.”⁷⁴

Moving to the case before it, the Court recognized that the presence or absence of a teaching, suggestion, or motivation in the prior art may prove relevant in trying to determine whether any particular combination of prior art elements is obvious.⁷⁵ But it rejected any rigid rule that such a teaching, suggestion, or motivation must be present before obviousness can be found.⁷⁶ The Court further rejected the Federal Circuit’s overly narrow and unduly circumscribed sense for the sort of teaching, suggestion, or motivation sufficient to establish obviousness.⁷⁷ It is not necessary for the prior art to be directed at solving the same problem as the patented claim for it to provide the necessary motivation to combine, the Court held, for two reasons. First, patent claims are not typically limited to the problem they intend to solve. Teleflex’s patent, for example, claims a particular arrangement of pedal, support bracket, and sensor, whether undertaken to reduce the size and complexity of the pedal assembly, to reduce wire chafing, or for some other reason. Second, whatever the original or primary purpose of a given piece of prior art, persons having ordinary skill in the art will often recognize that the prior art solves other problems as well. For these reasons, the Court held that “any 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.”⁷⁸

Finally, the Court rejected the longstanding Federal Circuit rule that “a patent claim cannot be proved obvious merely by showing that the combination of elements was ‘obvious to try.’”⁷⁹ To the contrary, obvious to try can establish obviousness “when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions.”⁸⁰

Applying these principles, the Court held the patent claim at issue obvious – “well within the grasp of a person of ordinary skill in the art.”⁸¹ Warning the Federal Circuit that not all patents are good patents, the Court cautioned that granting patents for such ordinary innovation –

⁷² *KSR Int’l Co.*, 550 U.S. at 416.

⁷³ *Id.* at 418.

⁷⁴ *Id.* at 418-19.

⁷⁵ *Id.*

⁷⁶ *Id.* at 419.

⁷⁷ *Id.* at 420.

⁷⁸ *Id.*

⁷⁹ *KSR Int’l Co.*, 550 U.S. at 420.

⁸⁰ *Id.*

⁸¹ *Id.* at 427.

innovation that would likely occur even without the inducement of a patent – “might stifle, rather than promote, the progress of useful arts.”⁸²

C. *KSR’s Impact*

Despite its occasional pretensions to being the “Supreme Court of Patents,” the Federal Circuit is well aware that it is not. Even before the Court issued its decision *KSR v. Teleflex* on April 30, 2007, the Court’s decision to grant certiorari in the case was influencing the Federal Circuit’s approach to the obviousness issue. Only a few months after the Court had granted certiorari, the Federal Circuit, whether reading the tea leaves or attempting to persuade the Court to leave well enough alone, was emphasizing that the teaching, suggestion, or motivation test was not a rigid doctrine. Thus, in October 2006, we find Judge Michel explaining, on behalf of the Federal Circuit, that:

In contrast to the characterization of some commentators, the suggestion test is not a rigid categorical rule. The motivation need not be found in the references sought to be combined, but may be found in any number of sources, including common knowledge, the prior art as a whole, or the nature of the problem itself.⁸³

Later in the same opinion, Judge Michel insisted that “[o]ur suggestion test is in actuality quite flexible and not only permits, but requires, consideration of common knowledge and common sense.”⁸⁴

After the Court’s *KSR* opinion issued, numerous Federal Circuit opinions cited the case and relied on its reasoning. For example, only a few months after *KSR* was decided, the Federal Circuit held a patent on an electronic learning device intended to teach children to read phonetically invalid for obviousness.⁸⁵ In doing so, the court relied on *KSR*’s reasoning that the common sense alone of a person having ordinary skill in the art could provide the necessary motivation to combine prior art elements.⁸⁶ A few years after that, in *Bayer Schering Pharma AG v. Barr Labs., Inc.*,⁸⁷ the Federal Circuit affirmed a district court’s conclusion that a patent on the formulation of a daily oral contraceptive was obvious. In doing so, the court relied on the *KSR* Court’s reasoning that “obvious to try” could establish obviousness, at least where the prior art provides a reasonable expectation of success among “a finite number of identified and predictable solutions.”⁸⁸ And two years after that, in *Tokai Corp. v. Easton Enters., Inc.*,⁸⁹ the Federal Circuit affirmed a district court’s holding that three patents on automatic safety mechanisms for utility lighters were invalid for obviousness. Again, the court relied extensively on *KSR*’s reasoning, holding that where the art lends itself to “identified, predictable solutions,”

⁸² *Id.* at 427.

⁸³ *Dystar Textilfarben v. C.H. Patrick Co.*, 464 F.3d 1356, 1361 (Fed. Cir. 2006), *cert. denied*, 127 S. Ct. 2937 (2007).

⁸⁴ *Id.* at 1367-68; *see also* *Alza Corp. v. Mylan Labs., Inc.*, 464 F.3d 1286, 1291 (2006) (“There is flexibility in our obviousness jurisprudence because a motivation may be found implicitly in the prior art. We do not have a rigid test that requires an actual teaching to combine . . .”).

⁸⁵ *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157 (Fed. Cir. 2007).

⁸⁶ *Id.* at 1161.

⁸⁷ 575 F.3d 1341 (Fed. Cir. 2009).

⁸⁸ *Id.* at 1350.

⁸⁹ 632 F.3d 1358 (Fed. Cir. 2011).

each of the elements exist in the prior art, and an explicit need in the prior art provides the necessary motivation to combine the elements, the resulting invention is obvious.⁹⁰

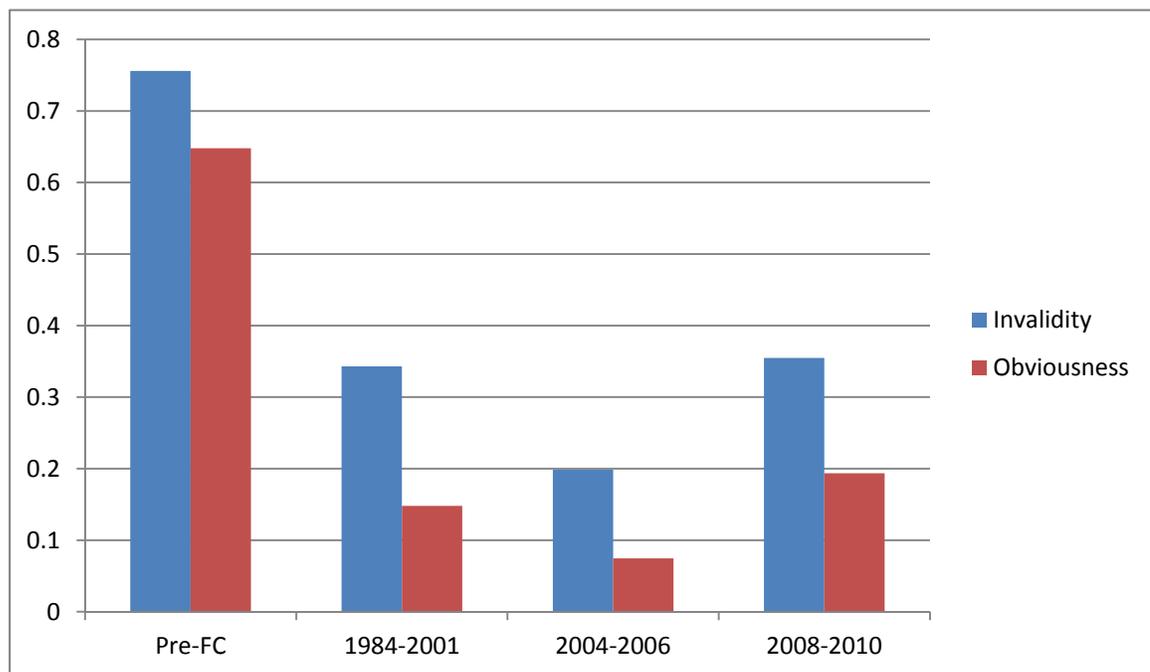
In addition to this anecdotal evidence of *KSR*'s impact, an empirical examination of appellate patent decisions establishes the difference that *KSR* has made. To examine this issue, we conducted an empirical investigation of all appellate decisions arising from patent infringement litigation in six pre-Federal Circuit time periods beginning with the period 1944-1946,⁹¹ and since January 1, 1984. As has become the practice, we conducted a population, rather than a sample, study and included all intermediate appellate utility patent infringement decisions that were available in the "US Court of Appeals Cases-Federal Circuit" LEXIS database for the post-Federal Circuit periods or in the "Federal Cases-Combined Courts" LEXIS database for the pre-Federal Circuit periods. After identifying cases in the relevant population, we separated decisions into three categories: (1) "success;" (2) "failure;" or (3) "non-final" resolutions where a patent holder neither succeeded nor failed. "Success" was defined as a decision where a patent holder obtained preliminary or permanent injunctive relief, or damages, on any patent claim at issue in the litigation. "Failure" was defined as a decision where the appellate court either denied preliminary injunctive relief or finally resolved all claims of patent infringement and no claim of patent infringement in the case succeeded. The final category consisted of non-final decisions, where a patent holder did not succeed in obtaining the relief sought, but the claims of infringement were not finally rejected by the court. Rather, the appellate court reversed or vacated the ruling of the district court on one aspect or another, and remanded the case for further proceedings.

To account for the possibility of selection bias in the population, we then focused exclusively on the "failure" category. For this category, we broke down the reasons why the patent claims failed into: (1) the patent claims were held invalid or otherwise unenforceable; (2) the patent claims were held obvious; (3) the patent claims were held not infringed; or (4) the patentee lost for some other reason. We then tracked the percentage of cases in the failure category for which invalidity and obviousness accounted. Figure 1 presents the results for four time periods: (1) the pre-Federal Circuit era; (2) during the pre-*KSR* Federal Circuit era from 1984 through 2001; (3) the immediate pre-*KSR* era from 2004 through 2006; and (4) the post-*KSR* era from 2008 through 2010.

⁹⁰ *Id.* at 1371-72.

⁹¹ The six time periods were: (i) 1944-1946; (ii) 1955-1957; (iii) 1964-1965; (iv) 1966-1967; (v) 1975-1976; and (vi) 1981-1982.

Figure 1. Reasons for Losing: Percentage of Losses Due to Invalidity or Unenforceability of Patent and Due to Obviousness.



As Figure 1 illustrates, obviousness was once, far and away, the single most important doctrine in patent law. During the pre-Federal Circuit era studied, when a patentee lost on claims of patent infringement, he or she lost nearly sixty-five percent of the time due to a finding that the patent claims at issue were obvious. Given that patentees lose between sixty-five and seventy percent of the time on final resolutions at the appellate level,⁹² nearly half of all cases that were finally resolved during the pre-Federal Circuit era were resolved by a finding of obviousness.

In contrast, with the advent of the Federal Circuit in 1982, the nonobviousness requirement became much easier to satisfy. From 1984 through 2001, when a patentee lost under the Federal Circuit, obviousness was the reason in less than fifteen percent of those losses. From 2004 through 2006, the period immediately preceding the grant of certiorari in *KSR v. Teleflex* in June 2006, when a patentee lost under the Federal Circuit, obviousness was the reason in only 7.5 percent of the losses, thus playing a decisive role in less than five percent of the appellate cases in which claims of patent infringement were resolved. Under the Federal Circuit, non-infringement has become the dominant explanation for patentee losses.⁹³

We see some recovery in the importance of the nonobviousness doctrine following *KSR*. From 2008 through 2010, obviousness accounted for just less than twenty percent of the losses patentees experienced. Compared to the immediately preceding period of 2004 through 2006, this represents a healthy rebound. Yet, despite the bump, obviousness today accounts for only a

⁹² See Glynn S. Lunney, Jr., *Patent Law, the Federal Circuit, and the Supreme Court: A Quiet Revolution*, 11 SUP. CT. ECON. REV. 1, 10-14 (2004).

⁹³ *Id.* at 15.

small fraction of the losses for which it accounted in the pre-Federal Circuit era, and is no longer the dominant doctrine it once was.

II. *Obviousness in Theory*

The diminished vitality of the nonobviousness doctrine weakens the ability of the patent system to encourage the full range of potential innovations in the useful arts. Although there remains an unfortunate level of confusion over the economic trade-offs entailed in patent protection, the basic trade-off is simple: Because patent law provides a largely uniform level of protection for everything within its scope, expanding protection brings forth additional innovation at the cost of overprotecting innovations that would have been brought forth at some lower level of protection (the “preexisting” innovations).⁹⁴ The trade-off is not between incentives and access for any given innovation, or between static and dynamic efficiency, more generally.⁹⁵ Rather, the trade-off is between the marginal increase in social value the additional innovations generate and the marginal decrease in social value that arises from overprotecting (or further overprotecting) the preexisting innovations. Within this framework, the question becomes one of optimal mechanism design, given limited information.

In any given art or technological field, there is the potential for a wide range of innovation. At any given time, some advances are easy and may require little or no patent protection to bring them forth. For these advances, the incentives that arise inherently in markets operating against a background of enforceable contracts and exclusive rights in real and personal property, will provide sufficient incentives, whether through lead-time advantages, reputational rents, or otherwise. In contrast, other advances are more difficult and may require some degree of encouragement beyond that that contracts and traditional property rights alone will provide. While a system of exclusive rights in such advances is not the only available mechanism to provide the additional encouragement necessary, in the presence of imperfect information as to the costs, value, and best research paths to pursue to achieve the desired advance, a system of exclusive rights, such as the set patent law provides, may prove the best available alternative. Yet, even for these advances that require additional encouragement, some may require only a little extra encouragement, while others require a great deal.

Indeed, for a given art, we can imagine some distribution of the potential advances that could be brought forth as the level of patent protection available increases, from no protection to the maximum protection theoretically possible, as shown in Figure 2.

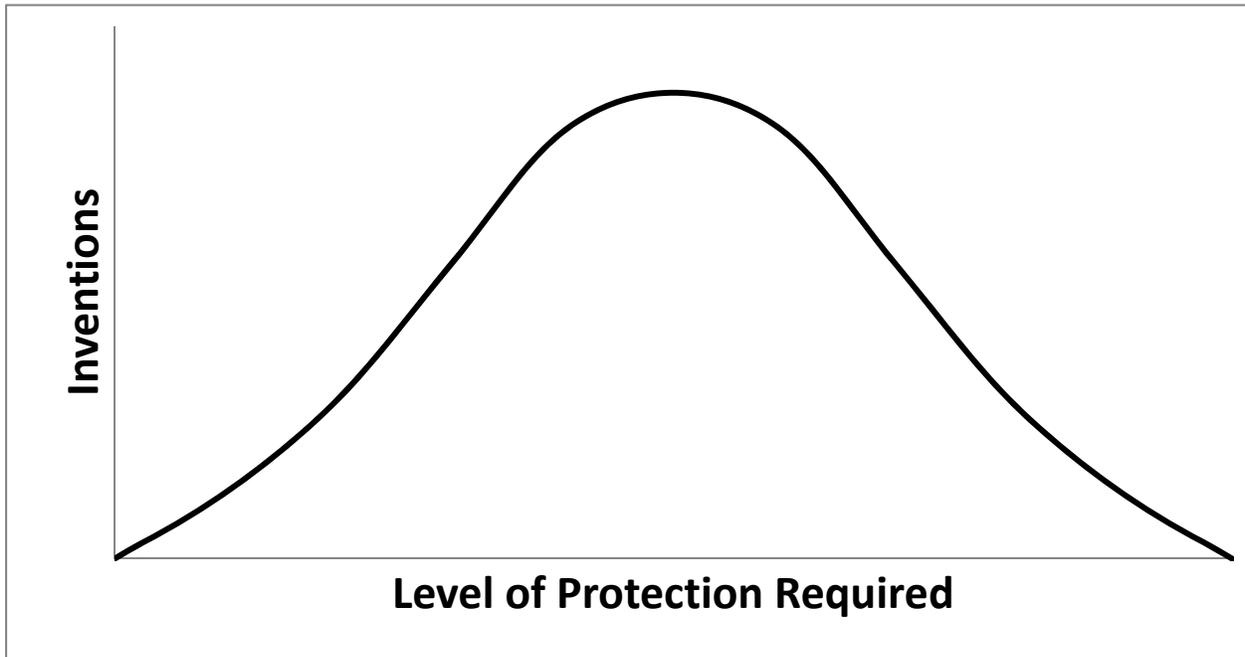
⁹⁴ See, e.g., Lunney, *supra* note [], at 5-6, 64-67.

⁹⁵ As one of the co-authors has explained elsewhere:

Even where a regime of exclusive rights represents the best available alternative for encouraging certain types of innovation, the social value of an innovation will presumably be somewhat less if protected by a patent than if its public good aspect could have been freely and fully exploited. Yet, if providing patent protection ensures the creation of a desirable information product and does so more efficiently than the plausible alternatives, such as patent prizes or direct government subsidies, the fact that the information product could have been more valuable still in the absence of the patent's protection has little practical significance.

Lunney, *supra* note [], at 5.

Figure 2. Possible Distribution of Inventions Available Against Protection Required to Bring Them Forth



If a regulator had perfect information regarding the potential range of inventions, and the level of protection required to bring forth each, and could enforce an individually tailored system of rights for each, the regulator would provide each invention with precisely that level of protection necessary to bring it forth and no more.⁹⁶ But in the real world, regulators don't have such perfect information and cannot realistically enforce a system of individually tailored rights.

In the real world, a regulator may have little or no information about the level of protection required to bring forth any given invention, but may know only the distribution of the potential innovations and the fraction of the distribution that any given level of patent protection will bring forth. Moreover, the administrative costs associated with enforcing a regime of individually tailored rights are also likely to prove prohibitive. Facing such limited information and high administrative costs, the regulator's optimal choice may be to provide some uniform level of protection, whether none, some, or a lot, to each of the potential inventions. This, historically, is what patent and copyright have done. They have provided a largely uniform set of exclusive rights, for a largely uniform term, to every invention or work that satisfied a given set of largely uniform prerequisites.

With such a uniform system of rights, any given level of protection will bring forth all of those advances that require that level of protection or less to ensure the expectation of a non-negative producer surplus from investing in the advance. If we provide additional protection, so as to increase the expected rents from investing in any given advance, that will likely bring forth some additional advances. However, it will also overprotect or further overprotect those advances that could have been brought forth with less protection. This overprotection has a cost.

⁹⁶ Of course, if these assumptions were satisfied, then the patent system would be both unnecessary and undesirable. See Lunney, *supra* note [], at 4.

Granting a right to exclude with respect to an otherwise nonrivalrous good, raises the prices associated with the goods, increases transaction costs associated with use of the good, and prevents others from putting the good to all of its highest and best uses. For these reasons, overprotection of any given advance will limit the ability of others to take advantage of the advance's nonrivalrous nature and will thereby decrease its social value. Given these competing benefits and costs from extending protection, in a system of uniform protection, we reach the optimal level of protection when, for any additional increase in protection provided, the marginal loss in social value from (further) overprotecting the preexisting advances exceeds the marginal gain in social value associated with the additional advances broader protection would bring forth.

Information costs and the resulting uniformity of protection thus impose two costs. First, we have the familiar deadweight losses and other costs associated with overprotecting those innovations that could have been brought forth with less protection. Second, given the trade-off between encouraging additional advances and maximizing the social value associated with the preexisting advances, an optimal system of uniform protection will, almost invariably, set the level of protection too low to ensure the expected profitability and hence existence of the full range of potential innovations.

A vibrant nonobviousness requirement can play a crucial role in reducing both of these uniformity costs. If our regulator lacks perfect information as to how much protection each advance requires, but can group the potential advances into rough categories that require a given level of protection, the regulator can use the nonobviousness requirement to tailor the protection provided to that required for each such category. Assume, for example, that the regulator has sufficient information to divide the potential advances into four categories: easy, somewhat difficult, more difficult, and hard; and further assume that the regulator knows that easy advances require only some minimal patent protection ("Level 1" protection), that somewhat difficult advances require a somewhat higher level of patent protection, whether through a longer term or a broader enforcement of the patent's scope ("Level 2" protection), that more difficult advances require a still higher level of protection ("Level 3" protection), and that hard advances require extensive patent protection ("Level 4" protection). Let each category of advance generate social value of 90, but because of the tension between property rights and public goods, each level of protection provided reduces the social value associated with the advances in each category by 20.

With this information set, the regulator can provide either Level 1, Level 2, Level 3, or Level 4 protection uniformly for all of the advances. Providing Level 1 protection brings forth the easy advances, generating a social value of 70, but Level 1 protection will not ensure the expected profitability of the somewhat difficult, more difficult, and hard advances. As a result, with Level 1 protection, these advances will not occur. Providing Level 2 protection brings forth both easy and somewhat difficult advances, generating a social value of 100, but again will not ensure the expected profitability of the more difficult and hard advances. Providing Level 3 protection brings forth the easy, somewhat difficult, and more difficult advances, generating a social value of 90, but will not ensure the expected profitability of the hard advances. Providing Level 4 protection will bring forth the advances in all four categories, generating a social value of 40.

Faced with these choices, the regulator will provide Level 2 protection. This leads to overprotection of the easy advances, with a consequent social welfare loss of 20, compared to the social welfare those advances would have brought if they received Level 1 protection. It also means that the patent system will not ensure the expected profitability of the more difficult and

hard advances, with a consequent welfare loss of 40, compared to the social welfare those advances would have brought if they received Level 3 and Level 4 protection, respectively. While the regulator could bring these advances forth by providing Level 3 or 4 protection, providing such protection uniformly, i.e. extending Level 3 or 4 protection to the easy and somewhat difficult advances as well, would lead to welfare losses that would exceed the welfare gains from ensuring the profitability of the more difficult and hard advances. Because of this uniformity cost, society will have to forego the more difficult and hard advances.

With sufficient information, vigorous enforcement of the nonobviousness requirement can help us avoid this undesirable result. Facing an otherwise uniform term of protection and a uniform set of exclusive rights for all four categories of advance, a regulator can nonetheless provide each category with the right level of patent protection by using the nonobviousness requirement to create a risk that any given patent will not, in the end, prove valid. For risk-neutral patentees, receiving a patent with a twenty-year term and the exclusive right to “make, use, offer to sell, or sell” the invention, but with a fifty percent chance that the patent will be found invalid has the same economic value as a patent with a shorter term or a narrower set of rights with a one hundred percent chance of being found valid.⁹⁷ Using the phrasing of our example, providing an advance with Level 4 protection, but a ninety percent chance of invalidity may provide effectively Level 1 protection. Providing an advance with Level 4 protection and a sixty percent chance of invalidity may provide effectively Level 2 protection. And providing an advance with Level 4 protection and a thirty percent chance of invalidity may provide effectively Level 3 protection. Thus, by varying the chance of an obviousness result, the regulator can tailor the level of patent protection effectively provided to each group of advances to the level of protection necessary to bring those advances forth.

If our regulator can group the potential advances appropriately, she can create a high risk that the patents on the easy advances will be held obvious, a moderately high risk of such an obviousness result for the somewhat difficult advances, a moderately low risk of such an obviousness result for the more difficult advances, and a minimal risk of such a result for the hard advances. By doing so, our regulator can effectively provide that level of patent protection for each category of advances that is approximately necessary to ensure their expected profitability, even in the face of an otherwise uniform patent term and set of rights. She can thereby design a patent system that will not overprotect the relatively easy advances, but will still provide sufficient encouragement to the relatively difficult advances.

The question becomes whether courts have sufficient information to group patented inventions into even such rough categories without undue mistakes. The central role that nonobviousness once played in patent litigation suggests that courts at one time believed that they could. Moreover, as an economic matter, we have a pretty good sense of the sorts of research and development investments that will prove difficult to recoup without a patent. As a general matter, it boils down to a question of: (i) the upfront investment required for the innovator; (ii) the cost-savings available to an imitator; (iii) the lead-time advantage likely available in the absence of a patent; (iv) the extent to which products will remain differentiated even after entry occurs; and (v) the availability of reputational rents due to imperfect information in the markets for the innovation.⁹⁸ While some mistakes in the sorting process are inevitable, a

⁹⁷ See Lunney, *supra* note [], at 72-73; see also Lemley, *Probabilistic Patents*.

⁹⁸ See Lunney; see also Barnett.

rough sorting of patented inventions along a spectrum from easy advances to hard advances, corresponding to some rough sense for a corresponding level of patent protection required to bring them forth, while not a trivial exercise, seems entirely practicable.

Such a rough sorting would yield two tangible benefits. First, it would reduce the overprotection costs otherwise associated with the easy advances in an otherwise uniform system of protection. Second and more importantly, it would enable the patent system to provide the broader protection necessary to encourage the more difficult advances.

Despite these potential benefits, the Federal Circuit has been curiously reluctant to engage in such a rough sorting, relegating the nonobviousness requirement to the role of bit player in the patent system. In part, this is due to the Federal Circuit's rejection of the notion that patents are undesirable monopolies.⁹⁹ In the Federal Circuit's eyes, patents are simply property, presumptively desirable. The Federal Circuit does not share Thomas Jefferson's view that patents are, in some sense, an embarrassment. As a result, the court sees no sense in attempting to sort those inventions that are worth "the embarrassment of an exclusive patent" from those that are not, or for a nonobviousness doctrine that purports to do so.

Yet, this simply property perspective has not been the only reason behind the Federal Circuit's refusal to enforce a vibrant nonobviousness requirement. The court's jurisprudence also reflects a strong fear of hindsight. And it is to this fear which we now turn.

III. *Hindsight, Bias, and Obviousness*

A. *The Fear of Hindsight in Patent Law*

Patent law has had a longstanding fear of hindsight in the obviousness determination. Indeed, even before the issue became known as "obviousness" with the enactment of the Patent Act of 1952, courts had recognized the tendency for hindsight to make an improvement or advance seem simpler or easier than it in fact was. In 1897, for example, the Second Circuit upheld a patent on an improvement to the sewing machine, concluding that it constituted the work of an inventor and not merely that of a skilled mechanic.¹⁰⁰ In reaching that conclusion, the court acknowledged that "[i]n view of the prior state of the art thus exhibited, it seems now to have been a very simple thing to do what was done by the patentees."¹⁰¹ The court refused, however, to accept hindsight's suggestion of apparent ease. Rather, the court found invention in the patent because, despite its seeming simplicity, it offered clear advantages over the prior art, yet despite "the vast number of skilled workmen" in the field, no one else had discovered it.¹⁰²

⁹⁹ See Lunney, *E-Obviousness*.

¹⁰⁰ Schenck v. Singer Mfg. Co., 77 F. 841, 844 (2d Cir. 1897).

¹⁰¹ *Id.*

¹⁰² *Id.* As the court explained:

But the record in this case affords extrinsic evidence of a most convincing kind that what was done by the patentees was not an obvious thing, and that the change of organization was not one which the skilled mechanics of the particular art could have suggested and introduced without the exercise of inventive faculty. This evidence is supplied, not only by the many patents for improvements, which fell short of producing the simple, compact, less expensive, and more efficient bearings of the patent, but by the sterility, during 20 years, of the great army of mechanics employed by the various sewing-machine manufacturers. The complainant itself, from 1865 to 1879, used the

Other courts reached similar conclusions.¹⁰³ From these cases, the Seventh Circuit derived the following rule: “Whether a patent involves invention is to be determined in the light of historical facts rather than what might appear to be simple in the light of hindsight.”¹⁰⁴

With the enactment of the Patent Act of 1952, courts tied the prohibition on hindsight to the statute’s requirement that the obviousness or nonobviousness of the patented invention be determined “at the time the invention was made.”¹⁰⁵ Yet, the basic approach to guarding against undue hindsight remained the same. Against the appearance of simplicity hindsight might suggest courts posited the simple fact that no one else had developed the invention at issue. This was not always sufficient to save a patent,¹⁰⁶ but as the Court recognized in *Graham*, focusing on secondary considerations such as long-felt, but unsolved need, the failure of others, and

overhung stud, and for several years of that period its machines contained cross braces readily adaptable to the office of the patented brace. It employed a vast number of skilled workmen. Yet to none of them did the suggestion occur which is embodied in the new organization of the patentees. The simple change made by the patentees has proved so valuable that the complainant has adopted it in more than 9,000,000 sewing machines. The sewing-machine company whose president is the defendant in this suit has also adopted it. No one can examine the bearings of the patent, even cursorily, and compare them with those previously in use, without recognizing the meritorious improvements which they embody. We agree with the court below that these improvements were invention, and not merely the exercise of mechanical skill and adaptation.

Id.; see also *Brunswick-Balke-Collender Co. v. Thum*, 111 F. 904, 905-06 (2d Cir. 1901) (following similar approach).

¹⁰³ See *Brown & Sharpe Mfg. Co. v. Kar Engineering Co.*, 154 F.2d 48, 50 (1st Cir. 1946) (rejecting hindsight’s suggestion that an advance was obvious); *Becket v. Coe*, 98 F.2d 332, 336 (D.C. Cir. 1938) (same); *Skinner Bros. Belting Co. v. Oil Well Improv. Co.*, 54 F.2d 896, 898 (10th Cir. 1931) (“We know that we should try to eliminate ‘hindsight’” in determining whether a patent constitutes invention.); *American Valve & Meter Co. v. Fairbanks, Morse & Co.*, 249 F. 234, 239 (7th Cir. 1917) (noting that “even with the aid of hindsight we fail to see in the patent anything other than a meritorious invention”).

¹⁰⁴ *Lakeshire Cheese Co. v. Shefford Cheese Co.*, 72 F.2d 497, 499 (7th Cir. 1934).

¹⁰⁵ 35 U.S.C. § 103(a) (2011). See *In re Sporck*, 301 F.2d 686, 689 (C.C.P.A. 1962) (“In determining the issue here we are required by 35 U.S.C. 103 to do so from the vantage point of one having ordinary skill in the metal spinning art and then to determine whether or not the claimed invention would have been obvious to such a person at the time the invention was made. This requires us to view the prior art without reading into that art the teachings of appellant’s invention.”); see also *Monroe Auto Equipment Co. v. Heckethorn Mfg. & Supply Co.*, 332 F.2d 406, 412 (6th Cir. 1964) (“The first is that in considering the question of obviousness, we must view the prior art from the point in time just prior to when the patented device was made. Many things may seem obvious after they have been made, and for this reason courts should guard against slipping into use of hindsight.”)

¹⁰⁶ For example, in *Procter & Gamble Co. v. Berlin Mills Co.*, the Second Circuit reversed the district court’s holding that a patent claim was invalid for lack of invention. In reversing, the court explained:

the question really is one of measuring foresight by hindsight. The problem seems easy now, but, when the object reached was desirable, useful, and apt for commercial success, the bald fact that nobody ever did it before is persuasive, though not conclusive, evidence of some invention.

256 F. 23, 26 (2d Cir. 1918). Yet, on further appeal, the Supreme Court reversed, holding that the patent claims lacked invention. *Berlin Mills Co. v. Procter & Gamble Co.*, 254 U.S. 156 (1920).

commercial success, “may . . . serve to ‘guard against slipping into use of hindsight,’ and to resist the temptation to read into the prior art the teachings of the invention in issue.”¹⁰⁷

Under the Federal Circuit, the fear of hindsight also became a justification for the requirement that the prior art teach, suggest, or motivate a given combination of elements in order to establish the *prima facie* obviousness of the combination.¹⁰⁸ In *KSR* itself, the Court, while acknowledging “the distortion caused by hindsight bias” and the need to “be cautious of arguments reliant upon *ex post* reasoning,”¹⁰⁹ rejected the need for a teaching, suggestion, or motivation as an absolute prerequisite for finding the obviousness of a given combination of prior art elements.¹¹⁰ Nevertheless, even after *KSR*, the Federal Circuit has continued to insist that the teaching, suggestion, or motivation test, flexible now, rather than rigid, remains an important guard against the improper use of hindsight.¹¹¹

Despite the repeated and pervasive cautions against the use of hindsight, patent law does not prohibit the use of hindsight altogether in obviousness determinations. To the contrary, patent law expressly allows the obviousness decision-maker to consider a number of facts arising only after the date of invention. Many of the so-called secondary factors, including the commercial success of a patented invention, copying by others, or its widespread licensing, necessarily arise after the time of invention and thus represent hindsight. Yet, the Federal Circuit has emphasized that this hindsight evidence may provide “the most probative and cogent evidence available”¹¹² on the obviousness issue. Going further, the Federal Circuit has expressly held that such evidence “must always when present be considered.”¹¹³ The failure to recognize that this evidence represents an apparently permissible form of hindsight represents a curious blind-spot in the court’s otherwise pervasive jurisprudential war on hindsight.

¹⁰⁷ *Graham v. John Deere Co.*, 383 U.S. 1, 36 (1966) (quoting *Monroe Auto Equipment Co. v. Heckethorn Mfg. & Sup. Co.*, 332 F.2d 406, 412 (6th Cir. 1964)).

¹⁰⁸ *See ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577 (Fed. Cir. 1984); *see also McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351 (Fed. Cir. 2001) (“The genius of invention is often a combination of known elements which in hindsight seems preordained. To prevent hindsight invalidation of patent claims, the law requires some “teaching, suggestion or reason” to combine cited references.”); *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 664 (Fed. Cir. 2000) (“In order to prevent a hindsight-based obviousness analysis, we have clearly established that the relevant inquiry for determining the scope and content of the prior art is whether there is a reason, suggestion, or motivation in the prior art or elsewhere that would have led one of ordinary skill in the art to combine the references.”); *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998) (“To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness.”); *Texas Instruments v. United States ITC*, 988 F.2d 1165, 1178 (Fed. Cir. 1993) (“Absent such suggestion to combine the references, respondents can do no more than piece the invention together using the patented invention as a template. Such hindsight reasoning is impermissible.”)

¹⁰⁹ *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

¹¹⁰ *Id.* at 421-22.

¹¹¹ *Ortho-McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520 F.3d 1358, 1364 (Fed. Cir. 2008) (holding after *KSR* that “a flexible TSM test remains the primary guarantor against a non-statutory hindsight analysis such as occurred in this case”); *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1260 (Fed. Cir. 2007) (“In any event, as the Supreme Court suggests, a flexible approach to the TSM test prevents hindsight and focuses on evidence before the time of invention, without unduly constraining the breadth of knowledge available to one of ordinary skill in the art during the obviousness analysis.”)

¹¹² *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983).

¹¹³ *Stratoflex, Inc v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983); *see also Simmons Fastener Corp. v. Illinois Tool Works, Inc.*, 739 F.2d 1573 (Fed. Cir. 1984) (reversing finding of obviousness for failure to consider evidence of secondary considerations); *WL Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 1555 (Fed. Cir. 1983) (same).

Moreover, the prohibition on the use of hindsight often seems intended more as a rhetorical trump card, than a meaningful analytical rubric. Invariably, patent applicants and patentees counter claims of obviousness by insisting that the piecing together of prior art references to yield their claimed invention represents no more than an impermissible hindsight reconstruction.¹¹⁴ In response to the invariably claim of hindsight, appellate panels sometimes reverse holdings of obviousness, whether by the Patent and Trademark Office or a district court¹¹⁵; sometimes they don't. When they don't, a dissenting judge will often chide the majority for failing to recognize the improper presence of hindsight,¹¹⁶ and when they do, a dissenting judge will often chide the majority for seeing hindsight, when in the dissenter's view, it was not there.¹¹⁷

Even within a single opinion, courts will use hindsight to explain why a patented invention was obvious, while at the same time insisting that the use of hindsight is improper. For example, in *Graham v. John Deere Co.*,¹¹⁸ the invention pertained to chisel plows. When a chisel plow is in use, being pulled by a tractor, the point of the plow digs a furrow several inches deep. Sometimes as the plow is digging the furrow, it will encounter an obstacle, such as a large buried rock. At that point, the plow needs to ride up and over the obstacle and then return to digging the furrow at the appropriate depth.¹¹⁹ Graham patented a particular arrangement of the key elements, the shaft of the plow, a hinge plate, and the body of the plow, in a way that apparently improved the plow's performance, in terms of breakage and wear, significantly. At the time of invention, no one knew all the reasons why Graham's arrangement worked better than prior arrangements; apparently, it just did. When the patent was eventually litigated, Graham's attorney theorized that the arrangement worked better because it allowed free flexing of the plow shaft along its full length. In holding Graham's arrangement obvious, the Court wrote:

¹¹⁴ See, e.g., *In re Winslow*, 365 F.2d 1017, 1020 (C.C.P.A. 1966) ("Appellant presents the usual argument that hindsight reconstruction has been employed by the examiner and the board.").

¹¹⁵ See, e.g., *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546 (Fed. Cir. 1998) (reversing jury's finding of obviousness and concluding that in the absence of a teaching or suggestion to combine the prior art references, jury must have resorted to improper hindsight); *Monarch Knitting Mach. Corp. v. Sulzer Morat GmbH*, 139 F.3d 877, 881 (Fed. Cir. 1996) ("Defining the problem in terms of its solution reveals improper hindsight in the selection of the prior art relevant to obviousness."); *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1271 (Fed. Cir. 1991); *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1054 (Fed. Cir. 1988) ("Having carefully reviewed the record, we conclude that the district court impermissibly used a hindsight analysis in determining that the claimed invention would have been obvious and did not properly analyze and consider secondary indicia of nonobviousness."); *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 448 (Fed. Cir. 1986) (reversing district court's conclusion of obviousness and declaring it the result of "improper hindsight analysis").

¹¹⁶ See, e.g., *Bayer Schering Pharma AG v. Barr Labs., Inc.*, 575 F.3d 1341, 1351 (Fed. Cir. 2009) (Newman, dissenting) ("The evidence in this case is a better measure of obviousness than is the hindsight science of judges"); *Erico Int'l Corp. v. Vutec Corp.*, 516 F.3d 1350, 1360 (Fed. Cir. 2008) (Newman, dissenting) ("The district court considered the relative simplicity of the invention, a factor that appears to have influenced my colleagues, who with perfect hindsight find that it would have been obvious to make Erico's J-hook by combining the OBO Betterment reference, the EIA standards, and Mr. Laughlin's testimony."); *In re Omeprazole Patent Litig.*, 483 F.3d 1364, 1381 (Fed. Cir. 2007) (Newman, dissenting) ("Hindsight is not an available analytical mechanism to show obviousness."); *Para-Ordnance Mfg. v. SGS Importers Int'l*, 73 F.3d 1085, 1091 (Fed. Cir. 1995) (Archer, C.J., dissenting) ("The obviousness analysis in this case is a classic example of hindsight.").

¹¹⁷ See, e.g., *In re Fine*, 837 F.2d 1071, 1073 (Fed. Cir. 1988) (reversing Board of Patent Appeals and holding that examiner improperly relied on hindsight over Judge Smith's dissent).

¹¹⁸ 383 U.S. 1 (1968).

¹¹⁹ *Graham*, 383 U.S. at 19-20.

If free-flexing, as petitioners now argue, is the crucial difference above the prior art, then it appears evident that the desired result would be obtainable by not boxing the shank within the confines of the hinge. The only other effective place available in the arrangement was to attach it below the hinge plate and run it through a stirrup or bracket that would not disturb its flexing qualities. Certainly a person having ordinary skill in the prior art, given the fact that the flex in the shank could be utilized more effectively if allowed to run the entire length of the shank, would immediately see that the thing to do was what Graham did, i. e., invert the shank and the hinge plate.¹²⁰

In this passage, the Court used the insight that free flexing of the plow shaft is desirable from Graham's own invention against him. Yet, later in the same opinion, the Court would recognize the need "to 'guard against slipping into use of hindsight,' and to resist the temptation to read into the prior art the teachings of the invention in issue."¹²¹

Patent law's fear of hindsight is thus an odd beast. Patent law fears some types of hindsight, but embraces others. Even where patent law seems clear that the use of certain types of hindsight patent law is prohibited, judges disagree over whether hindsight was in fact impermissibly used or not used in any given case. And sometime, even when courts say that certain types of hindsight should not be used, they use it anyway.

To rise above mere rhetoric and become a meaningful analytical tool, we need a better understanding of hindsight and the ways in which it informs our decision-making. In theory, as discussed above, there is some risk of obviousness for each patented invention that is socially optimal, in that it ensures that, for each socially desirable invention, the expected incentives from the patent exactly cover the invention's otherwise unrecoverable expected costs. The question thus becomes whether, and when, the use of hindsight information improves the patent system's ability to achieve that optimal risk of an obviousness result. To begin exploring that question, the next section examines the role of hindsight in a world of limited information.

B. *Imperfect Information and Hindsight*

At a general level, the fear of hindsight in patent law is curious given the central and important role hindsight plays in our everyday life. Reviewing how things turned out can improve the information available, and hence, our decision-making, when, as is often the case, a given set of choices recurs. Consider the simple example of a stop sign. The law requires a driver to come to a full and complete stop at a stop sign, but many drivers don't. A driver approaching a stop sign can run it, roll it, or obey it. If the driver matches the assumptions of neoclassical economics, the driver will choose between these three options in order to maximize her utility. Invariably, however, she will have imperfect information regarding the utilities each choice offers. What is the marginal increase in the likelihood of an accident at this particular stop sign at this particular time of day from rolling the stop sign rather than stopping completely? What is the marginal increase in the chance of an accident from running it altogether? What is the likely cost if an accident occurs? What is the chance and cost of a traffic ticket? How much

¹²⁰ *Id.* at 24-25.

¹²¹ *Id.* at 36 (citation omitted).

time can the driver save by not coming to a complete stop? Given the driver's schedule for the day and other circumstances, what is the marginal utility associated with that time savings?

When a driver first approaches a given stop sign, she may have a good sense for some of these values, but relatively imperfect information regarding the others. Over time, as the driver makes different choices repeatedly at the same stop sign, she will build up through hindsight a reasonably good sense for the costs and benefits associated with running, rolling, or obeying the stop sign. Her actual results in terms of the decisions she makes and the resulting outcomes, whether accident or no accident, ticket or no ticket, will come over time to match reasonably well the actual distribution of risks associated with each decision. Of course, there will be outliers – the unlucky soul who gets a ticket or into an accident every time he fails to come to a complete stop, or the carefree driver who never does. We should expect however the actual risks, costs, and benefits drivers experienced to form a bell curve around the true values. As a result, on average, updating the available information set regarding those risks, costs, and benefits through the use of hindsight should help our driver develop a more accurate decision-making heuristic over time.

This is true not just for decisions about whether to stop at stop signs, but generally. We make decisions all of the time, and never have perfect information as to the decision's true costs and benefits. But if the opportunity for a choice repeats itself, over time, our choices and their consequences should begin to approach the average, and in that sense, true costs and benefits associated with the decision. As a result, if we define bias as a difference between: (i) the true costs and benefits of a choice, and (ii) our perception of those costs and benefits, then the use of hindsight in our everyday lives typically reduces bias over time by bringing our perception of the risks, costs, or benefits associated with a choice more in line with the true values.

Hindsight offers the same benefit with respect to the question of obviousness. Consider a simplified model of the interaction between investments in innovation and patentability. A given innovation can either be hard or easy. If it is hard, our researcher will not invest in the innovation unless she will receive a patent for her discovery. If it is easy, our researcher will invest in the innovation whether she receives a patent or not. Of course, even if it is easy, the researcher would still prefer to receive a patent. In making her investment decisions, our researcher has an expectation as to whether any given innovation will prove hard or easy, but she may be mistaken in that expectation.

Given this framework, the question becomes: should we award patents based upon the researcher's expectation of the innovation's difficulty at the outset or based upon how things actually turn out? In other words, should we make obviousness determinations using hindsight? The answer: Use hindsight. In this framework, to maximize social utility, we should make obviousness determinations and award a patent (or not) based not on the researcher's expectations in approaching the project, but on how things actually turned out.

Using hindsight and awarding patents based upon how things actually turned out ensures that the innovation is found nonobvious and hence receives a patent when it was in fact hard, and further ensures that the innovation is found obvious and hence does not receive a valid patent when it was in fact easy. Knowing that she will receive a patent if the innovation in fact turns out to be hard, a researcher can invest in an innovation whether she expects the innovation at the outset of her research to be hard or easy. If she expects it to be hard and it is, she will receive a patent and knows that she will receive a patent, and will therefore pursue the innovation. If she

expects it to be easy, and it turns out to be hard, she will continue her work anyhow. In that case, she will receive a patent and knows that she will receive a patent because the innovation turned out to be hard. On the other hand, if she expects it to be easy and it is, or if she expects it to be hard, but it turns out to be easy, the researcher will not receive a patent and she knows that. She will nevertheless pursue or continue work on these easy innovations because the additional incentives a patent might provide are unnecessary to encourage investment in such easy innovations.

In contrast, a rule that awarded patents on the basis of the researcher's initial expectations would create two problems. First, if our researcher expected the innovation to be easy, and it turned out to be hard, a rule that awarded patents based solely on initial expectations and ignored how things actually turned out, would deny the researcher a patent. As a result, once it became clear that the innovation was going to be hard, the researcher would abandon her work. Second, if our researcher expected the innovation to be hard, but it turned out to be easy, a rule that awarded patents based solely on initial expectations would give the researcher a patent unnecessarily, creating the associated deadweight losses.

Despite this perfectly sensible justification for using hindsight, the prohibition on at least some kinds of hindsight seems to arise from two concerns. First, using the inventor's own work on the obviousness issue may lead to a mistaken conclusion of obviousness because the inventor had exceptional, rather than ordinary skill in the art. For a person with exceptional skill, certain inventions may prove easy where they would have been hard for a person of ordinary skill. As a result, a test that focused on whether the invention was hard or easy for the actual inventor might deny the true genius her patents. Yet, if that is our concern, several of the secondary factors, including long-felt, but unsolved need and failure of others should help us sort out directly whether an easy innovation was easy because the inventor happened to be a genius or because it was easy even for a person of ordinary skill.

Second, hindsight may also lead the decision-maker to identify mistakenly a hard invention as easy by providing a roadmap to piece together the relevant prior art to solve the problem at hand. The risk here is that while we judge obviousness from the perspective of a person having ordinary skill in the art who is presumed to know all of the relevant prior art, we must not focus our hypothetical person's attention on only that prior art that the inventor's own work proves is the most directly relevant and helpful. Thus, if we imagine our person of ordinary skill in the art sitting in her shop with the prior art references hanging around her, as Judge Rich once suggested,¹²² we must ensure that her walls include all of the prior art references, the helpful references, as well as the unhelpful. When we imagine our hypothetical person looking at all the available prior art, the task at hand may well seem impossible. In contrast, if we imagine our person of ordinary skill in the art sitting in her shop with only those prior art references that the inventor's own work has shown to be most helpful, the task of connecting the dots may seem trivially easy.¹²³ As the Federal Circuit has explained:

¹²² See *In re Winslow*, 365 F.2d 1017, 1020 (C.C.P.A. 1966) (“Appellant presents the usual argument that hindsight reconstruction has been employed by the examiner and the board. We disagree with that position. We think the proper way to apply the 103 obviousness test to a case like this is to first picture the inventor as working in his shop with the prior art references - which he is presumed to know - hanging on the walls around him.”)

¹²³ See *In re Antle*, 444 F.2d 1168, 1171 (C.C.P.A. 1971) (“The language relied on by the solicitor, quoted above, therefore, does not apply in cases where the very point in issue is whether one of ordinary skill in the art

It is wrong to use the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit. Monday morning quarterbacking is quite improper when resolving the question of nonobviousness in a court of law.¹²⁴

While this second concern raises an interesting possibility, the key question is the extent to which hindsight, or certain types of hindsight, will actually lead to such mistakes. Using a series of surveys, Professor Mandel has attempted to answer that question.

C. *Testing for Hindsight and Hindsight Bias: Professor Mandel's Work*

For his research, Professor Mandel followed survey protocols that social science researchers had developed and used to identify the significance of hindsight on a variety of issues.¹²⁵ The protocol essentially provides two groups of respondents with two information sets: the first lays out a question or problem with the information available up to the point where the question or problem is resolved; and the second includes the same “before the fact” information set but adds information regarding how the event actually turned out.

In applying this protocol to the use of hindsight in obviousness determinations, Professor Mandel developed fact patterns based upon two litigated patents. The first focused on finding a way to teach baseball players how to pitch, without the need for one-on-one instruction. The solution actually developed and patented was to manufacture a baseball with the finger positions for various pitches marked on the surface of the ball.¹²⁶ The second focused on finding a way to incorporate a salty taste into fishing lures. The solution actually developed and patented was to add salt into the plastic of the lure itself.¹²⁷

For each fact pattern, Professor Mandel created a brief, one page or so, description of: (i) the relevant prior art; and (ii) the problem to be solved. Based simply on this description, and without telling his respondents the nature of, or even if, a solution had been found, he then asked two different groups of respondents, one for the baseball and one for the salty-tasting lure, whether they believed that a solution to the problem at issue would have been obvious to a person of ordinary skill in the art. For this “no hindsight” or foresight scenario, twenty-four percent (24%) of his respondents thought a solution to the baseball fact pattern was obvious, and twenty-three percent (23%) of his respondents thought a solution to the salty-tasting lure fact pattern was obvious.

With these foresight scenarios as a benchmark, Professor Mandel then presented the same descriptions to two additional response groups. For these second groups, however, Professor Mandel added the fact that the problem had been solved and provided a brief description of the

would have selected, without the advantage of hindsight and knowledge of the applicant's disclosure, the particular references which the examiner applied.”).

¹²⁴ Orthopedic Equipment Co. v. United States, 702 F.2d 1005, 1012 (Fed. Cir. 1984) (*per curiam*).

¹²⁵ See Baruch Fischhoff, *Hindsight ≠ Foresight: The Effect of Outcome Knowledge on Judgment Under Uncertainty*, 1 J. OF EXPERIMENTAL PSYCHOL.: HUMAN PERCEPTION & PERFORMANCE 288, 289 (1975); see also Susan J. LaBine & Gary LaBine, *Determinations of Negligence and the Hindsight Bias*, 20 LAW & HUMAN BEHAVIOR 501, 502–04 (1996) (surveying a wide variety of hindsight bias studies); Jay J. J. Christensen-Szalanski & Cynthia Fobian Willham, *The Hindsight Bias: A Meta-Analysis*, 48 ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES 147 (1991) (meta-analysis of over 120 hindsight bias studies).

¹²⁶ See *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339 (Fed. Cir. 2001).

¹²⁷ See *Arkie Lures, Inc. v. Gene Larew Tackle, Inc.*, 119 F.3d 953 (Fed. Cir. 1997).

solution devised. With the benefit of this hindsight, the respondents were asked if they believed the solution to the problem was obvious. In this hindsight scenario, seventy-six percent (76%) of the respondents said the solution to the baseball fact pattern, and fifty-nine percent (59%) of the respondents said the solution to the salty-tasting lure fact pattern, were obvious. Finding the differences between the two scenarios to be large and statistically significant, Professor Mandel proclaimed his results proof of a hindsight bias.¹²⁸

Yet, Professor Mandel's results are scarcely surprising. Given limited initial information on an issue, people will invariably update their information set when they see how things actually turned out. Indeed, Professor Mandel's set-up seems predisposed to create the largest possible difference between the hindsight and foresight scenarios. Respondents are given a brief description of the prior art, but no real understanding of the art, the principles that underlie it, or how it might tie together. They are asked to answer the obviousness inquiry as if they were a person of ordinary skill in the art, yet they have no such skill.

While we certainly understand the need to simplify for the purposes of a survey, no reasonable patent attorney is going to allow her case to go forward on summary judgment, let alone trial, with the sort of summary information Professor Mandel provided his respondents.¹²⁹ The plaintiff's attorney will certainly present evidence concerning the difficulties encountered on the road to invention. The judge and the jury will hear extensive testimony regarding the long nights, the false trails, and the other elements now common to the heroic inventor story. The defense attorney will counter with her own evidence, showing how the prior art ties together and how its underlying principles lead almost inevitably to the patentee's solution.

Rather than this conflicting, but rich tableau, respondents in Professor Mandel's surveys are presented with only an informational skeleton. Given the limited information they are provided, the difference in obviousness outcomes that Professor Mandel finds is almost inevitable. Any respondent asked to solve a problem, based simply upon a brief description of existing work in the field, but without any training in the art, is not even going to know where to begin. Of course, a solution is not going to appear obvious, except perhaps in the most extreme of cases. On the other hand, if the respondent is given the same information and then also told that the problem has been solved, of course, that's going to make a solution appear radically more obvious. Whether due to a demand effect,¹³⁰ a desire to avoid appearing less smart than their peers, or otherwise, many people, once they know the outcome, will say that they saw the outcome coming all along. It's inevitable.

¹²⁸ See Mandel, *supra* note [], at 1411. In Professor Mandel's words:

The results demonstrate that the hindsight bias significantly influences non-obvious judgments. Participants who were not informed of the invention were substantially more likely to judge a solution non-obvious than participants who were informed what the invention was. The magnitude of the hindsight bias in these patent scenarios was striking and is greater than that reported for other legal judgments.

Id.

¹²⁹ While Professor Mandel acknowledged this problem with his format, he did not believe that it would affect the validity of his results. See Mandel, *supra* note [], at 1413-14.

¹³⁰ A demand effect is the recognized tendency of survey respondents to give the answer they believe the interviewer is looking for.

Mere knowledge of the fact and nature of the solution is not, however, the sort of illegitimate hindsight with which patent law is concerned. It does not indicate that respondents used that solution as a roadmap to connect the prior art dots. Nor does it establish that the respondent used the solution to focus on some pieces of prior art while ignoring others. At most, the difference that Professor Mandel finds establishes that the respondent used the additional information provided – the solution – to help understand the information already available. It does not establish that they used hindsight improperly.

Moreover, if Professor Mandel is going to assert bias, then he must show that the updating in the information set that takes place when the respondents learn of the solution leads not to difference, which is trivially and inevitably true, but to mistakes. He must show that with the use of hindsight, respondents get the obviousness issue wrong. In other words, to determine if hindsight leads to bias, we would need to know for the baseball patent, whether the 76 percent obviousness result of the hindsight scenario or the 24 percent obviousness result of the foresight scenario closer to the socially optimal resolution of the obviousness issue. Similarly, for the fishing lure, we would need to know whether the 59 percent obviousness result of the hindsight scenario or the 23 percent obviousness result of the foresight scenario closer to the optimal result. The doctrine of obviousness is presumably intended to achieve some purpose, and it is against that purpose that results should be measured.

While not perfectly clear, a plausible case can be made that the hindsight results are closer than the foresight results to the obviousness results in the actual litigated cases. For the patent on the baseball, the jury found the invention not proven obvious, the district judge granted judgment as a matter of law that the invention was obvious, and the Federal Circuit reversed and reinstated the jury verdicts, over Judge Michel's dissent.¹³¹ Thus, two judges held the invention obvious, and two judges and a jury held its obviousness not proven. In the case of the fishing lure, the district court granted summary judgment concluding that the invention was obvious, but was reversed on appeal by a panel of the Federal Circuit, again over Judge Michel's dissent.¹³² So again, two judges held the invention obvious, and two held its obviousness not proven. The actual results in these cases thus suggest that the obviousness issue in both was pretty close. Indeed, the very fact that the cases were litigated rather than settled suggests that obviousness was a close issue. Given the disproportionate stakes in patent litigation, patentees and alleged infringers chose to litigate rather than settle, not on the fifty-fifty case, but typically on a 30-70 case.¹³³ Taken together, these facts suggest that the obviousness results in the hindsight scenarios probably come closer to the 50 to 70 percent obviousness value that the litigation of the cases suggest is appropriate than the obviousness results in the foresight scenarios.

Of course, using the actual results in these cases as a proxy for the "right" result is not entirely satisfactory. The actual results in the cases reflect existing doctrine, which reflects in turn a given view of hindsight bias. Given that we are trying to determine if that view of hindsight bias is accurate, we cannot assume that the actual results are also the socially optimal results. To do so would almost necessarily concede that the existing doctrine's view of hindsight bias must be accurate. Yet, that is the very question we are trying to answer. Another way to see this point is to note that both cases were decided before the Supreme Court's decision in *KSR*. Given that both may well have come out differently had they been decided afterwards, if we use

¹³¹ See *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339 (Fed. Cir. 2001).

¹³² See *Arkie Lures, Inc. v. Gene Larew Tackle, Inc.*, 119 F.3d 953 (Fed. Cir. 1997).

¹³³ See Lunney, *supra* note [], at 12-14.

actual results as a proxy for “right” results, then we would have to allow our socially optimal result to change depending on whether these cases were decided before or after *KSR*. But that can’t be right. The costs and benefits of upholding or striking down these patents dictate the socially optimal result, not the relative timing of these decisions vis-à-vis *KSR*.

Thus, Professor Mandel’s work demonstrates a statistically significant and large difference in obviousness outcomes when we tell respondents that the problem at hand has been solved and explain how. Yet, we cannot tell if this difference is simply an artifact of the survey format, or represents something likely to be present in real-world litigation. Even if the difference matches real-world experience, we also cannot tell whether this additional information leads to bias, in the sense of a deviation from the ideal, or merely a difference, in the sense of a deviation between the hindsight and foresight scenarios.

D. *Testing for a Hindsight Difference with an Expanded Information Set*

To explore these remaining questions, we took Professor Mandel’s basic approach, and devised our own parallel set of materials. Our problem focused on dental hygiene. In the survey materials, we described the prior art, including conventional toothbrushes, floss, and ultrasonic or vibrating toothbrushes. We then described some of the advantages and disadvantages of each. A conventional toothbrush is inexpensive, but fails to clean some areas between and behind the teeth. Floss is great for cleaning between teeth, but many people fail to use it. Ultrasonic toothbrushes clean behind teeth well, but are expensive. We then described the problem our would-be inventor faced: design an inexpensive toothbrush that cleans as well between teeth as floss and as well behind teeth as an ultrasonic.

Following Professor Mandel’s lead, we began by exploring the difference in obviousness outcomes for foresight and hindsight scenarios. First, we asked a group of student respondents whether, based upon a brief description of these prior art devices and the problem to be solved, they believed that a solution would be obvious to a person of ordinary skill in the art of dental hygiene. Forty-eight percent (48%) of respondents thought that a solution would be obvious. Second, we then compared this foresight scenario to the obviousness percentage for a hindsight scenario. For the hindsight scenario, we provided the respondents with the same descriptions of the prior art and the problem to be solved, but added a statement that the problem had been solved and a brief description of the resulting toothbrush. With the benefit of this hindsight information, seventy percent (70%) of respondents thought that a solution would be obvious. Like Professor Mandel, we found a large and statistically significant ($p=0.04$) difference between the obviousness outcomes in the foresight and hindsight scenarios.¹³⁴

To begin exploring the possible shortcomings of Professor Mandel’s work, we then devised a third scenario, which we called the “partial” hindsight scenario. In this third scenario, we provided the respondents with the same descriptions of the prior art and the problem to be solved. We also told them that the problem had been solved. However, rather than present one solution, we presented the respondents with four possible solutions, told them that one of the four had been developed and patented, but that the other three were “*never* invented, *never* developed, and *never* patented.” We did not tell the respondents which one of the four possible solutions was the actual one developed and patented. Thus, respondents had the benefit of some hindsight – knowing the problem had been solved – but not perfect hindsight. We then described

¹³⁴ We calculated p values using Fisher’s exact test.

the four possible solutions, presenting the actual solution second, and after all four were presented, asked the respondents if each would have been obvious.

We had three issues we wanted to address through this scenario. First, we wanted to explore whether the hindsight difference Professor Mandel found remained as large when the hindsight was placed in a broader informational context. In this regard, the four possibilities, three of which did not work, might represent the sort of evidence judges and juries would likely hear regarding false trails and missteps on the path to the patented invention. Second, we wanted to explore the nature of the hindsight at work. In this scenario, respondents have some hindsight information. They are told that the problem has been solved, but are uncertain as to which of the possible solutions actually worked. From an engineering or scientific perspective, knowing that there is a solution is often half the battle. So we wanted to determine whether knowing that there was a solution would generate the same hindsight difference. Third, we wanted to check for a demand effect, to see if the order in which the possible solutions were presented to the respondents affected the obviousness results.

Although hindsight is clearly present in this third scenario, our results reflect no hindsight difference between this scenario and the original foresight scenario. In response to whether the actual solution would have been obvious to a person of ordinary skill in the art, only thirty-eight percent (38%) of respondents thought that it was. This obviousness result is statistically indistinguishable from the result in the foresight case ($p=0.419$). Unfortunately, from the results, we cannot tell why there was no hindsight effect. We cannot tell if the lack of a hindsight effect was due to: (1) the differing nature of the hindsight information available, that is knowledge only that a solution was found, but not its nature; or (2) the reduced importance of the hindsight information given the additional information provided by the description of the three failed solutions. Further work will be necessary to distinguish between these possibilities. Yet, the results plainly establish that the presence of this partial hindsight does not inevitably lead to a difference in obviousness results, let alone any bias.

The third scenario also revealed a clear demand effect in the form of a steady decline in the obviousness results across the four possible solutions. Ninety percent (90%) of respondents believed that the first proposed solution was obvious. Thirty-eight percent (38%) of respondents believed that the second proposed solution – the actual solution – was obvious. Sixteen percent (16%) of respondents believed that the third proposed solution was obvious. And six percent (6%) of respondents believed that the fourth proposed solution was obvious. The differences between the obviousness results for the first, second, and fourth proposed solution are large and statistically significant. Although not definitive,¹³⁵ the tendency of respondents to leap to an obviousness conclusion for the first proposed solution, once they know there is a solution, strongly suggests that Professor Mandel’s supposed hindsight difference may reflect, at least in part, a demand effect or respondents’ desire to get the answer “right.”

For our fourth scenario, we wanted to explore whether any of the hindsight difference arose because the survey respondents were not persons of skill in the art. We considered different approaches that we might use to try and get respondents to act and think more like persons of skill in the art. In the end, we settled on simply asking the respondents to write

¹³⁵ The differences could be due to some inherent difference in the obviousness of the four proposed solutions. Although the results of the fourth scenario tend to refute that, *see* text accompanying notes []-[] *infra*, further testing may be necessary to resolve that possibility.

briefly how they thought the problem might be solved. We asked for their written suggestions after describing the prior art and the problem to be solved, but before walking through the four possible solutions. After giving respondents an opportunity to write down their suggested solutions,¹³⁶ we then presented the four possible solutions, with the actual solution again second on the list, and then asked with respect to each of the four possible solutions whether it would have been obvious to a person having ordinary skill in the art.

Through this approach, we hoped to have our respondents approach the problem in, at least the same way, as would a person of ordinary skill in the art. While the respondents would still lack formal or informal training in the art, they would at least grapple with the problem directly and engage it actively, rather than passively accept the information that we provided. We also hoped that this would reduce if not eliminate any tendency of respondents to use the fact of a solution as a proxy for the difficulty of that solution.

Our results from this scenario were surprising. Although there was some hindsight present in this scenario, the fact that the problem was solved is the same hindsight that was present in the third scenario. Yet, here, fifty-eight percent (58%) of respondents thought the actual solution was obvious. This obviousness result is statistically indistinguishable from the seventy percent of respondents who thought the invention obvious in the perfect hindsight case ($p=0.298$). It is also statistically different from the thirty-eight percent obviousness result in the third scenario ($p=0.07$).

In addition to these obviousness results, this engagement scenario also eliminated the demand effect that we found in the third scenario results. For the first proposed solution, the obviousness result dropped from ninety percent to fifty-six percent. For the third proposed solution, the obviousness result remained statistically unchanged, moving from sixteen percent in the third scenario to eighteen percent in the fourth. The obviousness result for the fourth solution increased, moving from six percent in the third scenario to forty-eight percent in the fourth. Moreover, while the respondents in the third and fourth scenarios rearranged their votes as to which of the four solutions were obvious, the total number of obviousness results across the four solutions remained statistically unchanged.¹³⁷

The results from this fourth scenario raise some troubling questions. First, as set out in the introduction, there should be no hindsight difference, let alone bias, in the fourth scenario. After all, despite the introduction of some hindsight information in the third scenario, there was no difference in the obviousness result between the third scenario and the original foresight scenario. Moreover, the third and fourth scenarios contained identical hindsight information, presented in an identical format. Yet, the results of the fourth scenario are statistically identical

¹³⁶ Of the fifty respondents, thirty-seven wrote some sort of proposed solution. The remaining thirteen either wrote that they could not think of a solution or left the space blank. Nevertheless, all thirteen thought at least one of the proposed solutions was obvious; four thought two of the solutions were obvious; and one thought three of the solutions were obvious. Seven of these thirteen (or 54 percent) thought the actual solution was obvious – a percentage not statistically different from the fifty-eight percent obviousness result for the respondents as a whole with respect to the actual solution.

¹³⁷ In the third scenario, the fifty respondents thought a solution was obvious a total of seventy-time times across the four inventions. In the fourth scenario, the fifty respondents thought a solution was obvious a total of eighty times across the four inventions.

to the results from the pure hindsight scenario. This strongly suggests that the original difference we found between the foresight and hindsight scenarios does not represent hindsight bias.

Second, the statistically different obviousness results between the third and fourth scenarios must reflect something other than hindsight. Hindsight cannot account for this difference because the hindsight information available in the third and fourth scenarios is identical. Given that the only difference between the third and fourth scenarios was that we asked the respondents in the fourth scenario to write briefly a suggested solution to the problem, that request for engagement must somehow account for the differing obviousness results.¹³⁸

While we are open to other interpretations, we believe that the difference in results between the third and fourth scenarios arise because the fourth scenario's engagement corrects, either in whole or in part, for a bias that otherwise arises inherently in obvious determinations. Specifically, we ask the decision-maker in these cases to resolve obviousness issues as if they were persons having ordinary skill in the art. Yet, they have no such skill. Lacking such skill, our decision-makers are likely to overestimate the difficulty of solving any given technological problem. Absent the technical background to understand the prior art references, to see the principles underlying them, and to recognize their possible connections, our obviousness decision-maker, whether judge or jury, is likely, if not at trial, then certainly given the limited information provided in Professor Mandel's survey format, to see the prior art references as inherently indecipherable. Allowing our obviousness decision-makers to use hindsight helps them to understand these references, to see their principles, and to recognize their connections as if they had skill in the art.

The question remains, however, whether hindsight goes too far and allows the decision-maker to see these things too easily. Our survey results suggest that certain hindsight, specifically the knowledge that the problem was solved and how, helps the decision-maker neither too much nor too little, but just the right amount. In our study, when we tried to correct for this lack-of-skill by asking our respondents to engage the problem more like persons having ordinary skill in the art, we get an obviousness result that is at the same time: (i) higher than the obviousness results in the foresight scenario and the partial hindsight without engagement scenario; and (ii) statistically identical to the results in the pure hindsight scenario. Taken together, these results suggest that the hindsight at issue in Professor Mandel's study, rather than introducing a bias into the system, merely corrects a bias already present. By using hindsight knowledge of the fact and nature of the solution found, a person of no skill in the art can reach an obviousness outcome that more closely parallels the outcome that would have been reached by a person skilled in the art. Rather than lead to bias and incorrect obviousness determinations, our results suggest that the use of hindsight of this sort may improve decision-making on the obviousness issue.

¹³⁸ Another possibility is that, as a matter of random chance, the two groups of respondents simply perceived the obviousness issue differently. While our test for statistical significance suggests a less than ten percent chance that random chance alone accounts for the difference, it does not foreclose that possibility entirely.