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IS THE SUPREME COURT'S PATENTABLE SUBJECT MATTER TEST OVERLY AMBIGUOUS? AN EMPIRICAL TEST

Jason D. Reinecke*

*The prophecies of what the courts will do in fact, and nothing more
pretentious, are what I mean by the law.*¹

INTRODUCTION

Few, if any, patent law doctrines have undergone as radical a change in recent years as patentable subject matter. In four cases handed down between 2010 and 2014, the Supreme Court articulated a new two-step patent eligibility test that drastically reduced the scope of available patent protection for software and many life sciences inventions.² The first step is to determine whether the patent claims are directed to a law of nature, natural phenomena, or abstract idea.³ If so, the claim is only patent-eligible under step-two if it contains an “inventive concept” sufficient to transform the unpatentable law of nature, natural phenomena, or abstract idea into patent-eligible subject matter.⁴ Because this test directly relates to the permissible scope of patent protection in two industries that comprise a sizeable portion of the U.S. economy, it should come as no surprise that the test is highly controversial.⁵

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¹ Oliver Wendell Holmes Jr., *The Path of the Law*, 10 HARV. L. REV. 457, 461 (1897).

² *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208 (2014); *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013); *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66 (2012); *Bilski v. Kappos*, 561 U.S. 593 (2010).

³ *Alice Corp.*, 573 U.S. at 215–17.

⁴ *Id.*

⁵ Commentators and even members of the Supreme Court have expressed concern about the incentive effects of these recent rulings on these two fields, leading one researcher to discuss the nonpatent innovation incentives that are provided in the biomedical and software fields. Lisa Larrimore Ouellette, *Patentable Subject Matter and Nonpatent Innovation Incentives*, 5 U.C. IRVINE L. REV. 1115 (2015).

Scholars have described the test as, among other things, “a foggy standard cloaked as a rule,”⁶ “too philosophical and policy based to be administrable,”⁷ a “crisis of confusion,”⁸ “rife with indeterminacy,”⁹ and one that “forces lower courts to engage in mental gymnastics.”¹⁰ Former Chief Judge of the Federal Circuit Paul Michel has described the standard as “too vague, too subjective, too unpredictable and impossible to administer in a coherent, consistent way in the patent office or in the district courts or even in the federal circuit.”¹¹ Others have been even more colorful describing their feelings toward the new rule.¹² For instance, Gene Quinn, a patent attorney and founder of a popular legal blog,¹³ stated that rather than continuing to use the Supreme Court’s new two-step test, “[w]hy don’t we just tie a rope around the necks of the inventors and see if they float? Such an approach would be almost more enlightened than the hide the ball test we have now. At least we’d all know the rules!”¹⁴

These criticisms are based on anecdotal and experiential evidence. This Article brings more systematic evidence into the debate by providing the results of an

⁶ Michael Risch, *Nothing Is Patentable*, 67 FLA. L. REV. F. 45 (2015).

⁷ Dennis Crouch, *Eligibility: Explaining the IPO Legislative Proposal*, PATENTLYO (Feb. 9, 2017), <https://patentlyo.com/patent/2017/02/eligibility-explaining-legislative.html> [<https://perma.cc/JX8G-SSEL>].

⁸ David O. Taylor, *Amending Patent Eligibility*, 50 U.C. DAVIS L. REV. 2149, 2164 (2017).

⁹ Kevin Madigan & Adam Mossoff, *Turning Gold into Lead: How Patent Eligibility Doctrine is Undermining U.S. Leadership in Innovation*, 24 GEO. MASON L. REV. 939, 941 (2017).

¹⁰ Annal D. Vyas, *Alice in Wonderland v. CLS Bank: The Supreme Court’s Fantastic Adventure into Section 101 Abstract Idea Jurisprudence*, 9 AKRON INTELL. PROP. J. 1, 2 (2015). See also Brief of 19 Law Professors as Amici Curiae in Support of Petition for Writ of Certiorari, *Sequenom, Inc. v. Ariosa Diagnosis, Inc. et al.* (2016) (No. 15–1182) (detailing how the Supreme Court’s test for patent eligibility suffers from both legal indeterminacy and over-restrictiveness in application). To be clear, while the test is criticized for being difficult for courts to administer, the new section 101 jurisprudence is not without its supporters on a broader scale. See, e.g., Brian J. Love, *Why Patentable Subject Matter Matters for Software*, 81 GEO. WASH. L. REV. ARGUENDO 1 (2012).

¹¹ Gene Quinn, *Judge Michel Says Alice Decision ‘will create total chaos,’* IPWATCHDOG (Aug. 6, 2014), <http://www.ipwatchdog.com/2014/08/06/judge-michel-says-alice-decision-will-create-total-chaos/id=50696/> [<https://perma.cc/FLF8-EKV4>] (quoting former Chief Judge Paul Michel).

¹² An attorney from Kilpatrick Townsend & Stockton LLP wrote a witty satire on the new patentable subject matter rule. See Darin Gibby, *The Abstract Swing: Major League Problems in Patent Law*, JDSUPRA (May 17, 2017), <https://www.jdsupra.com/legalnews/the-abstract-swing-major-league-59124/> [<https://perma.cc/X5TV-W4Z6>]. Thanks to Darin Gibby for sending this my way after taking my survey.

¹³ Gene Quinn, IPWATCHDOG, <http://www.ipwatchdog.com/people/gene-quinn-3/> [<https://perma.cc/RP28-8KP4>] (last visited Nov. 5, 2018).

¹⁴ Gene Quinn, *It Is Time to Define the Term ‘Abstract Idea,’* IPWATCHDOG (May 18, 2017), <http://www.ipwatchdog.com/2017/05/18/time-define-term-abstract-idea/id=83393/> [<https://perma.cc/XER3-SY6E>].

empirical study conducted via survey that tests the clarity of the new two-step test in the software field. In particular, the 231 patent attorneys who responded to the survey received five software patent claims randomly selected from a population of fifty and were asked to predict how courts would rule regarding subject matter eligibility.¹⁵ The population of fifty software claims comprised district court patentable subject matter pleading-stage decisions issued between the Federal Circuit's influential *McRO, Inc. v. Bandai Namco Games America Inc.*¹⁶ decision on September 13, 2016 and April 19, 2017 when case collection began (a total time frame of just over seven months).

The results suggest that while the test is likely not a beacon of absolute clarity, it is also not completely amorphous. For example, patent prosecutors (attorneys who *write* patents)¹⁷ correctly identified how courts ruled 67.3% of the time. Patent litigators fared much more poorly, only correctly identifying court outcomes 59.7% of the time. Interestingly, patent litigators varied significantly in their inferential abilities. This means that some groups of patent litigators were much better than 59.7% at predicting court outcomes, and some were worse—with the difference being much more than one would expect due to chance alone.

Although patent litigators fared more poorly, I am not convinced that patent prosecutors are inherently better than litigators at applying the two-step test. The attorneys made quick eligibility decisions for the survey. As discussed in more detail below, I believe that litigators are just worse at making *quick* eligibility decisions, and the discrepancy between litigators and prosecutors would be reduced or eliminated if the attorneys spent more time making their decisions and had access to more information. If this inference is correct, then I think it's a mistake to read too much into the litigators' poor performance—they just needed more time and information.

For many respondents—patent prosecutors and some litigators—the new test for patentable subject matter seems less unpredictable than commentators have suggested. These results are particularly promising considering (1) attorneys only received the patent claim and were not given other highly relevant information such as the patent specification, priority date, and prior art; (2) more than 57% of respondents spent an average of *less than one minute analyzing each claim*; and (3) the new two-step test was only recently handed down and has had little time to establish itself.

Indeed, numerous attorneys indicated in the comments that they believed they would have done a much better job had they been able to review the specification.

¹⁵ A version of the test is available for readers to try at the following link: [https://stanforduniversity.qualtrics.com/jfe/form/SV_efVRMDNDTrHUNxj_\[https://perma.cc/P59C-KBM8\]](https://stanforduniversity.qualtrics.com/jfe/form/SV_efVRMDNDTrHUNxj_[https://perma.cc/P59C-KBM8]).

¹⁶ 837 F.3d 1299 (Fed. Cir. 2016).

¹⁷ My survey focused on patent prosecuting attorneys. I did not send my survey to patent agents—individuals who have passed the patent bar and can prosecute patents but have not attended law school and have not been admitted to a state bar. *See Who Can Take the Patent Bar Exam*, IPWATCHDOG, <https://www.ipwatchdog.com/patent-bar-exam/patent-bar-qualifications/> [https://perma.cc/PY7A-TW55] (last visited Feb. 28, 2019).

Furthermore, the results themselves suggest that attorneys would have been more successful predictors had they been given the claim's priority date. Participating attorneys were much better at predicting which claims were eligible—and worse at predicting which claims were ineligible—as the patent claim's priority date became more recent. Attorneys also exhibited a strong ineligibility bias on the claims with the earliest priority dates that went away on the claims with the later priority dates. These correlations are likely due to the fact that patent eligibility often turns on an inquiry that depends on time: whether the patent claims are directed to something inventive or to conventional and well-known techniques. The earlier claims comprise older technology that is inherently going to appear to be more patent-ineligible to any attorney absent information about the claim's priority date.

The results provide two more important observations. First, the results show that the claims vary widely with respect to clarity (much more than due to chance alone)—that is, attorneys were much better at correctly identifying court outcomes on some types of claims than on others. This finding remained even after controlling for priority date, which suggests that the new two-step test may be clearer for certain types of claims than for others. Second, patent attorneys did not generally agree with each other on the eligibility of the claims any more than with the courts, which suggests that judges are not misapplying the law due to lack of patent expertise.

The results clearly show that the two-step test is not wholly ambiguous or as impossible to administer as some commentators have suggested. If patent prosecutors can correctly predict court outcomes over two-thirds of the time after spending less than one minute analyzing merely one piece of the puzzle, the two-step test is clearly not impossible to administer coherently.

However, while the results show that the two-part test is not wholly ambiguous, this Article leaves to the readers to decide whether the results confirm or dispel their belief that the test is too difficult to administer from a social welfare perspective. I believe the social welfare implications suggested by the results are ambiguous for two reasons. First, it's unclear just how much better attorneys would have performed had they had more time to make their decisions and had they been able to make their decisions after reviewing all the relevant information. Indeed, the results suggest that attorneys would have performed significantly better. However, this cannot be confirmed without more research. Second, it's unclear how much certainty is sufficient certainty. Commentators will certainly disagree on how much certainty is "enough," and I do not wish to attempt to make that determination.

This Article proceeds in three parts. Part I begins by discussing the Supreme Court's new two-step patent eligibility test as it relates to software inventions and how that test has been administered by district courts and in the Federal Circuit. Part I concludes by highlighting the widespread criticism the rule has received for being too unpredictable. Part II describes the empirical study conducted to test this criticism. Part III provides and analyzes the results of the empirical study.

I. SECTION 101 PATENT ELIGIBILITY

Part I.A begins by discussing the new two-step patent eligibility test as it relates to software, including how that test has been applied by the federal courts. Part I.B proceeds by highlighting the widespread criticism the rule has received for being difficult to administer.

A. The New Two-step Patent Eligibility Test

Section 101 of the Patent Act permits patent protection for any “process, machine, manufacture, or composition of matter.”¹⁸ In spite of this all-encompassing language, courts have “long held that this provision contains an important implicit exception: Laws of nature, natural phenomena, and abstract ideas are not patentable.”¹⁹

The application of this implicit exception to software inventions “has a long and tortured history.”²⁰ In the 1970s, it appeared as though the Supreme Court would not grant patent protection to software.²¹ But in 1981, the Court granted protection to novel software because that software was used to operate a physical machine.²² Lower courts gradually did away with requiring software to be tied to a machine in the 1980s and 1990s²³ and instead began regularly upholding the patentability of software inventions.²⁴ In 1998, the Federal Circuit completely ousted any requirement that software be tethered to a machine, opting instead for a pro-software-patent rule that did not depend on implementation, but rather on whether the invention produced “a useful, concrete and tangible result.”²⁵

¹⁸ 35 U.S.C. § 101 (2018)

¹⁹ *Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 216 (2014) (quoting *Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576, 589 (2013)).

²⁰ Mark A. Lemley et al., *Life After Bilski*, 63 STAN. L. REV. 1315, 1317 (2011). This history is briefly discussed in the article. *See id.* at 1317–19. For a more complete discussion of the evolution of the patentable subject matter doctrine, see PETER S. MENELL ET AL., *INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE* 277–314 (2017); Peter S. Menell, *Forty Years of Wandering in the Wilderness and No Closer to the Promised Land: Bilski’s Superficial Textualism and the Missed Opportunity to Return Patent Law to Its Technology Mooring*, 63 STAN. L. REV. 1289, 1292–1305 (2011); Joshua D. Sarnoff, *Patent-Eligible Inventions After Bilski: History and Theory*, 63 HASTINGS L.J. 53, 63–84 (2011); Pamela Samuelson, *Benson Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions*, 39 EMORY L.J. 1025, 1032–98 (1990).

²¹ *See Parker v. Flook*, 437 U.S. 584, 594–95 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 65, 71–72 (1972).

²² *See Diamond v. Diehr*, 450 U.S. 175, 187, 191–93 (1981).

²³ *See Lemley et al.*, *supra* note 20, at 1318; *see also* Julie E. Cohen & Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 CALIF. L. REV. 1, 8–11 (2001).

²⁴ *See, e.g., In re Alappat*, 33 F.3d 1526, 1544–45 (Fed. Cir. 1994) (en banc).

²⁵ *State St. Bank & Trust Co. v. Signature Fin. Grp.*, 149 F.3d 1368, 1373 (Fed. Cir. 1998) (internal quotation marks omitted).

After the Federal Circuit's 1998 ruling, section 101 claims against software patents remained a "dead letter" for over a decade²⁶ until 2010 when the Supreme Court decided *Bilski v. Kappos*,²⁷ its first of four patentable subject matter rulings in four years.²⁸ Three of these rulings relate to software inventions and will be discussed in turn.²⁹

In *Bilski*, the Supreme Court found that the asserted patent was patent ineligible subject matter.³⁰ The Court reasoned that the patent was directed only to "the basic concept of hedging," which is an unpatentable "abstract idea" because it is "a fundamental economic practice long prevalent in our system of commerce."³¹ Providing patent protection to an abstract idea, with nothing more, would allow the patentee to "pre-empt use of [the basic and long-standing concept of hedging risk] in all fields."³² Furthermore, the claims provided nothing beyond the basic idea of hedging risk aside from other "well-known . . . techniques."³³ In finding the patent claims directed to ineligible subject matter,³⁴ *Bilski* helped establish the modern two-step test espoused more clearly in *Alice*³⁵ and *Mayo*.³⁶

I. Alice and Mayo: The Modern Two-step Test

In *Alice* and *Mayo*, the Supreme Court articulated the current two-step test that governs patent eligibility for software patents.³⁷ The test first questions whether the patent claims are directed to a patent ineligible law of nature, natural phenomena, or abstract idea.³⁸ If so, the claim is only patent-eligible if it contains an "inventive concept" sufficient to "transform" the unpatentable law of nature, natural phenomena, or abstract idea into patent-eligible subject matter.³⁹

The Court reasoned that laws of nature, natural phenomena, and abstract ideas are the "building blocks of human ingenuity,"⁴⁰ and "monopolization of these tools through the grant of a patent might tend to impede innovation more than it would

²⁶ See Lemley et al., *supra* note 20, at 1318.

²⁷ 561 U.S. 593 (2010).

²⁸ *Supra* note 2.

²⁹ See *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013). The *Myriad* decision does not strongly relate to software inventions and thus will not be discussed.

³⁰ *Bilski v. Kappos*, 561 U.S. at 611–12.

³¹ *Id.*

³² *Id.*

³³ *Id.* at 612.

³⁴ *Id.*

³⁵ *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208 (2014).

³⁶ *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66 (2012).

³⁷ *Alice Corp.*, 573 U.S. 208 (2014); *Mayo Collaborative Servs.*, 566 U.S. 66 (2012).

³⁸ *Alice Corp.*, 573 U.S. at 216–17; *Mayo Collaborative Servs.*, 566 U.S. at 72–73, 77.

³⁹ *Alice Corp.*, 573 U.S. at 216–18, 221; *Mayo Collaborative Servs.*, 566 U.S. at 72–73, 77.

⁴⁰ *Alice Corp.*, 573 U.S. at 217; see also *Mayo Collaborative Servs.*, 566 U.S. at 71.

tend to promote it.”⁴¹ Acknowledging, however, that “all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas,”⁴² the Court noted that “an invention is not rendered ineligible for patent simply because it involves an abstract concept.”⁴³ Accordingly, step two of the test is designed to distinguish between patents that inappropriately monopolize the “building blocks” of human ingenuity from those that “integrate the building blocks into something more,”⁴⁴ “thereby ‘transform[ing]’ them into a patent-eligible invention.”⁴⁵

In *Alice*, the Supreme Court rendered unpatentable a computer-implemented scheme for mitigating settlement risk by using a third-party intermediary.⁴⁶ The Court explained that the claims were directed to “intermediated settlement,” which is an abstract idea because it related to a fundamental economic practice of long prevalence, similar to the hedging discussed in *Bilski*.⁴⁷ In addition, the Court found that the claims failed to transform that abstract idea into a patent-eligible invention because the claims merely recited a generic implementation of an abstract idea on a computer.⁴⁸ Because the concept of intermediated settlement was a well-known and long-standing fundamental practice, and because the claims only applied this well-known concept on a computer, the Court found the asserted patent ineligible.⁴⁹

In *Mayo*, the Court found ineligible under § 101 a patent directed to a process to help doctors determine whether an applied dosage of a thiopurine drug to a patient to treat autoimmune disease is too low or too high.⁵⁰ People vary in how they metabolize thiopurines, and it has been difficult for doctors to determine whether a dose is too high, which could have harmful side effects, or too low, which could be ineffective.⁵¹

At the time of invention, scientists were aware that a patient’s metabolites 6-TG and 6-MMP were correlated with whether the patient’s dosage was too high or low, but the precise correlations were unknown.⁵² The asserted patents related to the researchers’ findings that identified these correlations.⁵³ More specifically, the claims at issue were directed to administering a thiopurine drug to a patient and

⁴¹ *Mayo Collaborative Servs.*, 566 U.S. at 71; *see also Alice Corp.*, 573 U.S. at 216 (quoting with approval).

⁴² *Mayo Collaborative Servs.*, 566 U.S. at 71; *see also Alice Corp.*, 573 U.S. at 217 (quoting with approval).

⁴³ *Alice Corp.*, 573 U.S. at 217 (citation omitted); *see also Mayo Collaborative Servs.*, 566 U.S. at 71–72.

⁴⁴ *Alice Corp.*, 573 U.S. at 217.

⁴⁵ *Id.* (quoting *Mayo Collaborative Servs.*, 566 U.S. at 82).

⁴⁶ *Id.* at 212.

⁴⁷ *Id.* at 218–21.

⁴⁸ *Id.* at 221–26.

⁴⁹ *Id.* at 224–26.

⁵⁰ 566 U.S. 66, 72 (2012).

⁵¹ *Id.* at 73.

⁵² *Id.* at 73–74.

⁵³ *Id.* at 74.

determining the concentration of 6-TG or 6-MMP metabolite in the patient's blood, wherein certain levels of either of these metabolites "indicates a need" to increase or decrease "the amount of [thiopurine] drug subsequently administered" to the patient.⁵⁴ Put differently, the claims did not even require a doctor to change the dosage, but were rather directed to the finding that levels of certain metabolite in a patient's bloodstream "indicates a need" to change the dosage.⁵⁵

Under step one of the test, the Supreme Court found that the patents were directed to laws of nature: the "relationships between concentrations of certain metabolites in the blood and the likelihood that a dosage of a thiopurine drug will prove ineffective or cause harm."⁵⁶ Because the patent "simply *describes* that relation," and because the "relation is a consequence of the ways in which thiopurine compounds are metabolized by the body," the patent simply "sets forth a natural law."⁵⁷ Under step two of the test, although the claims included steps to administer the thiopurine and determine the level of metabolite in the bloodstream, these additional steps beyond the underlying natural law were merely "well-understood, routine, conventional activity previously engaged in by scientists who work in the field" and were thus insufficient to transform the claims into patent-eligible subject matter.⁵⁸

2. *Application of the Two-step Test by Lower Courts*

The Supreme Court has left district courts and the Federal Circuit to fend for themselves since deciding *Alice* in 2014. The new test significantly impacted the scope of available patent protection, and the Federal Circuit has found asserted patents valid in less than 10% of its post-*Alice* decisions on patentable subject matter.⁵⁹ While a comprehensive overview of the Federal Circuit's patentable subject matter jurisprudence is beyond the scope of this Article, this subpart briefly discusses a few of the highlights.⁶⁰

*Enfish, LLC v. Microsoft Corp.*⁶¹ has had perhaps the most influence on step one of the test for software claims. In *Enfish*, the Federal Circuit held that claims

⁵⁴ *Id.* at 74–75 (quoting U.S. Patent No. 6,355,623 col. 20 ll. 10–20).

⁵⁵ *Id.*

⁵⁶ *Id.* at 77.

⁵⁷ *Id.* (emphasis added).

⁵⁸ *Id.* at 79.

⁵⁹ Paul R. Gugliuzza & Mark A. Lemley, *Can a Court Change the Law by Saying Nothing?*, 71 VAND. L. REV. 765, 765 (2018).

⁶⁰ For recent patentable subject matter case briefs, see Mark A. Lemley et al., *Recent Developments in Patent Law (Spring 2017)* 6–22 (Stan. Pub. L., Working Paper No. 2959553, 2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2959553 [<https://perma.cc/VZ7R-8EEV>]; Mark A. Lemley & Madeleine Laupheimer, *Recent Developments in Patent Law (Spring 2016)* 5–10 (Stan. Pub. L., Working Paper No. 2778163, 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2778163 [<https://perma.cc/A3R6-3URW>].

⁶¹ 822 F.3d 1327 (Fed. Cir. 2016).

directed to a logical model for a computer database with a novel “self-referential” property were patent-eligible.⁶² Unlike the traditional relational model, the self-referential model can store all data types in a single table and can define the table’s columns by its rows.⁶³ The result: the self-referential model provides faster searching and for more effective and flexible storage of data compared to the traditional relational model.⁶⁴

The court found that the patent claims were not directed to an abstract idea and therefore passed step one of the test.⁶⁵ It noted that “some improvements in computer-related technology when appropriately claimed are undoubtedly not abstract, such as a chip architecture, an LED display, and the like.”⁶⁶ And “[s]oftware can make non-abstract improvements to computer technology just as hardware improvements can, and sometimes the improvements can be accomplished through either route.”⁶⁷ Thus, the court found it most “relevant to ask whether the claims are directed to an improvement to computer functionality versus being directed to an abstract idea.”⁶⁸

The court found that the claims were not directed to an abstract idea because “the plain focus of the claims is on an improvement to computer functionality itself, not on economic or other tasks for which a computer is used in its ordinary capacity.”⁶⁹ Moreover, “the claims are not simply directed to *any* form of storing tabular data, but instead are specifically directed to a *self-referential* table for a computer database.”⁷⁰

The Federal Circuit has made very similar rulings on a memory system with programmable operational characteristics that advantageously self-configure based on the type of processor connected to the system,⁷¹ and on an improved virus scanning approach that can proactively scan for potentially hostile operations, as compared to prior art systems that can merely recognize the presence of previously identified viruses.⁷² The court has also made somewhat analogous rulings on unconventional computerized techniques, such as on an inertial tracking system using inertial sensors in an unconventional configuration to track motion,⁷³ and in *McRO* on an automated method of synchronizing animated characters’ facial expressions with sound (an improvement over the traditional and tedious manual

⁶² *Id.* at 1346.

⁶³ *Id.* at 1340.

⁶⁴ *Id.* at 1332.

⁶⁵ *Id.* at 1336.

⁶⁶ *Id.* at 1335.

⁶⁷ *Id.*

⁶⁸ *Id.*

⁶⁹ *Id.* at 1336.

⁷⁰ *Id.* at 1337.

⁷¹ *Visual Memory LLC v. NVIDIA Corp.*, 867 F.3d 1253, 1255–56, 1259–62 (Fed. Cir. 2017).

⁷² *Finjan, Inc. v. Blue Coat Sys., Inc.*, 679 F.3d 1299, 1304–06, No. 2016-2520, 2018 WL 341882, at *2–4 (Fed. Cir. Jan. 10, 2018).

⁷³ *Thales Visionix Inc. v. United States*, 850 F.3d 1343, 1348–49 (Fed. Cir. 2017).

method).⁷⁴ This portion of the Federal Circuit precedent has been described by some commentators as a “technological arts” test, broadly meaning that patents covering software-based technological improvements to computer functionality are patent eligible under step one of the test unlike non-technological disciplines that utilize computers operating in their ordinary fashion.⁷⁵

The Federal Circuit has made less headway on step two of the test but has twice found claims eligible under step two. In *Bascom Global Internet Services, Inc. v. AT&T Mobility LLC*,⁷⁶ the Federal Circuit found patent-eligible claims directed to using ISP servers to filter content while also providing individually customizable filtering features, which gives the novel filtering tool the benefits of both of the competing prior art filtering tools.⁷⁷ The court found that the claims were directed to the abstract idea of filtering content on the internet.⁷⁸ But the ordered combination of the claim limitations provided an inventive concept because, as described above, the patent claims “a technology-based solution . . . to filter content on the Internet that overcomes existing problems with other Internet filtering systems” and provides the “advantages of [both prior art] filtering tools while avoiding their drawbacks.”⁷⁹

The Federal Circuit in *Amdocs (Israel) Ltd. v. Openet Telecom, Inc.* found patent-eligible, under step two, a system “which allows network service providers to account for and bill for [IP] network communications.”⁸⁰ The court stressed that the system utilized a distributed architecture that reduced “congestion in network bottlenecks, while still allowing data to be accessible from a central location.”⁸¹ The claimed system was patent-eligible under step two because the claim “entail[ed] an *unconventional* technological solution (enhancing data in a distributed fashion) to a technological problem (massive record flows which previously required massive databases).”⁸²

⁷⁴ *McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1303, 1306–07, 1316 (Fed. Cir. 2016).

⁷⁵ *See Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 721 (Fed. Cir. 2014) (Mayer, J., concurring) (“A rule holding that claims are impermissibly abstract if they are directed to an entrepreneurial objective, such as methods for increasing revenue, minimizing economic risk, or structuring commercial transactions, rather than a technological one, would comport with the guidance providing in both *Alice* and *Bilski*.”); Joshua L. Sohn, *A Defense of the Current Jurisprudence on Section 101*, LAW 360 (Oct. 7, 2016), <https://www.law360.com/articles/846930/a-defense-of-the-current-jurisprudence-on-section-101> [<https://perma.cc/5EAL-CRFA>] (“[T]he Federal Circuit has consistently invalidated patent claims that simply apply economic, business, or human-interaction practices on a computer without improving the computer itself or any other technological art.”); *see also* Gugliuzza & Lemley, *supra* note 59.

⁷⁶ 827 F.3d 1341 (Fed. Cir. 2016).

⁷⁷ *Id.* at 1343–44, 1350.

⁷⁸ *Id.* at 1348–49.

⁷⁹ *Id.* at 1344, 1351.

⁸⁰ 841 F.3d 1288, 1290–92 (Fed. Cir. 2016).

⁸¹ *Id.* at 1292.

⁸² *Id.* at 1300 (emphasis added).

Together, *Bascom* and *Amdocs* generally stand for the proposition that patent claims will survive step two if they implement a novel and unconventional technical solution to a technological problem unsolved by prior art technologies.

B. Criticism of the New Two-step Test

Commentators on the new patentable subject matter doctrine generally fall into one of three camps. The first includes those who believe the doctrine is a useful tool to weed out bad patents quickly and inexpensively before parties must engage in expensive discovery.⁸³ The second camp includes those who believe that while the patentable subject matter decisions may generally reach the correct result, other patent law doctrines—such as novelty, nonobviousness, and written description—better serve any policy objective that might be served by the new patentable subject matter doctrine.⁸⁴ While commentators in the first camp surely agree that the patentable subject matter doctrine overlaps with other patentability doctrines,⁸⁵ individuals in these two camps likely disagree most over whether other patentability doctrines *alone* better serve those interests,⁸⁶ or whether other patentability doctrines could advantageously be decided in some instances at the pleadings stage before

⁸³ See, e.g., John M. Golden, *Patentable Subject Matter and Institutional Choice*, 89 TEX. L. REV. 1041, 1058 (2011); Paul R. Gugliuzza, *Quick Decisions in Patent Cases*, 106 GEO. L.J. 619, 650–62 (2018).

⁸⁴ It can be difficult to distinguish between commentators in camp two (who think patentable subject matter is the wrong tool but generally reaches the right outcome) from those in camp three (who think patentable subject matter is the wrong tool that often reaches the wrong outcome). However, commentators who criticize the doctrine under one of these grounds are not hard to find. See, e.g., J. Jonas Anderson, *Applying Patent-Eligible Subject Matter Restrictions*, 17 VAND. J. ENT. & TECH. L. 267, 281 (2015); Dmitry Karshtedt, *Photocopies, Patents, and Knowledge Transfer: “The Uneasy Case” of Justice Breyer’s Patentable Subject Matter Jurisprudence*, 69 VAND. L. REV. 1739, 1776–82 (2016); Brief of Professors Jeffery A. Lefstin and Peter S. Menells as *Amici Curiae* in Support of Petition for a *Writ of Certiorari* at 23, *Sequenom, Inc. v. Ariosa Diagnostics, Inc.*, 136 S. Ct. 2511 (2016) (No. 15-1182); Risch, *supra* note 6, at 45; Madigan & Mossoff, *supra* note 9, at 941–42; Michael Risch, *Everything Is Patentable*, 75 TENN. L. REV. 591, 650–51 (2008); Taylor, *supra* note 8, at 2152 (“I address whether the existing statutory patentability and specification requirements sufficiently address the relevant concerns raised by the Supreme Court in its cases addressing eligibility. Ultimately, I conclude that the other patentability and specification requirements already do, without amendment, address those concerns.”); David O. Taylor, *Confusing Patent Eligibility*, 84 TENN. L. REV. 157, 159–60 (2016); Vyas, *supra* note 10, at 2–3.

⁸⁵ See Gugliuzza & Lemley, *supra* note 59, at 777 (“Aspects of the patentable subject matter inquiry indisputably overlap with other patentability requirements.”); see also Lemley et al., *supra* note 20, at 1329–32; Timothy R. Holbrook & Mark D. Janis, *Patent-Eligible Processes: An Audience Perspective*, 17 VAND. J. ENT. & TECH. L. 349, 377 (2015); John M. Golden, *Redundancy: When Law Repeats Itself*, 94 TEX. L. REV. 629, 701–03 (2016) (explaining the benefits of legal redundancy).

⁸⁶ See generally Golden, *supra* note 83; Gugliuzza, *supra* note 83.

parties must engage in expensive discovery.⁸⁷ Commentators in the third camp believe that the current doctrine is far too patent-unfriendly and encourages judges to make important decisions on an insufficient record.⁸⁸

But many commentators from all three camps believe that the new two-step test is ambiguous and unpredictable. As sampled in the introduction,⁸⁹ scholars have been quite colorful in their descriptions of the rule's ambiguity.⁹⁰

There are certainly reasons the test could be difficult to administer. For one, the test first asks whether the claims are directed to an "abstract idea," which might be difficult to ascertain because, as admitted by the Supreme Court in *Mayo* and *Alice*,⁹¹ all claims are directed to an abstract idea on some level.⁹² The *Alice* Court provided no guidance on this step, merely stating that "we need not labor to delimit the precise contours of the 'abstract ideas' category in this case."⁹³ The second step is also a bit of a judgment call just like many other patent eligibility doctrines like obviousness, considering virtually all claims will offer something beyond the abstract idea itself. However, the Federal Circuit has provided some guidance on step one at least in cases like *Enfish*,⁹⁴ and on step two at least in cases like *Bascom*.⁹⁵

The literature is devoid of any empirical support for the popular belief that the Supreme Court's new two-step test is overly ambiguous. This Article aims to fill that void.

⁸⁷ See Gugliuzza, *supra* note 83, at 640–41.

⁸⁸ Scholars in this camp can sometimes be hard to distinguish from scholars in the second camp. See *supra* note 84.

⁸⁹ See *supra* notes 6–14.

⁹⁰ See also Kevin Emerson Collins, *Bilski and the Ambiguity of "An Unpatentable Abstract Idea,"* 15 LEWIS & CLARK L. REV. 37, 41 (2011) (describing the "abstract idea" concept as "multiply ambiguous"); John M. Golden, *Flook Says One Thing, Diehr Says Another: A Need for Housecleaning in the Law of Patentable Subject Matter*, 82 GEO. WASH. L. REV. 1765, 1770 (2014) ("Since the Supreme Court issued its *Bilski* decision in 2010, the law of subject-matter eligibility has plunged into a seemingly ever widening maelstrom of uncertainty."); Christopher M. Holman, *Patent Eligibility Post-Myriad: A Reinvigorated Judicial Wildcard of Uncertain Effect*, 82 GEO. WASH. L. REV. 1796, 1798 (2014) ("Unfortunately, the Court has provided little guidance with respect to the readjusted contours of the newly invigorated doctrine, and as a consequence, judges and the PTO have been thrown into a state of confusion with respect to the proper application of the doctrine; the high degree of uncertainty is even more problematic for patent attorneys and their clients.").

⁹¹ See *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 71 (2012); *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208, 217 (2014) (quoting with approval).

⁹² See Collins, *supra* note 90, at 39–40; Risch, *supra* note 6, at 53; Tun-Jen Chiang, *The Rules and Standards of Patentable Subject Matter*, 2010 WIS. L. REV. 1353, 1369–71 (2010).

⁹³ *Alice Corp.*, 273 U.S. at 221.

⁹⁴ See *supra* notes 61–75 and accompanying text.

⁹⁵ See *supra* notes 76–82 and accompanying text.

II. EMPIRICAL TEST

This Article provides the results of an empirical study testing the clarity of the new two-step test in the software field. In particular, 231 patent attorneys were provided five software patent claims randomly selected from a population of fifty and were asked to predict how courts would rule regarding subject matter eligibility.⁹⁶ This Part explains how the populations of attorneys and claims were selected.

A. Population of Attorneys

The population of attorneys included all attorneys uncovered through a search for patent attorneys on the websites of each of the twenty-five law firms listed in the 2017 Vault Best Law Firms for Intellectual Property.⁹⁷ The law firms listed in Vault are believed to have a robust and thriving intellectual property practice. Moreover, I do not believe patent attorneys at these law firms are inherently better or worse predictors than patent attorneys at other law firms.

One potential bias in the sample is that the listed firms tend to engage in more patent litigation defense work than plaintiff work. Over the last decade, non-practicing entities have represented an increasingly larger percentage of patent plaintiffs, approaching 40% in recent years.⁹⁸ This number appears to be even higher in high-tech cases.⁹⁹ The surveyed firms listed in Vault tend to represent mostly operating companies, and therefore they tend to defend patent lawsuits more often than bring them (and, therefore, they tend to argue patents are patent ineligible). For this reason, the patent *litigators* surveyed may have a patent ineligibility bias because that is the position they most often take in court.¹⁰⁰

The patent *prosecutors* surveyed, on the other hand, may have the opposite bias, because they are in the business of obtaining patent protection for inventions, not arguing for invalidity. In addition, they generally deal with the USPTO rather than with courts, and the USPTO has a reputation for being quite lenient in granting patents.¹⁰¹ Because there are reasons to think patent litigators and patent prosecutors

⁹⁶ For a link to take the test yourself, see *supra* note 15.

⁹⁷ *2017 Best Law Firms for Intellectual Property*, VAULT, <http://www.vault.com/comp-any-rankings/law/best-law-firms-in-each-practice-area/?sRankID=20&rYear=2017&pg=2> [<https://perma.cc/677P-MNWX>].

⁹⁸ See Sara Jeruss et al., *The America Invents Act 500: Effects of Patent Monetization Entities on US Litigation*, 11 DUKE L. & TECH. REV. 357, 388 (2012); *2016 Annual Patent Dispute Report*, UNIFIED PATENTS, <https://www.unifiedpatents.com/news/2016/12/28/2016-annual-patent-dispute-report> [<https://perma.cc/5DPJ-A9AC>].

⁹⁹ See *2016 Annual Patent Dispute Report*, *supra* note 98.

¹⁰⁰ See Zev J. Eigen & Yair Listokin, *Do Lawyers Really Believe Their Own Hype, and Should They? A Natural Experiment*, 41 J. LEGAL STUD. 239 (2012) (finding that “following participation in moot court contests, students overwhelmingly perceive that the legal merits favor the side that they were randomly assigned to represent”).

¹⁰¹ See Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV.

may have different perspectives on the patentability of the claims, the background portion of the survey asked attorneys to list their primary area of practice (litigation, prosecution, transactions, or other) so that both litigators and prosecutors could be analyzed separately.

The patent attorneys for each of the 2017 Vault Twenty-Five Best Law Firms for Intellectual Property were obtained by going to each firm's website in May of 2017 and using some combination of filters and keyword searches to obtain the best estimate of patent attorneys within each firm. The survey was ultimately sent to 3,725 attorneys, of whom 231 responded to the survey for a 6.2% response rate.¹⁰²

Emails were sent out to the attorneys in batches between late May and early June of 2017. A reminder email was sent to each group around two days after the first email was sent.

B. Population of Claims

The population of fifty software claims was obtained from district court patentable subject matter pleading-stage decisions issued between the Federal Circuit's *McRO, Inc. v. Bandai Namco Games America Inc.*¹⁰³ decision on September 13, 2016 and April 19, 2017 when case collection began (a total time frame of just over seven months). The survey included only very recent decisions by design: it is most desirable to know whether the doctrine is currently ambiguous, not whether the doctrine was ambiguous in the recent aftermath of *Alice*. It is advantageous that case collection included only cases arising after *McRO* because (1) *McRO* is one of the rare cases in which the Federal Circuit found a patent subject matter eligible, and thus the case may have a meaningful effect on the law; and (2) at that point sufficient cases had been collected.¹⁰⁴

1495 (2001); see also John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AIPLA Q.J. 185, 205 (1998) (suggesting that nearly half of the patents eventually litigated to judgment are held invalid); Julie E. Cohen, *Reverse Engineering and the Rise of Electronic Vigilantism: Intellectual Property Implications of "Lock-Out" Programs*, 68 S. CAL. L. REV. 1091, 1177–79 (1995); Robert P. Merges, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKELEY TECH. L.J. 577, 589–90 (1999); John R. Thomas, *Collusion and Collective Action in the Patent System: A Proposal for Patent Bounties*, 2001 U. ILL. L. REV. 305, 316–22.

¹⁰² The initial email list included 3,848 emails. However, during the sending process, twenty-two emails were received notifying me that the attorney no longer worked for the firm, and an additional email was received from a kind attorney at Jones Day who informed me that he didn't work in patent law and that I should exclude him from the response rate calculation. Furthermore, 100 individuals (2.6% of the population) were sent an original pilot version of the survey, but these individuals are not counted because the survey underwent significant revision before being sent to the remainder of the respondents.

¹⁰³ 837 F.3d 1299 (Fed. Cir. 2016).

¹⁰⁴ For example, to determine whether all cases are approximately equally hard, it helps to have a reasonable number of predictions for each claim.

To arrive at the population of software claims, I conducted a Westlaw search around April 19, 2017 for all cases that cited either *Alice* or *Mayo*. It seems highly unlikely that a patentable subject matter ruling on a software claim would not cite to at least one of these two cases, considering they are the two cases handed down by the Supreme Court that articulate the new two-step test.

For each case that issued a software-related subject matter eligibility ruling, the patents at issue and representative claims were reviewed, as well as the ultimate ruling on each patent. But not all representative claims for which there was a ruling were included in the final population of claims. Because rulings on different patents in the same lawsuit may not be wholly independent,¹⁰⁵ in general only one claim per case was included in the final population of claims. If the opinion focused on a representative claim from one of the patents in particular, that claim was chosen for the dataset. If not, then one of the claims was randomly selected from the group of representative claims examined by the court.

The only circumstances in which more than one claim was chosen from a particular case was where the court clearly bundled up the patents at issue into multiple distinct groups. In these cases, the court often, though not always, found some groups of asserted claims eligible and other groups ineligible.

At least one claim was taken from every uncovered pleading-stage opinion that issued a § 101 subject matter eligibility ruling on a software patent, except a claim was not included from the internet gambling patent infringement cases brought by *CG Technology Development, LLC* for various reasons. Two *CG Technology* opinions fell within the date-range of the study. For one of these cases, the plaintiffs did not even present arguments on eligibility and instead simply “preserve[d] their right to appeal.”¹⁰⁶ For the other case, it was unclear to what extent the court was truly making a patentability ruling separate from its prior decisions in earlier cases that fell outside of the relevant date range.¹⁰⁷ Based on the results discussed in Part III, because the court found all the disputed claims in these excluded opinions to be ineligible (and because these claims are clearly directed to an application of computers to gambling) if anything, including one of these claims in the population would have likely only slightly increased the percentage of correct predictions.

Because few attorneys billing their time at hundreds of dollars per hour would be willing to take a lengthy survey, to keep the survey as concise as possible and to ensure that all attorneys use roughly the same information in making their decisions, the attorneys were only given the claims to review in making their patentability decisions. Accordingly, attorneys were not given other highly relevant information, such as a given patent’s specification. Had the specification been given to the

¹⁰⁵ See, e.g., John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AIPLA Q.J. 185, 245 (1998); John R. Allison et al., *Understanding the Realities of Modern Patent Litigation*, 92 TEX. L. REV. 1769, 1796 (2014).

¹⁰⁶ *CG Tech. Dev., LLC v. FanDuel, Inc.*, No. 16-CV-801, 2017 WL 58572, at *5 (D. Nev. Jan. 4, 2017).

¹⁰⁷ See *CG Tech. Dev., LLC v. DraftKings, Inc.*, No. 16-CV-781, 2016 WL 7190547 (D. Nev. Dec. 12, 2016); *CG Tech. Dev., LLC v. Bwin.Party (USA), Inc.*, No. 16-CV-00871, 2016 WL 6089696 (D. Nev. Oct. 18, 2016).

attorneys, I believe many of the attorneys would not have taken the extra time to look at it. Because the attorneys were reviewing the cases on a limited record, only pleading stage decisions were included in the experiment. That way, the records on which those cases were decided would be closer to what the attorneys received as compared to the excluded cases that were decided after discovery and claim construction.

The resulting list included sixty-two distinct claims.¹⁰⁸ For eight of these sixty-two claims, however, the court simply concluded that it was premature to render the claims ineligible at the motion to dismiss stage. Although these claims were ultimately included in the population of claims sent to the attorneys, they were not ultimately included in the detailed analysis provided in Part III. These claims were not included in the final analysis for three reasons: (1) most importantly, because it is unclear how courts will ultimately rule on these claims; (2) the attorneys were asked whether a court would ultimately find the claims patent-eligible or patent-ineligible, not whether the claims would survive a motion to dismiss; and (3) it is unlikely the attorneys could make an educated prediction on even less information than was before the court if the court believed that it needed more information before rendering a decision.¹⁰⁹ The rest of the Article will only provide results pertaining to claims for which the courts provided a more definitive ruling.

In addition, four of the sixty-two cases were heard by the Federal Circuit. The claims in these cases were included in the population of claims sent to the patent attorneys; however, these claims are not included in the final analysis discussed in Part III. These claims were ultimately excluded because they come from cases about which responding attorneys were most likely to have had prior knowledge. If the responding attorneys were familiar with the specific Federal Circuit decisions, they might have recognized the claims and made an eligibility decision based on their familiarity with the actual case. Importantly, every piece of analysis in Part III was conducted with and without the Federal Circuit cases included, and it was determined that *the results provided in Part III would have been the same even if the Federal Circuit cases were included in the analysis*. Interestingly, the responding attorneys were actually slightly worse at predicting on the Federal Circuit cases than on the district court cases, though this result was neither statistically significant nor significant enough to affect any of the results provided in Part III.

Because each of the 231 responding attorneys made five predictions, the resulting study includes 1,155 predictions, 952 of which were on the fifty claims relevant to the results discussed throughout the rest of the Article (as stated previously, these 952 data points are used for all the conclusions made in Part III).

¹⁰⁸ The claim population is on file with the author.

¹⁰⁹ As will be discussed in more detail below, the attorneys ultimately predicted eligible 25% of the time on the ineligible claims and 47% of the time on the eligible claims. They predicted eligible 35.7% of the time on the claims for which the district courts determined it was premature to render the claims ineligible at the motion to dismiss stage. This 35.7% result is right in between the 25% result for the ineligible claims and the 47% result on the eligible claims, which makes sense because the courts will likely ultimately find some of the claims for which it reserved judgment to be eligible and others ineligible.

III. RESULTS

The results suggest that while the new two-step test is most certainly not a beacon of clarity, it is also not completely ambiguous. But this conclusion is not apparent at first glance. As a whole, the 231 attorneys surveyed agreed with the courts 63% of the time as to the eligibility of the claims. This number alone leaves much to be desired. For one, the attorneys would have agreed with the courts roughly 50% of the time just by flipping a coin to decide each case (or some other form of guessing). Courts found 56% of the claims ineligible, though patent attorneys predicted the claims to be patent-ineligible 65% of the time. Had the attorneys simply randomly predicted patent-ineligible 65% of the time on the claims, they would have correctly identified court outcomes 51.8% of the time.¹¹⁰

The rest of this Part will show why the results are somewhat more promising than at first glance. Importantly, the data can only be lumped and analyzed together as done above if each data point is sufficiently similar. If not, then the data is more appropriately analyzed after being broken down. For example, a hypothetical study showing that the average height of the human population is 5' 7" could inaccurately imply that this average is uniform across both men and women, where in fact this average applies to neither sex. A better way to convey the information from the study would be that the average height is 5' 4" for females and 5' 10" for males.¹¹¹

For this empirical study, any two data points can differ (1) by the attorney making the prediction, and (2) by the claim being predicted. Thus, the data points can only be appropriately lumped together if attorneys are approximately equally skilled predictors and if the claims are all approximately equally difficult to predict.¹¹²

Part III.A shows that all attorneys are not equally good predictors, and Part III.B illustrates that some claims are more difficult to predict than others. Parts III.A and III.B together show that the data is not accurately and precisely represented as a single unit by the 63% figure above. Part III.C reanalyzes the data in light of these findings and demonstrates that the new two-step test may not be as ambiguous as many commentators have suggested. Part III.D provides insight regarding whether patent attorneys tended to agree with one another about the eligibility of the claims more than with the courts.

¹¹⁰ For the 56% of cases courts found ineligible, attorneys would get those cases correct 65% of the time. For the other 44% of the cases, attorneys would get those right 35% of the time. $(56) \cdot (.65) + (44) \cdot (.35) = 51.8\%$.

¹¹¹ These averages were made up for illustration and are not based on any actual data.

¹¹² In more statistical terms, the data should only be lumped together if the data fits the binomial distribution. See, e.g., *The Binomial Distribution*, UNIV. OF NOTRE DAME, <https://www3.nd.edu/~rwilliam/stats1/x13.pdf> [<https://perma.cc/QJ9Z-ZTR8>] (last visited Nov. 6, 2018); Wayne W. LaMorte, *The Binomial Distribution: A Probability Model for a Discrete Outcome*, B.U. SCH. OF PUB. HEALTH (July 24, 2016), http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Probability/BS704_Probability7.html [<https://perma.cc/T5NG-5MVD>].

A. Are All Predictors Equally Good?

To be clear, just because some of the 231 attorneys correctly predicted court outcomes on a greater percentage of cases than other attorneys does not mean that some groups of attorneys are better predictors. Indeed, if someone flips 231 different quarters 5 times each and records the number of heads flipped for each coin, the number of heads will clearly not be the same for each quarter, even though the quarters all have the same probability of turning up heads. The differences in the outcomes for the quarters is attributable to chance alone. What matters is whether the differences in the number of claims each attorney correctly predicted is attributable to chance alone (like with the quarters), or whether the differences are also attributable to the fact that some groups of attorneys are better predictors.

As it turns out, attorneys aren't quarters.¹¹³ The attorneys' distribution of scores was much wider than what could be expected due to chance alone, which means that some groups of attorneys were much better predictors than others.¹¹⁴ For this reason alone, the 63% value is an inappropriate measure of attorney performance. Just like the 5' 7" average human height is an unrepresentative metric for both men and women in the hypothetical above (the average being 5' 10" for men and 5' 4" for women in the example), the 63% value turns out to be an unrepresentative metric for the attorneys.

So which kinds of attorneys are the best predictors? Unfortunately, because asking attorneys to make predictions on five claims was already asking a lot, the attorneys were asked only a few background questions to keep the survey as manageable as possible. Nonetheless, the following information was acquired: number of years of legal experience (0–2; 3–5; 6–9; 10+), percentage of time spent on patent law (0–25%; 25–50%; 50–75%; 75%–100%), the attorney's primary area of practice (litigation; prosecution; transactions; other), the attorney's subjective evaluation of his or her familiarity with the two-step test (extremely familiar; very familiar; moderately familiar; slightly familiar; not familiar at all), and familiarity with different technological areas (such as software).

¹¹³ Either literally or with respect to their relative abilities to correctly predict patent eligibility.

¹¹⁴ The MATLAB code used to make this determination is on file with the author. This determination was made more difficult due to the fact that the attorneys received five claims randomly selected from a population of sixty-two, but this analysis is only relevant for the fifty claims for which district courts made a more definitive ruling. That means that not all attorneys received five claims that are of interest in this analysis (because some received at least one of the eight claims for which the courts made a less-than-definitive ruling). To deal with this complication, I first determined how many relevant claims each attorney predicted. Then I ran 10,000 trials simulating the results of a random binomial draw and calculated the variance of the results for each trial. Finally, I checked to see if the actual variance was in the statistically significant range of the 10,000 binomial trials. None of the 10,000 trials produced a variance even close to as large as the variance received from the actual data, which shows that the differences in outcomes across attorneys cannot be entirely attributable to chance.

Because virtually all the attorneys surveyed indicated that they spent most of their time on patent law, that metric could not be used to differentiate the attorneys. In addition, only insignificant differences were found for the attorneys based on years of legal experience and their subjective evaluations of their familiarity with the two-step test. The latter finding is not that surprising, considering attorneys' subjective self-evaluations may not be that accurate.¹¹⁵

By far the biggest differentiator in predictor accuracy was primary area of practice (litigation vs. prosecution). Patent prosecutors correctly predicted court outcomes 67.3% of the time, while patent litigators correctly predicted court outcomes only 59.7% of the time.¹¹⁶

The hypothesis that all patent prosecutors surveyed are approximately equally skilled predictors could not be rejected, though this could be because the differences are too small to detect with a sample size of ninety-seven patent prosecutors.¹¹⁷ The results for the 128 litigators, however, *were* too widely dispersed to be attributable to chance alone.¹¹⁸ Accordingly, some litigators are better than 59.7% at predicting court outcomes, and some are worse.

Because litigators familiar with software unsurprisingly fared better than litigators unfamiliar with software (61.3% correct vs. 54.8% correct), the wide disparity in litigators' predicting abilities might be because the litigators familiar and unfamiliar with software constitute two distinct groups. However, this finding was not statistically significant, which is unsurprising because filtering out all the responding prosecutors and splitting the population of litigators into two produced two comparatively small samples from which to draw conclusions. Interestingly, splitting up the prosecutors into those familiar and unfamiliar with software produced less than a 3% difference.

This finding is surprising. It seems hard to believe that familiarity with the subject matter of the claims would not improve predicting ability. I believe that the benefit to being familiar with software would manifest more strongly if the attorneys took a more thorough look at the claims and had access to other relevant information such as the patent specification. Regarding the former, as stated previously most respondents spent less than a minute analyzing each claim. My guess is that, had they spent more time analyzing the claim and other relevant information, any expertise would begin to show. If this theory is right, the predicting abilities of the

¹¹⁵ David Dunning et al., *Flawed Self-Assessment: Implications for Health, Education, and the Workplace*, 5 PSYCHOL. SCI. PUB. INT. 69, 90–92 (2004), <https://pdfs.semanticscholar.org/bed3/59015324e4e105e95cce895cc79cae2bc2e7.pdf> [https://perma.cc/M4T4-VQDX].

¹¹⁶ The difference between these two population proportions is statistically significant when representing both populations as binomial distributions ($p=0.01596$). However, as will be discussed in the next paragraph, the litigators do not fit the binomial distribution, which means that patent prosecutors may not be better predictors than all groups of litigators.

¹¹⁷ To make this determination, the same analysis was conducted as described in note 114, but only with the data received from patent prosecutors.

¹¹⁸ Again, the same analysis described in note 114 was used, but only with the litigator data.

attorneys knowledgeable about software would likely measurably increase if they were able to conduct a more thorough investigation.

To sum up, the surveyed patent prosecutors were better at predicting court outcomes than patent litigators. However, patent litigators varied significantly in their predictive abilities—much more than what can be attributable to chance alone—and thus some groups of patent litigators might fare similarly to the patent prosecutors.

Why do prosecutors seem to be better predictors than at least some groups of litigators? Unfortunately, no conclusive answer can be given, but I have some theories. For one, patent prosecutors are more likely to have a technical background and thus may be better suited to quickly interpreting complex patent claims as was done for the survey. Second, patent prosecutors often need to make quick decisions about patentability as a part of their job, while patent litigators often have a lot of time to formulate their patentability arguments. Third, patent prosecutors deal with patent eligibility questions all the time, whether they are attempting to draft patent-eligible claims, conducting patentability analysis, conducting freedom-to-operate investigations, or drafting invalidity opinions. In other words, patent prosecutors are always dealing with validity and examining numerous patents on a day-to-day basis. By contrast, litigators are often staffed on only a few cases at a time, and patent validity analysis will only comprise one small job of many that litigators perform.

Although patent litigators fared more poorly, I am not convinced that patent prosecutors are inherently better than litigators at applying the two-step test. I think the more accurate inference is that litigators are worse than prosecutors at making *quick* eligibility decisions, as was done by the attorneys on the survey. Litigators are less likely to have a technical background and thus may require a little more time to fully understand the technology and claims. And unlike litigators, prosecutors must often make quick eligibility decisions. For these reasons, I believe the discrepancy between litigators and prosecutors would be reduced or eliminated if the attorneys spent more time on their decisions and had access to more information. If this inference is correct, then I think it's a mistake to read too much into the litigators' poor performance—they just needed more time and information.

Due to the differences shown in this part between patent prosecutors' and patent litigators' predictive abilities, for the rest of the Article, the data for these two groups will generally be analyzed separately.

B. Are All Claims Equally Hard?

Chance does not even come close to explaining the varying degrees of success attorneys had at predicting the eligibility of the claims.¹¹⁹ This heterogeneity implies one or both of the following: (1) the predictors were biased for some reason, such as for lacking certain relevant information; and/or (2) the two-step test is much easier

¹¹⁹ The MATLAB code used to make this determination is on file with the author. A similar analysis was conducted for the claims as was done for the attorneys. *See supra* note 114.

to apply for some groups of claims than for other groups of claims. So, which claims are the most difficult to predict, and why?

Attorneys were much better at predicting which claims were eligible—and worse at predicting which claims were ineligible—as the patent claim’s priority date became more recent. In addition, attorneys predicted that claims were patent-eligible more often as the patent claim’s priority date became more recent. These results suggest, among other things, that attorneys would have been much more successful predictors had they been given priority date information. These results are somewhat unsurprising, considering the two-step test often turns on whether the patent claims are directed to conventional and well-known techniques, which changes with time. Indeed, the attorneys would be much more likely to read the patents with the earlier priority dates as being directed to conventional and well-known technology.

To illustrate this finding, the claims were divided into two groups: a group consisting of the twenty-five patents with the earliest priority dates (older group) and a group consisting of the other twenty-five patents with the most recent priority dates (newer group). Twelve of twenty-five claims were deemed eligible by courts in the older group, and ten of twenty-five in the newer group. The older group included one patent with a priority date of 1981 and twenty-four additional patents with priority dates ranging between 1992 and 2001. The priority dates for the newer group ranged from 2001 to 2014.

Patent prosecutors correctly predicted court outcomes more often for the older group than for the newer group (72.8% vs. 61.2%).¹²⁰ For the older group of claims, patent prosecutors correctly identified patent-ineligible claims 87.2% of the time, but they only correctly identified patent-ineligible claims 56.3% of the time on the newer group of claims (this difference is highly statistically significant).¹²¹ Conversely, patent prosecutors correctly identified patent-eligible claims only 41.2% of the time for the older group of claims but 65.1% of the time for the newer group of claims (again, this difference is highly statistically significant).¹²²

Patent prosecutors predicted patent-eligible over twice as often on the newer group than the older group (55.6% of the time vs. 21.7% of the time).¹²³ Thus, patent prosecutors were ineligibility biased for the older group (52% of the claims were found patent-ineligible by courts but patent prosecutors predicted patent-ineligible 78.3% of the time), but prosecutors were eligibility biased for the newer group (40% of the claims were found patent-eligible by courts but patent prosecutors predicted patent-eligible 55.6% of the time). These biases exist presumably because, as described above, the older group of claims are based on older technology that may

¹²⁰ This finding is statistically significant ($p=0.012$).

¹²¹ Again, estimating the populations with the binomial distribution, $p<0.0001$.

¹²² Again, estimating the population with the binomial distribution, $p=0.006$.

¹²³ Again, estimating the population with the binomial distribution, this finding is statistically significant ($p<0.0002$).

seem more conventional and well-known to the attorneys absent knowledge of the patent's priority date. These findings suggest that, had prosecutors been given the representative claim's priority date, they likely would have done a better job on their predictions.

Similar results were obtained for the patent litigators. Litigators were no better at predicting court outcomes for either group of claims (58.9% vs. 60.4%). Litigators correctly identified the patent-ineligible claims 79% of the time for the older group of claims but only 68.5% of the time for the newer group.¹²⁴ Conversely, they correctly identified patent-eligible claims only 35% of the time for the older group but 49.5% of the time for the newer group.¹²⁵ Litigators predicted patent-eligible claims much more often for the newer group than for the older group (39.2% vs. 27.4%), presumably for the same reasons as the prosecutors. Interestingly, although litigators were ineligibility-biased for the older group, they were not eligibility-biased in either direction for the newer group (they predicted patent-eligible 39.2% of the time on the claims in the newer group, and 40% of the newer group claims were found patent-eligible by courts).

While I believe these results are most likely attributable to the fact that older technologies are more likely to seem conventional and well-known absent context about the invention date, yet another possible reason is that claims written nearer to the present may have been written with patentable subject matter concerns in mind and therefore appear more eligible absent additional context. Cutting against this theory is that the newer claims did not appear more patent-eligible to the courts—as stated above, the courts found more claims patent-eligible in the older group than the newer group. However, it is at least possible that the newer claims themselves were written with the new two-step test in mind and therefore at least appear more patent-eligible absent additional context. While this theory seems less probative to me, importantly, this theory is still consistent with the fact that the attorneys may have performed better if they spent more time and had more information.¹²⁶

Whatever the case, patent priority date does not itself explain the varying degrees of success the attorneys had at predicting the eligibility of the claims.¹²⁷ Indeed, even after splitting the claims into the two groups described above, the varying degrees of success the attorneys had on the claims could not be explained by chance alone. Although additional reasons for the disparity were not uncovered,

¹²⁴ Again, estimating the population with the binomial distribution, $p=0.042$.

¹²⁵ Again, estimating the population with the binomial distribution, $p=0.0026$.

¹²⁶ I attempted to test this theory by breaking up the claims into two groups by issue date (as opposed to priority date), because patent claims can be amended essentially up until the patent issues. However, because issue date and priority date generally closely track one-another, the older and newer priority date groups ended up too similar to the older and newer issue date groups to make any definitive conclusions.

¹²⁷ This was determined by breaking up the claims yet again into four groups and testing to see if chance alone could explain the differences in outcomes for each of the claims, as was discussed *supra* note 114. The four groups were the following: (1) patent prosecutors, first group; (2) patent prosecutors, second group; (3) patent litigators, first group; and (4) patent litigators, second group.

I believe that it's likely that application of the two-step eligibility test is easier for some groups of claims than for others.

C. Is the Patentable Subject Matter Test Overly Ambiguous?

While the Supreme Court's new two-step test is not crystal clear, it is not completely nebulous either. For example, patent prosecutors correctly identified how courts ruled 67.3% of the time. Patent litigators fared much worse, correctly identifying how courts ruled only 59.7% of the time. Interestingly, patent litigators varied significantly in their predictive abilities—much more than due to chance alone. Thus, some groups of litigators are much better at predicting than the 59.7% value would suggest, and some groups of patent litigators are even worse than 59.7% at predicting court outcomes. Furthermore, patent prosecutors were over 1.7 times more likely to predict patent-ineligible on claims that courts found patent-ineligible than on claims courts found patent-eligible. These results are more impressive than they sound, considering (1) attorneys were only provided with the patent claim and were not given other highly relevant information such as the patent specification, priority date, and prior art; (2) more than 57% of respondents spent an average of *less than one minute analyzing each claim*; (3) the doctrine is still new and may become clearer in the coming years;¹²⁸ and (4) the attorneys displayed various eligibility-and-ineligibility biases (depending on attorney type and priority date) that hindered their abilities to make correct predictions.

As explained above, the results show that attorneys would have been better predictors had they been given priority date information. Many attorneys also indicated in their comments that they subjectively believed that they would have been much better predictors had they been able to review the specification and review the prior art. I stand by my decision not to include the specification, however, because it is unlikely many attorneys would have taken the time to look at it, and it would have been equally difficult to know how closely any given attorney reviewed the specification as well. It also would have been more difficult to collect responses, because some attorneys likely would have been dissuaded from completing the more intense survey. In any event, the attorneys likely would have improved had they spent more time on each claim and reviewed more relevant information.

Patent priority date alone did not explain the varying degrees of success attorneys had at predicting the eligibility of the claims. This finding suggests that the two-step test might be easier to administer for some claims than for others (or that there are other fixable biases due to lack of time and information). Aside from priority date, the reasons for why some groups of claims are easier than others were not uncovered; however, the finding suggests that courts are developing rules that are easier to apply to some claims than to others.

¹²⁸ See Keith N. Hylton, *Patent Uncertainty: Toward a Framework with Applications*, 96 B.U. L. REV. 1117, 1148 (2016) (stating that common law doctrines like patentable subject matter can often be difficult to apply in the early stages of litigation).

Although patent litigators performed rather poorly, it may be a mistake to read too much into the litigators' poor performance. It seems reasonable to believe that, rather than being inherently worse than prosecutors at applying the two-step test, patent litigators are simply worse at making *quick* eligibility decisions as was done on the survey. If this is the case, then the litigators would have performed comparatively much better had they spent more time on their decisions and had access to more information.

For these reasons, the results show that the two-step test is not wholly ambiguous or as impossible to administer as a few (though perhaps not all) commentators have suggested. If patent prosecutors can correctly predict court outcomes over two-thirds of the time after spending less than one minute analyzing merely one piece of the puzzle, the two-step test is not impossible to administer coherently.

However, I leave it to the readers to decide for themselves whether they believe the two-part test is too ambiguous as many have suggested. This Article does not take a stance on whether the two-step test is sufficiently clear to be good patent policy for two reasons. First, the survey presented here provides only a lower bound for the clarity of the new two-step test because it would be difficult if not impossible for attorneys to predict §101 outcomes in less time or with less information. Although the results suggest that the attorneys' predictions would have greatly improved had they had access to even the patent's priority date, and although some attorneys subjectively believed that they would have performed much better had they been able to review the specification, more research is necessary to determine just how much better attorneys would have improved by spending more time and reviewing more information.

Second, this Article takes no stance on how much certainty is "enough" certainty. Commentators will surely disagree on how much certainty is sufficient, and the purpose of this empirical test was not to make this determination.

This Article also does not take a stance on whether the current test is socially optimal as a matter of public policy, or on whether certain tweaks to the test could serve the same policy goals while also improving the rule's clarity.¹²⁹ This Article does, however, take a crucial first step in showing that the current two-step test is clearly not as ambiguous as its most vehement critics suggest.

D. Other Important Findings

One other important finding should be noted. Attorneys agreed with one-another 62% of the time, which is roughly equal to their 63% agreement with the

¹²⁹ See generally Risch, *supra* note 84, at 591 (recommending that confusing jurisprudence regarding patentable subject matter "can be clarified by implementing a single rule: any invention that satisfies the Patent Act's requirements of category, utility, novelty, nonobviousness, and specification is patentable."); Risch, *supra* note 6, at 45 (advocating for the idea that all claims for "application of abstract ideas and laws of nature" should be "eligible, and allow the remaining patentability rules to weed out underserving patent applications.").

courts.¹³⁰ This finding holds if the attorneys are broken down into prosecutors and litigators as well.¹³¹ This implies that district courts may not be misapplying the two-step test due to lack of patent expertise. One reason to hesitate in making this conclusion, however, is that over 57% of the attorneys spent much less than one minute analyzing each claim, and it's unclear whether this result would hold if patent attorneys spent more time on each case. It is possible, for example, that as attorneys spend more time on the claims, their expertise would play a stronger role in their decisions, and thus they would tend to agree with each other comparatively more often than with the courts.

The results also suggest that attorneys might be more worried about *Alice*'s scope than they should be. Patent litigators were particularly ineligibility biased for claims with older priority dates but were not eligibility biased on the claims with more recent priority dates. Patent prosecutors were ineligibility biased for the older group of claims but eligibility biased for the newer group of claims. Viewing the claims as a whole, however, both types of attorneys are ineligibility biased. This finding suggests that attorneys may be overestimating the effects of *Alice*.

Furthermore, the results strongly suggest that patent attorneys were not correctly identifying claims to any meaningful degree due to outside knowledge of any of the claims or cases in the dataset. For one, patent prosecutors outperformed patent litigators, even though patent prosecutors are much less likely to have any direct knowledge of the cases in the dataset. Patent prosecutors generally have little, if any, contact with the vast majority of district court cases. Second, the respondents actually performed a bit better on the fifty district court cases (63%) than on the four Federal Circuit cases (59.7%). Because the attorneys are much more likely to know about the Federal Circuit cases than the district court cases, if attorneys were basing their decisions on prior knowledge, one would expect them to perform much better on the Federal Circuit cases than on the district court cases. Third, the variance in performance discussed above, such as the variance based on priority date and claim eligibility, bear no relation to the ability to obtain outside knowledge about the case at-issue.

One final point: the reinvigorated patentable subject matter doctrine is still new and in flux. As the doctrine continues to change, so will its degree of clarity. Accordingly, as the patentable subject matter doctrine evolves, it may become more or less ambiguous than suggested by this study, which was limited to cases decided between September 13, 2016 and April 19, 2017.

¹³⁰ This determination was made by calculating the inter-rater agreement. *See Raw Agreement Indices*, JOHN-UEBERSAX.COM, <http://john-uebersax.com/stat/raw.htm> [<https://perma.cc/G48C-E99M>] (last visited Nov. 6, 2018).

¹³¹ Prosecutors agreed with courts 67% of the time and agreed with one another 67.2% of the time. Litigators agreed with courts 59.5% of the time and with each other 58.3% of the time.

CONCLUSION

This Article shows that the new two-step patent-eligibility test is not as un-administrable as at least its most ardent critics have suggested. More research is necessary to ascertain how much better the attorneys would have predicted court outcomes had they spent more time on their predictions and had access to more information.