

BLOCKCHAIN & BUSINESS METHODS: HOW BUSINESS METHOD PATENTS MAY BE REDEEMED BY FURTHERING BLOCKCHAIN INNOVATION

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Business methods remain a controversial area of innovation for which the United States Patent and Trademark Office (“USPTO”) grants patent protection. The USPTO frequently rejects business method patent applications for attempting to claim an “abstract idea,” only granting patents after the initial patent claims have been narrowed to improve a specific physical technology. Some argue that granting patent rights for business methods cannot be justified because the costs to society outweigh the benefits, concluding that business methods should always be excluded from consideration for patent protection. If these arguments are persuasive and successful, it could lead to the patent office neglecting useful innovations near the intersection of computing technology and business methods to the detriment of the public good. To show that business method patents can be more beneficial than costly to society, the USPTO must demonstrate that it is granting business method patents with unquestionable utility.

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Business method patents could be pivotal to furthering “blockchain” innovation. Blockchain—the technology behind cryptocurrencies like Bitcoin and Ethereum—is nascent and in need of innovation before it can be a realistic, sustainable solution for a wide variety of main-stream applications. Blockchain technology was designed to eliminate the need for trusted third-party intermediaries (e.g., banks and credit card companies) between transacting parties. Initially intended to support cryptocurrencies, blockchain technology may be useful in other areas where the immutability, reliability, and security of a database are essential. However, the computational power required to perpetuate and secure a blockchain, as designed by its creator, consumes tremendous electrical energy. Efficiency gains from hardware improvements alone cannot keep up with projected increases in demand. The business method patent could be a powerful tool for encouraging innovation that transforms blockchain from a fledgling technology with great potential to a technology that profoundly improves business transactions.

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INTRODUCTION

In 2014, *Alice Corp. v. CLS Bank* ushered in a shift in the requirements for patent eligibility in the areas of business method

and software patents.¹ The Supreme Court put an end to the era of the “pure” business method patent by effectively requiring that such inventions yield technological improvements instead of merely a useful result.² *Alice* sent shockwaves of uncertainty through the patent law community.³ The Supreme Court declared *Alice Corp.*’s business method patent claims invalid as patent-ineligible subject matter under 35 U.S.C. § 101.⁴ Applying a new two-prong test, the Court held that (1) *Alice Corp.*’s claims were “directed to”—i.e., claimed, at least in part—the “abstract idea” of intermediated settlement and (2) failed to add “significantly more” to that abstract idea; thus, the patent claims amounted to no more than a mere claim to the abstract idea itself.⁵

Alice Corp.’s patent was for a method of mitigating settlement risk in financial transactions between two parties.⁶ Settlement risk is the risk that one party will not pay, but still receive the benefit of the exchange.⁷ *Alice Corp.*’s solution was to have a computer serve as a trusted third-party intermediary, which would monitor each party’s financial records and allow transactions only if both parties have the resources to meet their obligations.⁸ The Court reasoned that intermediated settlement is an abstract idea because it is a “fundamental economic practice,” and the method failed to add significantly more because the recited computer functions were “well-understood, routine, conventional activit[ies]” previously known to the industry.⁹ The Court suggested that the claims at issue would have been more likely to meet the requirements for patent eligibility if they had purported to improve the functioning of the computer technology itself.¹⁰

Many had called for the Court to discourage patent trolling behavior by reigning in overbroad patent claims like those at issue

1. *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 573 U.S. 208; see Donald S. Chisum, *The Supreme Court’s Alice Decision on Patent Eligibility of Computer-Implemented Inventions: Finding an Oasis In the Desert*, PATENTLYO (June 23, 2014), <https://patentlyo.com/patent/2014/06/eligibility-implemented-inventions.html> [<https://perma.cc/D7LK-2Y5L>].

2. Chisum, *supra* note 1.

3. See *Alice*, *supra* note 1; Chisum, *supra* note 1.

4. See *Alice*, *supra* note 1, at 212.

5. See U.S. Patent No. 5,970,479 (filed May 28, 1993) (issued Oct. 19, 1999) (containing claim 33, which was cited by the Supreme Court in *Alice*); 35 U.S.C. § 101 (2018); See *Alice*, *supra* note 1, at 212, 225.

6. See *Alice*, *supra* note 1, at 212.

7. *Id.*

8. *Id.*

9. *Id.* at 225 (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 68 (2012)).

10. *Id.*

in *Alice*.¹¹ Patent trolls are non-practicing entities that do not invent new technologies or make any products.¹² Their primary business model is to buy the patent rights of others and make money by asserting patent claims against alleged infringing practicing entities.¹³ Some patent troll business models are indifferent to, and may even thrive off of, weak patents that the USPTO would likely invalidate upon review.¹⁴ Thus, patent trolls commonly thrive off of costly patents that provide no benefit to society.¹⁵

Many patent system stakeholders see the *Alice* decision as a victory over patent trolls because it provides a check on patents of poor quality that threaten to preempt downstream innovation.¹⁶ However, *Alice*'s two-step standard—originating in the biotech arena with *Mayo v. Prometheus Labs* and made applicable to the realm of business method and software patents by *Alice*—is far from a model of clarity.¹⁷ The standard is malleable and unpredictable. Patent drafters are often left guessing what a patent examiner, a Patent Trial and Appeal Board (PTAB) judge, or the courts will consider to be an “abstract idea” and when the claims may be deemed patent-eligible for adding “significantly more.”¹⁸

The law in this area is constantly evolving. The USPTO publishes updated guidelines based on case law applying the *Alice/Mayo* standard, in an attempt to add clarity and consistency to its examination procedures.¹⁹ How the law develops and how it

11. Julie Samuels & Daniel Nazer, *EFF Urges Supreme Court to Crack Down on Patent Trolls*, ELEC. FRONTIER FOUND. (Mar. 3, 2014), <https://www.eff.org/press/releases/eff-urges-supreme-court-crack-down-patent-trolls> [<https://perma.cc/K7GK-HP3A>].

12. Jim Kerstetter & Josh Lowensohn, *Inside Intellectual Ventures, the Most Hated Company in Tech*, CNET: TECH INDUSTRY (Aug. 21, 2012, 6:57 AM PDT), <https://www.cnet.com/news/inside-intellectual-ventures-the-most-hated-company-in-tech/> [<https://perma.cc/9GG2-P4W2>].

13. Mark A. Lemley & A. Douglass Melamed, *Missing the Forest for the Trolls*, 113 COLUM. L. REV. 2117, 2118–2128 (2013).

14. *See id.* at 2126 (comparing the business models of “bottom-feeder” trolls, “patent aggregators,” and “lottery-ticket” trolls).

15. *Id.* at 2124.

16. *See Alice Decision Saves Crowdfunding From Patent Troll*, ELEC. FRONTIER FOUND., <https://www.eff.org/alice/alice-decision-saves-crowdfunding-patent-troll> [<https://perma.cc/YD4H-5UV2>] (last visited Jan. 10, 2019).

17. *See* USPTO, 2014 INTERIM ELIGIBILITY GUIDANCE QUICK REFERENCE SHEET (2014), https://www.uspto.gov/sites/default/files/documents/2014_eligibility_qrs.pdf [<https://perma.cc/ZU86-UUQT>]; *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66 (2012); Manny Schecter, *Congress Needs to Act So Alice Doesn't Live Here (in the Patent System) Anymore*, IPWATCHDOG (Feb. 13, 2017), <https://www.ipwatchdog.com/2017/02/13/congress-needs-to-act-so-alice-doesnt-live-here-in-the-patent-system-anymore/id=78241/> [<https://perma.cc/XM79-BGDY>].

18. Schecter, *supra* note 17.

19. USPTO, *Subject Matter Eligibility*, <https://www.uspto.gov/patent/laws-and-regulations/examination-policy/subject-matter-eligibility> [<https://perma.cc/HS7B-A58E>] (last visited Feb. 23, 2019); *see also* Kevin A. Rieffel, *Revised MPEP May Provide New*

is applied moving forward will have long-term effects on the progress of new technologies near the intersection of computing technology and business methods.²⁰ At one extreme, if the USPTO grants business method patents that are highly abstract, patent trolls could emerge victorious and stunt technological growth by creating an ever-expanding thicket of useless patents.²¹

At the other extreme, if the USPTO categorically rejects all patent applications with anything resembling a business method without considering their merits, innovators may be more likely to keep their innovations secret. This extreme could slow technological progress because competitors would not be incentivized to find alternative approaches to the same problem by designing around the boundaries of existing patents.²²

“Blockchain”—the technology behind cryptocurrencies like Bitcoin and Ethereum—is nascent and in need of innovation before it can be a realistic, sustainable solution for a wide variety of mainstream applications.²³ Many blockchain innovations will involve patent claims near the intersection of computing technology and business methods because the technology incorporates software for the automation of business transactions.²⁴ In 2008, blockchain was introduced, under the pseudonym Satoshi Nakamoto, as the technology behind Bitcoin, one of the world’s most valuable cryptocurrencies.²⁵ Blockchain was developed to solve the problem

Tools in Alice Rejections, IPWATCHDOG (Feb. 4, 2018), <http://www.ipwatchdog.com/2018/02/04/revised-mpep-tools-alice-rejections/id=93305/> [<https://perma.cc/28KG-TPVQ>].

20. See Mark Nowotarski, *If You Want to Protect Your Business Method, Reframe It as a Technical Invention*, IPWATCHDOG (Sept. 3, 2019), <https://www.ipwatchdog.com/2019/09/03/want-protect-business-method-reframe-technical-invention/id=112875/> [<https://perma.cc/Y887-APKS>].

21. Dolly Krishnaswamy, *Hacking Through Patent Thickets*, IPWATCHDOG (Sept. 29, 2013), <https://www.ipwatchdog.com/2013/09/29/hacking-through-patent-thickets/id=45429/> [<https://perma.cc/6DBC-KATF>].

22. See Gene Quinn, *The Theory of Patents and Why Strong Patents Benefit Consumers*, IPWATCHDOG (Nov. 24, 2015), <https://www.ipwatchdog.com/2015/11/24/theory-patents-strong-patents-benefit-consumers/id=61341/> [<https://perma.cc/Z7GM-LDND>].

23. Morgen E. Peck & Samuel K. Moore, *The Blossoming of the Blockchain*, IEEE SPECTRUM 28–25 (Oct. 2017), <https://ieeexplore.ieee.org/document/8048835> [<https://perma.cc/8F84-HTYX>].

24. See Charles R. Macedo & Barry Brager, *The Bitcoin Network, Blockchain Technology and Altcoin Futures*, IPWATCHDOG (Sept. 12, 2017), <https://www.ipwatchdog.com/2017/09/12/bitcoin-network-blockchain-technology-altcoin-futures/id=87916/> [<https://perma.cc/BWR4-XPZ8>] (explains the basics of bitcoin & blockchain tech).

25. Satoshi Nakamoto, *Bitcoin’s Enigmatic Creator*, THE ECONOMIST (Aug. 30, 2018), <https://www.economist.com/technology-quarterly/2018/09/01/satoshi-nakamoto-bitcoins-enigmatic-creator> [<https://perma.cc/X9ZM-EC4B>]; John Divine, *The 10 Biggest Digital Currencies by Market Cap*, U.S. NEWS & WORLD REPORT (Aug. 8, 2018), <https://money.usnews.com/investing/cryptocurrency/slideshows/the-10-most-valuable-cryptocurrencies-in-the-world?slide=11> [<https://perma.cc/5A57-2YR8>].

of double-spending in providing a “purely peer-to-peer version of electronic cash.”²⁶ In other words, blockchain provides a way to make secure electronic payments directly between transacting parties, in a way that is closer to paying with physical currency than paying with a credit card.²⁷ Because blockchain is likely to provide fertile ground for an influx of business method patent applications at the USPTO, patent trolls will likely attempt to cash in on the blockchain patent race.²⁸

Nonetheless, in order to provide sustainable, mainstream business solutions, blockchain technology will require significant innovation. Thus, inventors are likely to come forth with patent applications disclosing valuable improvements to further blockchain innovation.²⁹ This Note will argue that business method patents, appropriately constrained by the requirements of *Alice* and its progeny, are well-positioned to help blockchain technology ripen into a sustainable, mainstream solution by promoting disclosure over secrecy.

This Note proceeds in four parts. Part I presents a history of business method patents. Some patent system stakeholders have argued that—like the already existing exceptions to patent eligibility for laws of nature, natural phenomena, and abstract ideas—there should be an explicit exception for business methods. This Note will counter such arguments by examining how the requirements of *Alice* have ushered in a new era of business method patents that will be more beneficial than harmful to society. And that this new era will differ from business method patents in prior eras. Throughout history, the Supreme Court and the Federal Circuit have affected changes in the relative ease of obtaining business method patents.

Before *Alice*, the USPTO granted many business method patents for business ideas that yielded a useful result, but without

26. Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System*, <https://bitcoin.org/bitcoin.pdf> [<https://perma.cc/BK28-Z42T>] (last visited Jan. 11, 2019).

27. Dan Blystone, *Bitcoin Transactions Versus Credit Card Transactions: What's the Difference?*, INVESTOPEDIA, <https://www.investopedia.com/articles/forex/042215/bitcoin-transactions-vs-credit-card-transactions.asp> [<https://perma.cc/6TH2-K7D2>] (last updated July 17, 2019).

28. Chris Skinner, *BankThink Blockchain is Fintech's Real Game-Changer*, AMERICAN BANKER (Mar. 21, 2016, 9:30 AM), <https://www.americanbanker.com/opinion/blockchain-is-fintechs-real-game-changer> [<https://perma.cc/87PA-WXGP>]; see Malathi Nayak, *Blockchain Patent Race Is On, But Hurdles Await*, BLOOMBERG LAW (May 30, 2018), <https://biglawbusiness.com/blockchain-patent-race-is-on-but-hurdles-await/> [<https://perma.cc/BUL4-VVDS>]; Stephen O'Neal, *Is Blockchain About to Become a Patent War Battleground?*, COINTELEGRAPH (July 25, 2018), <https://cointelegraph.com/news/is-blockchain-about-to-become-a-patent-war-battleground> [<https://perma.cc/36AJ-SRDE>].

29. See Peter Fairley, *Feeding the Blockchain Beast*, IEEE SPECTRUM 36, 37, 58–59 (Oct. 2017) (explaining the problem of blockchain power consumption and the limited ability of hardware efficiency improvements to help).

any corresponding technological improvement—i.e., “pure” business method patents. After *Alice*, the courts have established that business methods must provide technological improvements, or else they will be rejected under the abstract-idea exception to patent eligibility. Nevertheless, business methods are still eligible for patenting and blockchain innovators should not overlook the value of patenting business methods that further the progress of blockchain technology.

Part II presents a taxonomy developed by Professor Harry Surden for evaluating whether a particular technological arena afforded patent protection may be more problematic than justifiable. Professor Surden’s five justifications provide a useful framework for analyzing and articulating when policy change may be necessary to keep problematic patents in check. Professor Surden has applied the taxonomy to both pharmaceutical patents and business method patents to argue that business method patents, unlike pharmaceutical patents, are highly problematic. Further, this Note examines Judge Mayer’s dissent from *In re Bilski*, which argues the extreme position that business method patents should be excluded categorically from patent eligibility.³⁰ Arguments such as these are primarily attacks on “pure” business method patents in the abstract and are detached from an examination of specific business methods that purport to solve a technological problem. To counter these arguments, this Note will examine a new technology—blockchain—with tremendous potential, but serious shortcomings. This Note will explore how business methods may be useful, if not crucial, for furthering blockchain innovation.

Part III explains the concepts behind how blockchain technology works to highlight both its tremendous potential and some of its major limitations, and to show how business methods may provide technological improvements. “Blockchain” has become a buzz word of epic proportions. In the Fall of 2018, IBM began advertising “IBM Blockchain, a smart way to track every step” to ensure your coffee beans “did indeed come from 6,000 feet above sea level and not a foot lower.”³¹ The world’s two most popular countries for blockchain-related patent applications—China and the United States—have seen dramatic increases in new filings each year since 2014. Patent applications in the United States with the word “blockchain” in the title, abstract, or claims increased from one new

30. See *In re Bilski*, 545 F.3d 943, 998 (Fed. Cir. 2008).

31. *IBM Blockchain TV Commercial, ‘Smart Supply Chain’*, ISPOT.TV, <https://www.ispot.tv/ad/doiE/ibm-blockchain-smart-supply-chain> [https://perma.cc/Y93H-WTXS] (last visited Mar. 23, 2019).

application in 2014 to about 383 new applications in 2017.³² Similar blockchain patent applications in China increased even more dramatically from 21 new applications in 2014 to about 1,291 new applications in 2017.³³ There are exciting applications for blockchain technology, beyond cryptocurrency, with the potential to greatly benefit the public welfare. This Note discusses three such applications—product tracking/traceability, peer-to-peer energy trading, and medical record coordination—to illustrate the real-world benefits that may be enabled for mainstream use after further improvements to blockchain technology.

Part IV applies the five justifications of Professor Surden's taxonomy to the prospect of blockchain-related business method patents to analyze how the availability of such patents may prove to be more justifiable than problematic.

I. HISTORY OF BUSINESS METHOD PATENTS—AS THE PENDULUM SWINGS

While “patent law is technology-neutral in theory, it is technology-specific in application.”³⁴ During the twentieth and twenty-first centuries, the Supreme Court and the Federal Circuit applied patent statutes to business methods in a different way than they applied the laws to other areas of invention.³⁵ This was meant to calibrate the patent system to serve policy goals.³⁶ The following history provides a look back at key cases from three eras of business method patents that have swung the patent-law pendulum on business method patent eligibility.

During the first era, courts made it extremely difficult to obtain business method patents. Many perceived this to be an *implied* business method exception to patent eligibility.³⁷ During the second era, the courts made it easy to obtain business method patents,

32. *Search International and National Patent Collections*, WIPO, <https://patentscope.wipo.int/search/en/result.jsf> [https://perma.cc/7MHD-SJW6] (last visited Mar. 24, 2019) (based on an advanced search for “(AB:blockchain or TI:blockchain or CL:blockchain) and AD:[01.01.2014 TO 31.12.2014]”).

33. *Search International and National Patent Collections*, WIPO, <https://patentscope.wipo.int/search/en/result.jsf> [https://perma.cc/A65W-83HG] (last visited Mar. 24, 2019) (based on an advanced search for “(AB:区块链 or TI:区块链 or CL:区块链) and AD:[01.01.2014 TO 31.12.2014]”). The Chinese translation for “blockchain” is 区块链 (qū kuài liàn).

34. Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1577 (2003).

35. *See id.* at 1618.

36. *See id.*

37. *Id.*

which led to the patent troll problem.³⁸ Finally, in the current era, which this Note refers to as the *Alice* era, the courts have once again made it more difficult, but not impossible, to obtain a business method patent.³⁹ The Court has made it clear that business methods are still patent-eligible, so long as the invention purports to make a technological improvement.⁴⁰

A. *Hotel Security Checking: Advice Is Not Patentable*

Hotel Security Checking provides the background for the first era of business method patents, when many perceived an implied exception to patent eligibility for business methods.⁴¹ In 1893, the Hotel Security Checking Company successfully patented their business methods for preventing fraud and embezzlement from a restaurant's wait staff.⁴² However, in 1908, the Second Circuit held that the patent claims were invalid.⁴³ The court reasoned, in part, that the patent claimed a mere "system of transacting business disconnected from the means for carrying out the system."⁴⁴

The claims involved a type of ledger verification system where each waiter used slips of paper, marked with the waiter's identification number, to record each order.⁴⁵ Each department—e.g., kitchen, bar, or cigar stand—would be given a large sheet with columns for keeping track of each waiter's orders.⁴⁶ "At the close of business the sum of the slips of waiter No. 6[, for example,] in the hands of the cashier, . . . [could] easily be compared with the sum of the items charged to him by the departments collectively" to reveal any fraud or carelessness "and discover where the fault lies."⁴⁷

The court reasoned that the claims were directed to a fundamental principle of bookkeeping and merely applied it to the hotel and restaurant context using an obvious means of implementation.⁴⁸ The court explained that the claims were directed to business advice adding nothing of substance to the art

38. Neel Chatterjee, *Patent 'Gold Rush' to Blame for Patent Sharks, Patent Trolls*, IP WATCHDOG (Aug. 13, 2017), <https://www.ipwatchdog.com/2017/08/13/patent-gold-rush-patent-sharks-patent-trolls/id=86649/> [<https://perma.cc/QZD3-ETXN>].

39. *Chisum*, *supra* note 1.

40. *See id.*

41. *See State St. Bank & Tr. Co. v. Signature Fin. Grp.*, 149 F.3d 1368, 1375-77 (Fed. Cir. 1998).

42. *See Hotel Sec. Checking Co. v. Lorraine Co.*, 160 F. 467, 467 (2d Cir. 1908).

43. *Id.* at 472.

44. *Id.* at 469.

45. *Id.* at 467-68.

46. *Id.*

47. *Id.* at 468.

48. *Id.* at 469-70.

of bookkeeping, deeming the claimed invention to be a “mere abstraction” and declaring that “[a]dvice is not patentable.”⁴⁹

B. *State Street: A Useful, Concrete, and Tangible Result*

State Street ushered in a second era of business method patents during which the USPTO granted many patents for “pure” business methods—i.e., business methods without a purported technological improvement. In 1998, the Federal Circuit held that Signature Financial Group’s patent claims—which were directed to a business method involving a “Hub and Spoke financial services configuration”—should not have been invalidated on summary judgment under 35 U.S.C. § 101 as patent-ineligible subject matter by the District of Massachusetts.⁵⁰ The court reasoned that the claims were not merely directed to an abstract idea because they incorporated a computer for making mathematical calculations, which transformed data and produced a “useful, concrete, and tangible result.”⁵¹

The Federal Circuit criticized the District of Massachusetts’ reliance on a supposed business-method exception to patent eligibility to erroneously invalidate the “Hub-and-Spoke” patent claims.⁵² The court explained that, at least since the 1952 Patent Act, business method claims have been subject to the same patentability requirements as any other type of method claim.⁵³

As a result of *State Street*, the USPTO granted many problematic business method and software patents, which ended up providing fuel for patent trolls.⁵⁴

C. *Efforts to Curb Patent Trolling?*

1. *Bilski: The Machine or Transformation Test Is Not the Only Test*

The Federal Circuit’s 2008 *In re Bilski* decision and the Supreme Court’s 2010 *Bilski v. Kappos* decision turned the tide for business method patents, once again making them more difficult to obtain.⁵⁵

49. *See id.*

50. *State St. Bank & Tr. Co. v. Signature Fin. Grp., Inc.*, 149 F.3d 1368, 1370 (Fed. Cir. 1998), *abrogated by In re Bilski*, 545 F.3d 943 (Fed. Cir. 2008).

51. *Id.* at 1373.

52. *Id.* at 1375.

53. *Id.*

54. *See* Christopher W. Quinn, *The 20 Year War On Patents: When Will It End?*, QUINN IP LAW (Feb. 21, 2017), <https://www.quinniplaw.com/20-year-war-on-patents/> [<https://perma.cc/VXT9-5JN7>].

55. *See In re Bilski*, 545 F.3d 943 (Fed. Cir. 2008).

In *In re Bilski*, the Federal Circuit held that Bilski's business method patent claims were invalid under 35 U.S.C. § 101, reasoning that the claims were directed to the abstract idea of "hedging risk in the field of commodities trading."⁵⁶ Furthermore, the court declared that the machine-or-transformation ("MoT") test was the governing test for determining whether a claim directed to an abstract idea was, nevertheless, patent-eligible.⁵⁷ The court explained that it was concerned about highly abstract patent claims that would preempt "substantially all uses" of the underlying abstract idea if granted.⁵⁸

First, the court applied the machine-implementation branch of the MoT test. Bilski's claimed invention failed the test because it did not limit the process to a particular machine or device.⁵⁹ Second, the court applied the transformation branch of the test, concluding that Bilski's claimed invention of a transformation of business risks failed the test because such a transformation did not involve "physical objects or substances."⁶⁰

In *Bilski v. Kappos*, the Supreme Court held that the machine-or-transformation test, while still a useful test, was not the exclusive test for making a § 101 determination.⁶¹ The Court explained that a claimed invention that passed the MoT test was likely patent-eligible; however, a claimed invention that failed the MoT test was not necessarily patent-ineligible.⁶² The Court held Bilski's claims ineligible because they were directed to an abstract idea, and explained that merely "limiting an abstract idea to one field of use or adding token post-solution components did not make the concept patentable."⁶³ In other words, claiming the abstract idea of hedging risk and limiting it to commodities trading (one field of use) or implementing the abstract idea with a generic computer (a token post-solution component) would not be enough to satisfy the subject matter eligibility requirement.

In sum, the Supreme Court agreed with the Federal Circuit that a change in the patent eligibility standard was necessary to prevent the issuance of problematic business method patents. However, the Court did not seem to agree that patent eligibility should be limited to purely physical inventions by way of the MoT test.

56. *Id.* at 949–50.

57. *Id.* at 956.

58. *Id.* at 954 ("A claimed process is surely patent-eligible under § 101 if: (1) it is tied to a particular machine or apparatus, or (2) it transforms a particular article into a different state or thing.")

59. *Id.* at 961–62.

60. *Id.* at 963.

61. *Bilski v. Kappos*, 561 U.S. 593, 604 (2010).

62. *Id.* at 604–06.

63. *Id.* at 612.

2. *Mayo & Alice*: Abstract Ideas and Significantly More

The Supreme Court's *Mayo* and *Alice* decisions continued the trend of combating problematic patents. The Court articulated and applied a new standard for patent-eligible subject matter, which effectively excludes "pure" business methods from patent eligibility without limiting patentability to purely physical inventions.

In its 2012 *Mayo* decision, the Supreme Court reversed the Federal Circuit's decision, which had held Prometheus Labs' claims valid under the MoT test. In reversing the Federal Circuit's decision, the Supreme Court announced the new two-step standard.⁶⁴ In step one, courts must determine whether the patent claims are directed to one of the judicially created exceptions to patent eligibility: laws of nature, natural phenomena, or abstract ideas.⁶⁵ If so, step two requires courts to analyze the claim elements individually and in combination, to determine whether any additional elements are sufficient to provide an "inventive concept" that ensures the patent constitutes "significantly more" than a patent on the underlying law of nature, natural phenomenon, or abstract idea alone.⁶⁶

Prometheus Labs' claims involved the treatment of autoimmune diseases with thiopurine drugs and research findings for the correlation between metabolite levels and the likelihood of harm or ineffectiveness from a particular dosage of the drug.⁶⁷ The court held that these claims were invalid because they were directed to a law of nature and failed to add "significantly more" to the underlying law of nature itself.⁶⁸

In its 2014 *Alice* decision, the Supreme Court introduced the *Mayo* two-step to the world of business method and software patents by applying it to abstract ideas, in addition to laws of nature.⁶⁹ Alice Corp.'s patents claimed a method of mitigating settlement risk between transacting parties by using a computer as a third-party intermediary.⁷⁰ The computer created real-time "shadow records" of each party's bank account ledger and instructed the banks to only execute transactions if both parties had the resources to fulfill the transaction.⁷¹ Applying step one of the *Alice/Mayo* test, the Court reasoned that Alice Corp.'s business method claims were directed to the abstract idea of "intermediated

64. *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 76–77 (2012).

65. *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 573 U.S. 208, 217 (2014).

66. *Id.* at 217–18 (quoting *Mayo*, 566 U.S. at 72–79 (2012)).

67. *Mayo*, 566 U.S. at 73–75.

68. *Mayo*, 566 U.S. at 72–73.

69. *Alice*, 573 U.S. at 217–18.

70. *Id.* at 213.

71. *Id.* at 213–14.

settlement,” just like the claims in *Bilski* were directed to the abstract idea of “risk hedging.”⁷²

Moving on to step two, the Court reasoned that the additional claim elements merely required using a generic computer to implement the abstract idea, which failed to transform the claim into “significantly more” than a claim to the abstract idea of intermediated settlement itself.⁷³ The Court explained that claims purporting to improve some “technology or technical field” would more likely have been deemed to satisfy the “significantly more” prong of the test.⁷⁴ Moreover, the Court distinguished Alice Corp.’s computer-implemented claims from the computer-implemented claims of a prior case—*Diamond v. Diehr*. In *Diehr*, the claims were patent-eligible “because they improved an existing technological process, not because they were implemented on a computer.”⁷⁵ Accordingly, the Court held Alice Corp.’s claims invalid as patent-ineligible subject matter under 35 U.S.C. § 101.⁷⁶

Writing in 2014, Donald Chisum—the author of the treatise “Chisum on Patents”—explained what he considered to be *Alice*’s new guidance over the *Mayo* and *Bilski* decisions.⁷⁷ Because the *Alice* Court distinguished the claims in *Diehr* on the basis that they improved a technological process, *Alice* provides a “safe harbor from Section 101 abstract idea scrutiny . . . if the claimant establishes that the claim is directed to a solution of a technological problem.”⁷⁸

D. Pathways to Patentability

The USPTO uses a two-step approach in determining patent eligibility under § 101, which contains both steps of the *Alice/Mayo* test in what the USPTO refers to as steps 2A and 2B.⁷⁹ At USPTO step 1, patent examiners determine whether the claims are directed to one of the four statutory categories of patent-eligible inventions—a process, machine, manufacture, or composition of matter. Business methods are processes, so they always pass USPTO step 1. At USPTO step 2A, examiners determine whether the claims are directed to one of the judicially created exceptions to patentability—laws of nature, natural phenomena, or abstract

72. *Id.* at 218–21.

73. *Id.* at 225–26.

74. *Id.*

75. *Id.* at 223 (citing *Diamond v. Diehr*, 450 U.S. 175 (1981)).

76. *Id.* at 221.

77. Chisum, *supra* note 1.

78. *Id.*

79. 2014 Interim Guidance on Patent Subject Matter Eligibility 79 Fed. Reg. 74,618, 74,621–22 (Dec. 16, 2014).

ideas.⁸⁰ In USPTO step 2B, examiners determine whether the claim recites “additional elements that amount to significantly more than” a claim to the judicially created exception.⁸¹

Donald Chisum’s idea that *Alice* provides a safe harbor for claims purporting to solve a technological problem is supported by *Alice*’s progeny, including *Enfish* and *BASCOM*.

1. *Alice/Mayo* Step One (USPTO Step 2A)

- a. *Enfish*: Improvements in Computer Functionality

In 2016, the Federal Circuit held that *Enfish*’s software claims involving a “self-referential’ database” were not directed to an abstract idea under step one of the *Alice/Mayo* framework and were, therefore, not ineligible under 35 U.S.C. § 101.⁸² The court reasoned that “[s]oftware can make non-abstract improvements to computer technology just as hardware improvements can,” and in such cases the claims are not directed to patent-ineligible subject matter.⁸³ Because *Enfish*’s claims were directed to improvements in computer technology allowing for more flexibility, increased search speed, and more efficient use of memory than the prior art, the claims were different from the claims in *Alice*, which were directed to an abstract idea that was merely carried out on a generic computer.⁸⁴

The *Enfish* case also serves as an example of a software-related invention that would not have passed the MoT test due to its non-physical nature, but that still yields a technological improvement.

80. *Id.*

81. *Id.*

82. *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1330 (Fed. Cir. 2016).

83. *Id.* at 1335. *See also* Memorandum from Robert W. Bahr, Deputy Comm’r for Patent Examination Policy, USPTO, to Patent Examining Corps, Recent Subject Matter Eligibility Decisions (*Enfish, LLC v. Microsoft Corp.* and *TLI Communications LLC v. A. V Automotive, LLC*) 2 (2016), https://www.uspto.gov/sites/default/files/documents/ieg-may-2016_enfish_memo.pdf [<https://perma.cc/BX6K-7EDD>] (explaining that improvements to functionality may be defined, not only by reference to physical structures, but also by reference to “logical structures and processes”) (last visited Nov. 2, 2019).

84. *Enfish*, 822 F.3d at 1338–39.

2. *Alice/Mayo* Step Two (USPTO Step 2B)

a. *BASCOM*: Non-Conventional and Non-Generic Combinations

In 2016, the Federal Circuit clarified the analysis of step two of the *Alice/Mayo* test.⁸⁵ The court held that a non-conventional and non-generic combination of known, conventional elements may still yield an inventive concept—i.e., when a claim as a whole amount to “significantly more” when elements of the claim are combined instead of taken in part.⁸⁶

BASCOM's claims were directed to an internet-content filtering system that could be installed at a single, remote location and still be tailored to the individual filtering preferences of many different users.⁸⁷ The court held that *BASCOM*'s claims could not be deemed conventional as a matter of law, even though they used conventional elements and were directed to the abstract idea of “filtering content.”⁸⁸ The court explained that an inventive concept could still be found because the claims involved a specific method of filtering content that purported to solve technological problems of prior-art filters.⁸⁹

II. AN ARGUMENT AGAINST BUSINESS METHOD PATENTS

In Part IV, this Note will counter the arguments outlined in this Part II. As you read, notice how the arguments attack business method patents in a general sense—presuming that all business methods are “pure” business methods and failing to recognize that many business methods could provide technological improvements. After outlining the rationales behind the arguments against granting patent rights for business methods in general, this Note will explain how blockchain works in Part III to show how the same rationales ultimately support the conclusion that business methods related to improvements in blockchain technology may be justified.

85. See *BASCOM Glob. Internet Servs., v. AT&T Mobility LLC*, 827 F.3d 1341, 1349 (Fed. Cir. 2016).

86. *Id.* at 1349–50. See also Memorandum from Robert W. Bahr, Deputy Comm’r for Patent Examination Policy, USPTO, to Patent Examining Corps, Recent Subject Matter Eligibility Decision 3 (2016), <https://www.uspto.gov/sites/default/files/documents/McRo-Bascom-Memo.pdf> [<https://perma.cc/5TDV-48LJ>] (“[E]xaminers should consider the additional elements in **combination**, as well as individually, when determining whether a claim as a whole amounts to significantly more, as this may be found in the nonconventional and non-generic arrangement of known, conventional elements.” (emphasis in original)) (last visited Nov. 2, 2019).

87. *BASCOM*, 827 F.3d at 1350.

88. *Id.* at 1352.

89. *Id.* at 1350.

A. When Patent Rights Are Justified: A Taxonomy for Problematic Patents

In his Patent Law course lectures at the University of Colorado Law School, Professor Harry Surden has explained how patent system stakeholders may apply the underlying principles of patent law to help identify when exclusive patent rights for different areas of invention may be more or less justifiable.⁹⁰ In support of such efforts, Professor Surden has developed a five-part “taxonomy of problematic patent characteristics” to help stakeholders better articulate why a category of patents may be more problematic than justifiable.⁹¹ Adding further support to the rationale behind the taxonomy is Judge Mayer’s dissent in the Federal Circuit’s *In re Bilski* decision.⁹² His dissent took the extreme position that all business method patents should be categorically excluded from patent eligibility.⁹³ Patent rights are more justifiable and, therefore, less problematic when the five factors, discussed below, weigh in favor of honoring such rights—based on the social benefits outweighing the social costs.⁹⁴

First, granting exclusive patent rights is more justifiable when the inventions in a particular field are expensive to develop and easy to copy.⁹⁵ In such fields, innovators rely on exclusive patent protection. Having the exclusive rights to their patents is “economically rational” because it helps innovators overcome the problem of free-riders and recover costs in research and development.⁹⁶ If innovators made investments in new technologies only to be undercut by free-riding competitors who copied the

90. See Harry Surden, Assoc. Professor U. of Colo. L. Sch., *Business Method, Software Patents I* (Sept. 28, 2017) [hereinafter *Surden Lecture*]; see also Harry Surden, *Principles of Problematic Patents* (2014), https://www.law.berkeley.edu/files/Surden_Harry.pdf [<https://perma.cc/Q9B5-QR43>] [hereinafter *Surden Taxonomy*]. Full disclosure—Professor Surden was the author’s Patent Law professor during the Fall 2017 semester. Professor Surden’s taxonomy sets forth a valuable checklist for articulating why the patent laws, as applied to particular areas of technological endeavor, may be in need of policy reform, as well as for articulating why certain reforms may have corrected for past inadequacies.

91. *Surden Taxonomy*, *supra* note 90.

92. *In re Bilski*, 545 F.3d 943, 998 (Fed. Cir. 2008).

93. *Id.* (“The patent system is intended to protect and promote advances in science and technology, not ideas about how to structure commercial transactions. Claim 1 of the application of Bernard L. Bilski and Rand A. Warsaw (“Bilski”) is not eligible for patent protection because it is directed to a method of conducting business. Affording patent protection to business methods lacks constitutional and statutory support, serves to hinder rather than promote innovation and usurps that which rightfully belongs in the public domain. State Street and AT&T should be overruled.” (emphasis in original)).

94. *Surden Principles of Problematic Patents*, *supra* note 90.

95. *Surden Lecture*, *supra* note 90.

96. *In re Bilski*, 545 F.3d at 1006; Rochelle Cooper Dreyfuss, *Are Business Method Patents Bad for Business?*, 16 SANTA CLARA COMPUTER & HIGH TECH. L.J. 263, 274–75 (2000).

innovation and did not incur costs in research and development, everyone would be in the business of copying, and no one would be in the business of inventing.⁹⁷

Second, patent rights are more justifiable when they promote the development of inventions that would not be produced absent exclusivity.⁹⁸ Businesses are always finding new methods of conducting business to outdo their competitors without the promise of patent protection.⁹⁹ Thus, business innovations will continue to thrive even if they are excluded from patent eligibility.¹⁰⁰

Third, exclusive patent rights are more justifiable when society receives something valuable in exchange.¹⁰¹ The constitutional purpose for granting patent rights is for the “promotion of advances in the ‘useful arts.’”¹⁰² However, business method patents “do little to promote scientific research and technological innovation.”¹⁰³ In other words, patents are not granted for the purpose of making patent owners rich and society receives nothing of value in exchange for pure business method patents.¹⁰⁴

Fourth, exclusive patent rights are more justifiable when they do not unduly inhibit competitors.¹⁰⁵ Patent protection is intended to increase public knowledge and encourage further innovation.¹⁰⁶ However, patents for business methods “remove building blocks of commercial innovation from the public domain,” instead of encouraging further innovation by providing competitors incentives to “develop improved techniques.”¹⁰⁷ Business method patents, unattached from a specific technological improvement, are unjustifiably broad and anticompetitive because competitors have no way to improve on the innovation without infringing.¹⁰⁸

Fifth, exclusive patent rights are more justifiable when the twenty-year patent term is needed to capture value.¹⁰⁹ As discussed below, some innovators rely on a longer patent term due to delays in getting products to market where profits can be made.

97. *Surden Lecture, supra* note 90.

98. *Surden Lecture, supra* note 90.

99. *In re Bilski*, 545 F.3d at 1005.

100. *Id.*

101. *Surden Lecture, supra* note 90.

102. *In re Bilski*, 545 F.3d at 1001 (quoting *Graham v. John Deere Co.*, 383 U.S. 1, 5 (1966)).

103. *Id.* at 1004.

104. *See id.*

105. *Surden Lecture, supra* note 90.

106. *Id.*

107. *See In re Bilski*, 545 F.3d at 1006.

108. *Id.*

109. *Surden Lecture, supra* note 90.

B. A Comparison of Patent Types—Justifiable or Unjustifiable?

1. Pharmaceutical Patents Are Justifiable

Pharmaceutical patents are justifiable because they meet all five justifications.¹¹⁰ First, pharmaceuticals are expensive to develop—costing \$2 billion in research efforts—and are easy to copy.¹¹¹ Generic drug manufacturers have their production lines running the very second the patent term expires.¹¹² Second, pharmaceuticals would not be produced absent exclusivity.¹¹³ The \$2 billion in research costs would never be recouped since the generic drug producers, who did not expend research funds, would be able to sell their drugs for much less while offering the identical product.¹¹⁴ Third, society receives something valuable in exchange.¹¹⁵ Drugs, like penicillin, can save many lives.¹¹⁶ Fourth, pharmaceutical patents do not unduly inhibit competitors because the boundaries of molecules are well defined.¹¹⁷ Fifth, the twenty-year term is needed to capture the value.¹¹⁸ FDA regulations can delay the release of a new drug by ten to fifteen years, leaving only five years for the patentee to recoup losses and make profits.¹¹⁹

2. Business Method Patents Are Problematic

Business method patents are problematic because they fail all five justifications.¹²⁰ First, most business methods are inexpensive to develop.¹²¹ Second, the world is not short on business ideas.¹²² People do not need patent rights to encourage them to develop new business methods. After all, 99.9% of businesses do not have patents on their business practices.¹²³ Most businesses use intellectual property law to protect their products and brands, not their methods of doing business.¹²⁴ Third, society does not receive

110. *Surden Lecture*, *supra* note 90.

111. *Id.*

112. *Id.*

113. *Id.*

114. *Id.*

115. *Id.*

116. *Id.*; see generally Robert Gaynes, *The Discovery of Penicillin—New Insights After More Than 75 Years of Clinical Use*, 23 EMERGING INFECTIOUS DISEASES J. 849 (2017), <https://wwwnc.cdc.gov/eid/article/23/5/pdfs/16-1556.pdf> [<https://perma.cc/A844-G66B>].

117. *Surden Lecture*, *supra* note 90.

118. *Id.*

119. *Id.*

120. *Id.*

121. *Id.*

122. *Id.*

123. *Id.*

124. *Id.*

something valuable in exchange for most business method patents.¹²⁵ The vast majority of business method patents are simply restating existing practices and are usually drafted at too high of a level of abstraction relative to the actual inventive contribution.¹²⁶ Fourth, business method patents unduly inhibit competitors.¹²⁷ The social benefits are negligible, while the social costs are significant.

The benefits are negligible because competitors are precluded from practicing new business innovations due to overly broad business method claims with little or no technological improvement. The costs are significant because non-practicing entities (e.g., patent trolls) are fueled by overbroad business method claims allowing them to threaten litigation upon practicing businesses and win a settlement.¹²⁸ Fifth, businesses do not need twenty years of patent protection to recoup business method research and development costs and make a profit since business methods are inexpensive to develop.¹²⁹

3. Amazon's "1-Click" Patent: A Real-World Business Method

On September 11, 2017, Amazon's controversial "1-Click" patent expired.¹³⁰ It is considered by many to be a prime example of unjustified business method patenting.¹³¹ The patent claims read, in part:

A method of placing an order for an item comprising: . . . displaying information identifying the item; and in response to only a single action being performed, . . . generating an order to purchase the requested item . . . whereby the item is ordered without using a shopping cart ordering model.¹³²

The invention's stated purpose is to "reduce the number of purchaser interactions needed" to make an order, as well as to reduce "the amount of sensitive information that is transmitted

125. *Id.*

126. *Id.*

127. *Id.*

128. *Id.*

129. *Id.*

130. Monica Nickelsburg, *Amazon's '1-Click' Patent Expires Today, and Soon You'll Be Able to Accidentally Order Stuff Across the Entire Internet*, GEEKWIRE (Sept. 11, 2017, 10:03 AM), <https://www.geekwire.com/2017/amazons-1-click-patent-expires-today-soon-youll-able-accidentally-order-stuff-across-entire-internet/> [<https://perma.cc/TC4L-CY4X>]; U.S. Patent No. 5,960,411 (filed Sept. 12, 1997) (issued Sept. 28, 1999).

131. See Nickelsburg, *supra* note 130.

132. '411 Patent, Claim 1.

between a client system and a server system” in an environment between client and server.¹³³

The 1-Click patent is commonly referred to as a business method patent, but it could just as easily be considered a software patent describing the invention at a high level of abstraction.¹³⁴ On the one hand, the disclosure provides Amazon’s method for making online business transactions more efficient and lowering the risk of compromising customer data. This seems like a business-centric concept.¹³⁵ On the other hand, the patent takes a step-by-step algorithmic approach to describing the invention and includes an assortment of flow charts that are ubiquitous in the software patent domain.¹³⁶

In October of 1999, Amazon sued Barnes & Noble (“BN”) for infringing the 1-Click patent with BN’s “Express Lane” online shopping feature.¹³⁷ The Western District of Washington had granted Amazon’s motion for preliminary injunction against BN, but, on review, the Federal Circuit vacated the order and remanded the case for a final resolution of BN’s validity challenge.¹³⁸ The parties reached a settlement in 2002.¹³⁹

The story of Amazon’s 1-Click patent illustrates two cautionary points for those who, like Judge Mayer in *In re Bilski*, would argue for a categorical business-method exception to patentability. First, it is not always easy to categorize a patent as claiming a “business method.” They rarely reveal themselves by claiming a “business method, comprising: A; B; and C.” Second, an invention that appears to be trivial on its face from the perspective of more than ten years into the future, may only seem trivial due to hindsight bias.

In retrospect, reducing a two-click process to one may seem inconsequential and obvious. However, consider the following: a federal district court granted a preliminary injunction favoring the 1-Click patent owner; after remand from the Federal Circuit, the

133. *Id.*

134. *See id.*; Gene Quinn, *Software Patent Basics: What Level of Description is Required?*, IPWATCHDOG (Jan. 25, 2014), <https://www.ipwatchdog.com/2014/01/25/software-patent-basics-what-level-of-description-is-required/id=47663/> [<https://perma.cc/Z3RQ-2PXU>].

135. *See Business Method Patent: Everything You Need to Know*, UPCOUNSEL, <https://www.upcounsel.com/business-method-patent> [<https://perma.cc/5H2J-WRW3>] (last visited Mar. 23, 2019) (explaining that “new types of e-commerce” are an example of business method patents).

136. *See* Gene Quinn, *Writing a Software Patent Application*, IPWATCHDOG (Oct. 15, 2018), <https://www.ipwatchdog.com/2018/10/15/writing-software-patent-application/id=102317/> [<https://perma.cc/NA7S-VXRE>].

137. *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343, 1346 (Fed. Cir. 2001).

138. *Id.* at 1347, 1360.

139. Nickelsburg, *supra* note 130.

parties settled; and Apple's CEO, Steve Jobs, made the decision to license the technology from Amazon in 2000.¹⁴⁰ If it were really such an obvious case of invalidity, one would expect these sophisticated business players to invalidate the patent.

III. BLOCKCHAIN

A basic understanding of how blockchain works will allow the reader to see how the technology may be improved by business methods. This will, in turn, show that business methods that improve technology can be more justifiable than problematic.

A. What is Blockchain?

On October 31, 2008, a pseudonymous inventor, or group of inventors, going by the name Satoshi Nakamoto published the famous Bitcoin white paper that introduced blockchain technology to the world.¹⁴¹ Blockchain is the technology behind Bitcoin, so to understand blockchain, it helps to understand some of the history and concepts behind Bitcoin.

In 2008, the United States was in the depths of the Great Recession.¹⁴² Congress had passed a \$700 billion bailout bill to save the big banks of Wall Street that were deemed "too big to fail."¹⁴³ Big banks and other "trusted" third-party intermediaries were largely to blame for the economic crisis, and Bitcoin offered a solution to cut out the middle man of the traditional trust-based financial system.¹⁴⁴ The Bitcoin white paper was first sent to the subscribers of a cryptography mailing list—the Cypherpunks

140. *Amazon*, 239 F.3d at 1347, 1360; *id.*

141. HISTORY OF BITCOIN, <http://historyofbitcoin.org> [<https://perma.cc/TJ69-VRY2>] (last visited Jan. 8, 2019) (October 31, 2008, event on historical timeline); *Bitcoin White Paper Made Simple: A Guide to Understanding the Bitcoin White Paper for People Without an Advanced Degree in Computer Geekery*, THE BLOCKCHAIN REVIEW 8, <https://blockchainreview.io/wp-content/uploads/2018/02/Intrepid-Ventures-Bitcoin-White-Paper-Made-Simple-1.pdf> [<https://perma.cc/Q5QN-ZYUB>] [hereinafter *Bitcoin WPMS*] (last visited Jan. 8, 2019).

142. See *Chart Book: The Legacy of the Great Recession*, CENTER ON BUDGET AND POLICY PRIORITIES (Jan. 8, 2019), <https://www.cbpp.org/research/economy/chart-book-the-legacy-of-the-great-recession> [<https://perma.cc/ZZ49-5DYE>].

143. Kimberly Amadeo, *What Too Big to Fail Means*, THE BALANCE (Nov. 6, 2018), <https://www.thebalance.com/too-big-to-fail-3305617> [<https://perma.cc/FL3K-UTF2>].

144. Kimberly Amadeo, *Causes of the 2008 Global Financial Crisis*, THE BALANCE (Nov. 7, 2018), <https://www.thebalance.com/what-caused-2008-global-financial-crisis-3306176> [<https://perma.cc/JG69-656K>]; Morgen E. Peck, *Blockchains: How They Work and Why They'll Change the World*, IEEE SPECTRUM 28 (Oct. 2017), <https://spectrum.ieee.org/computing/networks/blockchains-how-they-work-and-why-theyll-change-the-world> [<https://perma.cc/A9MG-8RFH>] ("Bitcoin's unofficial catchphrase, 'In cryptography we trust,' left no doubt who was to blame: it was the middlemen, the bankers, the 'trusted' third parties who actually couldn't be trusted.").

electronic mailing list.¹⁴⁵ Satoshi's white paper explains the "inherent weakness of the trust based model" for processing electronic payments online.¹⁴⁶

Because "completely non-reversible transactions are not really possible" without physical currency, financial institutions must mediate disputes, which increases transaction costs, and vendors "must be wary of their customers, hassling them for more information than they would otherwise need."¹⁴⁷ Satoshi's white paper proposes a solution—"an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party."¹⁴⁸

B. *The Big Concepts Behind How Blockchain Works*

Satoshi Nakamoto is praised for realizing how to combine several technologies together "to create a truth protocol that no one explicitly controls."¹⁴⁹ Satoshi used the existing concepts of (1) peer-to-peer networks, (2) digital signatures, and (3) proof-of-work consensus algorithms to create a distributed database of transactions that is immutable, reliable, and secure even though there is no central administrator overseeing it, like a traditional database would have.¹⁵⁰

Satoshi's goal in creating the Bitcoin blockchain was to "prevent double-spending."¹⁵¹ Double-spending is not a problem with transactions involving an exchange of physical currency because, for example, you cannot give a \$100 bill to A and then give that same \$100 bill to B. Once the \$100 bill physically leaves your possession, it is gone and you cannot spend it again.¹⁵² However, double-spending is a problem with online transactions. In the digital world, money is just data in a digital file.¹⁵³ Without blockchain, third-party intermediaries are necessary to create trust

145. Jamie Redman, *Satoshi Nakamoto's Brilliant White Paper Turns 9-Years Old*, BITCOIN.COM (Oct. 31, 2017), <https://news.bitcoin.com/satoshi-nakamotos-brilliant-white-paper-turns-9-years-old/> [<https://perma.cc/3G6U-SAZV>]; PetriB, *The Untold History of Bitcoin: Enter the Cypherpunks*, MEDIUM (Jan. 26, 2018), <https://medium.com/swlh/the-untold-history-of-bitcoin-enter-the-cypherpunks-f764dee962a1> [<https://perma.cc/9X4P-627U>].

146. Nakamoto, *supra* note 26, at 1.

147. *Id.*

148. *Id.*

149. Taylor Gerring, *Cut and Try: Building a Dream*, ETHEREUM BLOG (Feb. 9, 2016), <https://blog.ethereum.org/2016/02/09/cut-and-try-building-a-dream/> [<https://perma.cc/X6F4-2LTX>].

150. See *Bitcoin WPMS*, *supra* note 141, at 16, 28.

151. Nakamoto, *supra* note 26, at 1.

152. See *Bitcoin WPMS*, *supra* note 141, at 12.

153. *Id.*

between two parties transacting online by making sure each party's financial records are up to date and accurate.¹⁵⁴ If you make a \$100 payment to A online, banks make sure your bank account ledger reflects a deduction of \$100 while A's bank account ledger reflects an increase of \$100, and "[n]o double spending can occur."¹⁵⁵

So, how does blockchain make it work without the trusted third party? "The only way to confirm the absence of a transaction is to be aware of all transactions[, and] . . . [t]o accomplish this without a trusted party, transactions must be publicly announced . . . [, and] we need a system for participants to agree on a single history of the order in which they were received."¹⁵⁶

1. Distributed Ledger Technology: The Transaction Process

"A blockchain is a type of distributed ledger or decentralized database that keeps continuously updated records of" online transactions.¹⁵⁷ Even though Satoshi's white paper never mentions the word "blockchain," it conveniently describes the ledger.¹⁵⁸

"The ledger consists of records and encrypted data stored in 'blocks,' which are recorded [chronologically] one after another in a *chain of blocks*. The links between blocks and their content are protected by cryptography [a form of encryption], so it is [virtually] impossible to manipulate or change previous transactions in that chain."¹⁵⁹

A timestamp server is used to put a timestamp on transactions as they happen, creating a cryptographic hash, "and widely publishing the hash" across the blockchain network.¹⁶⁰ "Each timestamp includes the previous timestamp in its hash, forming a chain, with each additional timestamp reinforcing the ones before it."¹⁶¹ After the hash is created, the blockchain network "processes each transaction in order" based on "their respective timestamped hash."¹⁶² The hash in this context "serves as a complex computer

154. *Id.*

155. *Id.*

156. Nakamoto, *supra* note 26, at 2.

157. See Bitcoin WPMS, *supra* note 141, at 16.

158. See Nakamoto, *supra* note 26, at 7. "[A] chain of blocks" is the closest the Bitcoin white paper gets to using the term "blockchain."

159. Noah M. Huisman & Kaleb E. Rumicho, *Blockchain Unchained*, FREDRIKSON & BYRON P.A.: NEWS & MEDIA (Dec. 3, 2018), https://www.fredlaw.com/news__media/2018/12/03/2035/blockchain_unchained/?utm_source=fredlawemail&utm_medium=fredlawemail [https://perma.cc/Q3D3-DENY] (emphasis added); Bitcoin WPMS, *supra* note 141, at 18 ("Cryptography is just a form of encryption that involves the creation of codes to allow information to be kept secret.").

160. Nakamoto, *supra* note 26, at 2; See Bitcoin WPMS, *supra* note 141, at 21.

161. Nakamoto, *supra* note 26, at 2; Bitcoin WPMS, *supra* note 141, at 22.

162. Bitcoin WPMS, *supra* note 141, at 22.

problem that needs to be solved by [special network participants called] miners before a transaction can be added to the blockchain for eternity.”¹⁶³

Miners work out of special “nodes” of the blockchain network and use specialized computing equipment, called ASICs, to solve the complex computer problem—which is called a “proof-of-work problem.”¹⁶⁴ As new transactions are broadcast to the nodes of the network, the miners collect the new transactions into a block, which they put “through an algorithm that turns a large amount of transaction data into” a hash of fixed length.¹⁶⁵ The resulting hash must fit a predetermined format.¹⁶⁶ The problem remains unsolved if the hash fails to fit the required format.¹⁶⁷

Solving the proof-of-work problem for a block of transactions takes many attempts and requires tremendous computing power.¹⁶⁸ When a miner solves the problem, it broadcasts its block of transactions—including the proof-of-work hash—“to all nodes.”¹⁶⁹ The “[n]odes accept the block only if all transactions in it are valid” and have not been spent already.¹⁷⁰ The nodes “express their acceptance of the block by working on creating the next block in the chain, using the hash of the accepted block as the previous hash.”¹⁷¹

Thus, broadcasting the block of transactions, which contains an encrypted version of all transaction data, to all of the other nodes of the blockchain network creates a distributed ledger, that is, “a single, universally accessible digital ledger.”¹⁷²

2. Incentive, Consensus, and Irreversibility Through Proof-of-Work

“[T]he main role of miners is to ensure the irreversibility of new transactions, making them final and tamperproof. The method they use for doing so is thought to be the most significant contribution that Satoshi Nakamoto...made to the field of computer science.”¹⁷³

The Bitcoin blockchain is a public blockchain, having a “permissionless” ledger where anyone may participate as a

163. *Id.*

164. *Bitcoin WPMS, supra* note 141, at 27.

165. Nakamoto, *supra* note 26, at 3; *Bitcoin WPMS, supra* note 141, at 27.

166. *Bitcoin WPMS, supra* note 141, at 27.

167. *Id.*

168. *Id.*

169. *See* Nakamoto, *supra* note 26, at 3.

170. *Id.*

171. *Id.*

172. *See* Peck, *supra* note 144, at 29.

173. *Id.*

validator of transactions—i.e., a miner.¹⁷⁴ Miners are anonymous people, who do not necessarily know or trust one another, operating out of specialized network nodes all over the world.¹⁷⁵ There is no central authority to discipline them for attempts to defraud the system if they manipulate the transaction data for personal gain.¹⁷⁶ If they were employees working under a centralized authority, that authority could monitor and discipline fraudulent behavior to maintain the reliability of the system.¹⁷⁷ But since it lacks the trusted third party, a public blockchain must ensure the irreversibility of its ledger through its software alone.¹⁷⁸ That is where proof-of-work comes in.

Proof-of-work (PoW) is a consensus mechanism “that slows down the process of creating new blocks.”¹⁷⁹ As explained above, it is a complex computer problem used by “miners to verify that transactions within each block are legitimate.”¹⁸⁰ Miners are incentivized to compete with each other to validate new blocks because the first miner to do so is rewarded with a “newly minted” coin—i.e., digital data indicating ownership and value, except in this case there are no prior transactions.¹⁸¹

Solving the proof-of-work problem is not easy. As the Bitcoin white paper explains, the manner in which new coins get added into circulation is “analogous to gold miners expending resources to add gold to circulation.”¹⁸² The Bitcoin miners, through the use of specialized computing hardware, expend “CPU time and [substantial] electricity . . .” to get their reward.¹⁸³ This “adds an incentive for . . . [miners] to support the network, and provides a way to initially distribute coins into circulation, since there is no central authority to issue them.”¹⁸⁴

174. *Id.* at 30, 42, 45. The term “permissionless ledger” distinguishes the ledger of a public blockchain, like Bitcoin, from a “permissioned ledger” of a private blockchain, which runs on “software [that] restricts who can amend the database to a set of known entities.” *Id.* at 39, 45.

175. Peck, *supra* note 144, at 30.

176. *Id.*

177. *Id.*

178. *Id.*

179. Josephine Chang, *Blockchain: What Is It and Can I Protect it Via Patents?*, LEWIS ROCA ROTHGERBER CHRISTIE 1 (July 31, 2018), <https://www.lrrc.com/webfiles/blockchain.pdf> [<https://perma.cc/PSM8-6NQ9>].

180. *Id.* at 1-2.

181. *See id.* at 2; Peck, *supra* note 144; Nakamoto, *supra* note 26, at 4; *Bitcoin WPMS*, *supra* note 141, at 27.

182. Nakamoto, *supra* note 26, at 4.

183. *Id.*

184. *Id.* Interestingly, Satoshi points out that “[t]he incentive can also be funded with transaction fees.”

So, how does proof-of-work help make it virtually impossible to manipulate the data and undermine the reliability of the entire blockchain system? Satoshi explains it best:

If a greedy attacker is able to assemble more CPU power than all the honest nodes, he would have to choose between using it to defraud people by stealing back his payments, or using it to generate new coins. He ought to find it more profitable to play by the rules, such rules that favour him with more new coins than everyone else combined, than to undermine the system and the validity of his own wealth.¹⁸⁵

3. Smart Contracts and Decentralized Applications

In late 2013, a teenage computer science student from Canada named Vitalik Buterin published the Ethereum white paper, introducing the next generation of blockchain technology to the world.¹⁸⁶ Many consider Vitalik to have revealed “the true power of blockchain technology” by showing that, in effect, blockchain “is to Bitcoin what the internet is to email—a big electronic system on top of which you can build applications, currency is just one.”¹⁸⁷ Vitalik discovered that you can build programs called “smart contracts” on top of a blockchain “with an unlimited amount of complexity[,]” thereby creating “applications that run exactly as programmed without any possibility of downtime, censorship, fraud, or third-party interference.”¹⁸⁸ Thus, an application running on a distributed ledger becomes a decentralized application, or “Dapp.”¹⁸⁹

Based on this realization, Ethereum provides a custom-built blockchain that is “open-ended by design . . . [to provide] a foundational layer for a very large number . . . [of decentralized applications].”¹⁹⁰ The Ethereum platform could be, and is, used for running cryptocurrency applications similar to Bitcoin.¹⁹¹ The

185. *Id.*

186. Peck, *supra* note 144, at 32; *Ethereum White Paper Made Simple: A Guide to Understanding the Ethereum White Paper for People Without an Advanced Degree in Computer Geekery*, THE BLOCKCHAIN REVIEW 8, [hereinafter *Ethereum WPMS*] (last visited Jan. 8, 2019).

187. Sally Davies, *How Bitcoin and Its Blockchain Work*, FINANCIAL TIMES (Feb. 3, 2015), <https://www.ft.com/video/2be94381-66dc-3320-a292-6a1cde0a3d5f> [https://perma.cc/3VBL-28ZS]; *Bitcoin WPMS*, *supra* note 141, at 17; *Ethereum WPMS*, *supra* note 186, at 8.

188. Peck, *supra* note 144, at 32; *Build Unstoppable Applications*, ETHEREUM: BLOCKCHAIN APP PLATFORM, <https://www.ethereum.org> [https://perma.cc/7JJZ-M9KP] (last visited Jan. 13, 2019).

189. *See Ethereum WPMS*, *supra* note 186, at 12.

190. *Id.* at 11. (“This open-ended characteristic is in contrast to the Bitcoin blockchain, which could be deemed “a closed-ended, single purpose protocol . . .”).

191. *Id.*

Ethereum cryptocurrency coins, which are used to reward its blockchain miners, are called “ethers.”¹⁹²

4. Proof-of-Work vs. Proof-of-Stake

Proof-of-work (PoW) and proof-of-stake (PoS) are “alternative mechanism[s] for distributed consensus.”¹⁹³ Like the Bitcoin blockchain, the Ethereum blockchain relies on miners racing to solve proof-of-work (PoW) problems while expending computing time and electricity as a way to ensure the irreversibility and reliability of the blockchain.¹⁹⁴ However, Ethereum is planning to switch over to a proof-of-stake (PoS) system in the near future.¹⁹⁵

Under a PoW mechanism, miners process the same transactions simultaneously, and miners with greater computing power have a higher likelihood of being the first to solve the problem, add the new block, and be rewarded with a newly minted coin.¹⁹⁶ Under a PoS mechanism, “validators”—i.e., the PoS version of miners—are randomly picked based on their ownership stake to add the new block and be awarded a newly minted coin.¹⁹⁷ Accordingly, PoS is less wasteful than PoW because it only has one validator processing a given block of transactions, while PoW has “millions of processors simultaneously processing the same transactions.”¹⁹⁸

In general, proof-of-stake has several benefits over proof-of-work. These include the following: (1) proof-of-stake eliminates the need for “validators” to own the costly, specialized computing hardware, (2) proof of stake promotes energy efficiency—because validators are permitted to add new blocks by showing their ownership stake in a particular blockchain’s cryptocurrency, (3) proof of stake incentivizes validators to be more loyal because a validator with a higher stake for a longer period of time has a better chance of being picked to validate a block and be rewarded, and (4)

192. See Peck, *supra* note 144, at 32.

193. Peter Fairley, *Ethereum Will Cut Back Its Absurd Energy Use*, IEEE SPECTRUM 29, 31 (Jan. 2019) (pointing out that PoS “was first applied to cryptocurrency with the launch of Peercoin in 2012”).

194. See *Ethereum WPMS*, *supra* note 186, at 21–22.

195. See *id.*; see also Shawn Dexter, *Ethereum Roadmap Update [2018]: Casper & Sharding Release Date*, MANGO RESEARCH (Aug. 15, 2018), <https://www.mangoresearch.co/ethereum-roadmap-update> [<https://perma.cc/8ZT3-ZECM>]; see also Vitalik Buterin, *Understanding Serenity, Part 2: Casper*, ETHEREUM BLOG (Dec. 27, 2015), <https://blog.ethereum.org/2015/12/28/understanding-serenity-part-2-casper> [<https://perma.cc/N3V5-2YZ9>] (“The keystone mechanism of Casper [the Ethereum proof-of-stake algorithm] is the introduction of a fundamentally new philosophy in the field of public economic consensus: the concept of consensus-by-bet.”).

196. Fairley, *supra* note 193, at 31.

197. *Id.*

198. *Id.*

proof-of-stake's validation process and transaction times are faster than proof-of-work.¹⁹⁹

One disadvantage of PoS is that it can be more susceptible to attacks.²⁰⁰ In a PoS system, a small group of validators could gain ownership of more than half of the blockchain's cryptocurrency and, thereby, have the ability to reverse transactions. This is easier to achieve than it would be for a small group of miners to gain control of more than half of the network's computing power with a PoW mechanism.²⁰¹ As validation power becomes more concentrated, "the risk of collusion and fraud increases."²⁰² Accordingly, the reliability of the blockchain would be undermined. Nevertheless, additional safeguards can help. For example, in PoS, "each validator's account is known and can be destroyed if that validator breaks the rules."²⁰³

C. *Would the Inventor of Blockchain Have Received a Patent?*

A look at whether the inventor of blockchain would have received a patent reveals the importance of 35 U.S.C. §§ 101 and 112(a) for commensurability of claim scope—i.e., granting patent protection that is justified by the inventor's disclosure enabling others to make and use the claimed invention.²⁰⁴ The inventor, or inventors, behind the name Satoshi Nakamoto did not apply for a patent on the Bitcoin blockchain technology. Nevertheless, if Satoshi had filed an application, it is likely that the USPTO would have eventually granted the inventor a patent, at least after some back and forth to narrow the claim scope. Satoshi combined existing technologies to invent something new.

Further, the novelty is supported by strong "objective evidence of nonobviousness."²⁰⁵ Therefore, the common statutory hurdles of 35 U.S.C. §§ 102 and 103—novelty and nonobviousness, respectively—could have been cleared easily.²⁰⁶ However, the hurdle presented by § 101—patent-eligible subject matter—and the

199. Karthik Radhakrishnan, *Cryptocurrency—"Proof of Work" Vs "Proof of Stake"*, MEDIUM (Apr. 30, 2017), <https://link.medium.com/hCubcUMPt> [<https://perma.cc/CG7A-QEQ6>].

200. Robert Greenfield IV, *Vulnerability: Proof of Work vs. Proof of Stake*, MEDIUM (Aug. 23, 2017), <https://medium.com/@robertgreenfieldiv/vulnerability-proof-of-work-vs-proof-of-stake-f0c44807d18c> [<https://perma.cc/BGR9-LAT8>].

201. *See id.*; *see also* Radhakrishnan, *supra* note 199.

202. Fairley, *supra* note 193, at 31 (explaining that concentration of "mining power" is a risk for PoW mechanisms as some utilities have started "setting higher electricity rates for miners.").

203. Fairley, *supra* note 193, at 32.

204. 35 USC §§ 101, 112 (2019).

205. *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling United States, Inc.*, 699 F.3d 1340, 1349–55 (Fed. Cir. 2012).

206. *See* 35 USC §§ 102–103 (2019).

enablement hurdle of § 112(a) may have been more pivotal in negotiating the allowable claim scope, depending on how the claims were drafted.²⁰⁷

For example, if Satoshi had claimed something to the effect of a “peer-to-peer electronic cash system, comprising: a digital ledger, said ledger being distributed on a peer-to-peer network,” the claim may have been rejected under § 101, as interpreted by *Alice*. This would have amounted to a claim to the abstract idea of keeping a ledger of transactions and merely applied it to a peer-to-peer network—therefore, it is not “significantly more” than a claim to the abstract idea itself. Alternatively, if Satoshi had claimed something to the effect of a “peer-to-peer electronic cash system, comprising: digital signatures, peer-to-peer networks, and consensus algorithms, however developed, for making irreversible electronic transactions,” the claim may have been rejected under § 112(a) for lack of enablement in a manner similar to the Supreme Court’s rejection of Samuel Morse’s famous eighth claim for the telegraph.²⁰⁸

In effect, § 101 serves as a safeguard against overbroad claims drafted in a way that threatens to monopolize the use of a fundamental building block of human ingenuity. Similarly, § 112(a) serves as a safeguard against overbroad claims drafted in a way that threatens to gain a monopoly without giving up the “secret sauce.”²⁰⁹ The application of these two statutes to blockchain patent applications should be crucial to furthering blockchain innovation by keeping patent claim scope in check.

D. Blockchain-Related Invention Beyond Cryptocurrency

This Section examines three applications of blockchain technology to show that the value of the technology reaches far beyond its relatively esoteric use with cryptocurrencies.

207. See 35 USC §§ 101, 112(a) (2019).

208. *O’Reilly v. Morse*, 56 U.S. (15 How.) 62, 119–20 (1854) (“Eighth. I do not propose to limit myself to the specific machinery, or parts of machinery, described in the foregoing specifications and claims; the essence of my invention being the use of the motive power of the electric or galvanic current, which I call electro-magnetism, however developed, for making or printing intelligible characters, letters, or signs, at any distances, being a new application of that power, of which I claim to be the first inventor or discoverer.”).

209. See, e.g., Orley Lobel, *Filing for a Patent Versus Keeping Your Invention a Trade Secret*, HARV. BUS. REV. (Nov. 21, 2013), <https://hbr.org/2013/11/filing-for-a-patent-versus-keeping-your-invention-a-trade-secret> [<https://perma.cc/5DSY-8BVY>] (explaining how some inventors choose to keep their “secret sauce” secret).

1. Product Tracking/Traceability

Major food retailers have been collaborating with blockchain innovators to save lives by providing improved methods of tracking food through the commercial supply chain.²¹⁰ Every year, ten percent of the world's population fall victim to food-borne illnesses, with many of those illnesses resulting in death.²¹¹ Walmart and IBM teamed up Chinese retailer JD.com and Tsinghua University to form the Blockchain Food Safety Alliance in China for improved food safety through blockchain tracking.²¹² Using blockchain, Walmart was recently able to trace a package of mangoes from store to farm in about two seconds—a process that would have taken days to weeks using prior methods.²¹³

It is likely that the USPTO will more frequently see business method patent applications in this area, some of these applications have already been successful. For example, in October 2018, the USPTO issued a patent to Accenture for a blockchain tracking method.²¹⁴ Under this method, devices perform chemical analyses on a product at various stages of the supply chain.²¹⁵ The analyses provide unique identifying data about the product that can then be stored in a blockchain.²¹⁶ The blockchain allows comparison between prior or later stages to reveal whether tampering has occurred and, if so, to pinpoint where it occurred.²¹⁷

This application was assigned to USPTO Art Unit 3628—“Data Processing: Financial, Business Practice, Management, or Cost/Price Determination.”²¹⁸ It overcame an initial 35 U.S.C. § 101 “abstract idea” rejection after its independent method claim was narrowed by adding what was deemed “significantly more” than a claim to the abstract idea itself.²¹⁹

210. Roger Aitken, *IBM & Walmart Launching Blockchain Food Safety Alliance in China with Fortune 500's JD.com*, FORBES (Dec. 14, 2017, 12:04 PM), <https://www.forbes.com/sites/rogeraitken/2017/12/14/ibm-walmart-launching-blockchain-food-safety-alliance-in-china-with-fortune-500s-jd-com/#687d0c6a7d9c> [https://perma.cc/HQ4J-YTWC].

211. *Id.*

212. *Id.*

213. *Id.*

214. U.S. Patent No. 10,115,068 (filed Jan. 24, 2017) (issued Oct. 30, 2018).

215. *See id.*

216. *See id.*

217. *See id.*

218. '068 Patent, Image File Wrapper: Final Rejection 2 (Oct. 24, 2017), <https://portal.uspto.gov/pair/PublicPair>. The examiner rejected Claim 8 reasoning that it was directed to the abstract idea of receiving, collecting, analyzing, and recording information while reciting only generic computer functions. The applicant overcame the rejection by adding to Claim 8 that the analysis included at least one of spectral, chemical, or molecular analysis.

219. *Id.*

2. Peer-to-Peer Energy Trading

Companies like LO3 Energy, Siemens, IBM, and GE are exploring innovations that will allow individuals and businesses with solar panels to become “prosumers,” or energy consumers who also produce energy. Prosumers can trade energy with their neighbors on a blockchain-enabled smart grid.²²⁰ The market for rooftop solar panels is expected to grow by eleven percent by the year 2022, and direct energy trading between consumers could help “bolster the grid at times of peak consumption” and eventually compete for business with centralized utilities.²²¹ As the market in energy is growing and people search for more sustainable power methods, some believe that energy “needs a new set of technologies and a new set of *business processes* ... to make all of that work.”²²²

The USPTO is likely to increasingly see business method patent applications in the area of energy trading. For example, U.S. Patent Application Number 15/348,810 was filed on November 10, 2016 by IBM for an “autonomous peer-to-peer energy network operating on a blockchain.”²²³ The application claims an energy optimization procedure using “blockchain-enabled autonomous smart meter technology.”²²⁴ As of September 2019, the application is still under examination.²²⁵

3. Medical Record Coordination

Innovators including MedRec from the MIT Media Lab and BlackBerry are exploring how blockchain can be used to securely and reliably share electronic health records.²²⁶ On average,

220. Morgen E. Peck & David Wagman, *Energy Trading for Fun and Profit*, IEEE SPECTRUM 56–57, 61 (Oct. 2017); Sharon B. Jacobs, *The Energy Prosumer*, 43 Ecology L.Q. 519, 521 (2016); *A Microgrid Grows in Brooklyn*, SIEMENS (Feb. 16, 2018), <https://www.siemens.com/innovation/en/home/pictures-of-the-future/energy-and-efficiency/smart-grids-and-energy-storage-microgrid-in-brooklyn.html>

[<https://perma.cc/5LSP-ZC46>]; Jason Deign, *GE Wants to Build Virtual Power Plants Using Blockchain: Distributed Ledger Technology Could Be Integrated into GE's Predix Platform*, GTM (Oct. 31, 2018), <https://www.greentechmedia.com/articles/read/ge-wants-to-build-virtual-power-plants-using-blockchain#gs.tr3hPcqj> [<https://perma.cc/L267-T8KT>].

221. Peck & Wagman, *supra* note 220, at 56, 61.

222. Peck & Wagman, *supra* note 220, at 56 (emphasis added).

223. U.S. Patent Application No. 15/348,810 (filed Nov. 10, 2016).

224. ‘810 Patent Application, at [57], 2 para. 0021.

225. 15/348,810 Application Data, USTPO (Oct. 11, 2019), <https://portal.uspto.gov/pair/PublicPair> [<https://perma.cc/S6FU-FMBR>].

226. Brian Forde, *MedRec: Electronic Medical Records on the Blockchain*, MEDIUM (Jul. 2, 2016), <https://link.medium.com/ZEbNsPEHnT> [<https://perma.cc/3CDZ-YJLC>]; Ariel Ekblaw & Asaf Azaria, *MedRec: Medical Data Management on the Blockchain*, VIRAL COMM. (Apr. 11, 2016), <https://viral.media.mit.edu/pub/medrec> [<https://perma.cc/H9E3-UA34>]; Nick Hall, *Is BlackBerry Back with a Bang on the Blockchain?*, CRYPTO BRIEFING (Oct. 5, 2018), <https://cryptobriefing.com/blackberry-back-blockchain> [<https://perma.cc/9LJY-LTTU>].

Americans visit sixteen different doctors over their lifetime, and their electronic health records from all of these visits “are often stored in incompatible databases . . . which costs 150,000 lives and \$18.6 billion per year”²²⁷ MedRec explains that it will empower patients by providing a “focal point for access and review of their medical history, and an easy mechanism for sharing their data across medical jurisdictions.”²²⁸ Additionally, patients could quickly grant other doctors permission to access their records for a second opinion, and grandparents could share their medical history with family members to reliably reveal family health history.²²⁹

Further, MedRec has innovative plans to “incentivize medical researchers and other healthcare stakeholders to participate in the blockchain network as ‘miners’ . . . [by rewarding them with] census level, anonymized metadata in return for contributing the computational resources that sustain the network.”²³⁰ Finally, distributed ledger technology would prevent hackers from taking control of medical databases and holding them for ransom as they did in the 2017 WannaCry cyber-attack.²³¹

The USPTO is likely to see more business method patent applications in this field. For example, U.S. Patent Application Number 15/684,173 filed on August 23, 2017, by BBM Health entitled “Blockchain-Based Mechanisms for Secure Health Information Resource Exchange.”²³² The application claims a method involving blockchain smart contracts to allow patients and other registered users to have “secure flexible access to the healthcare information resources (HIR) contained within electronic health records (EHR) systems.”²³³ As of September 2019, the application is still under examination.²³⁴

227. Forde, *supra* note 226 (citing Premier Healthcare Alliance).

228. Ekblaw & Azaria, *supra* note 226.

229. *Id.*

230. *Id.*

231. Drexel Neumann, *Blockchain: A Panacea to US Healthcare’s EHR Problems*, OP-MED (May 23, 2018), <https://opmed.doximity.com/articles/blockchain-a-panacea-to-us-healthcare-s-ehr-problems-19adcae9-3757-41eb-a70e-0b389b482c0a> [<https://perma.cc/AFS9-DYGP>]; see also Ekblaw & Azaria, *supra* note 198 (“[B]ecause the medical data stays distributed, our system does not create a new, central target for content attack.”); Dustin Volz, *U.S. Blames North Korea for ‘WannaCry’ Cyber Attack*, REUTERS (Dec. 18, 2017), <https://reut.rs/2kgFEn9> [<https://perma.cc/N3GP-9UUP>] (explaining that the WannaCry cyber attack “crippled hospitals, banks, and other companies across the globe . . .”).

232. U.S. Patent Application No. 15/684,173 (filed Aug. 23, 2017).

233. *Id.* at 57.

234. 15/684,173 Application Data, USTPO (Oct. 11, 2019), <https://portal.uspto.gov/pair/PublicPair> [<https://perma.cc/5J4B-SJNY>].

E. Blockchain Limitations

1. Burdensome Power Consumption

As mentioned above, the proof-of-work (“PoW”) mechanisms behind the Bitcoin and Ethereum blockchains incentivize massive power consumption.²³⁵ However, slowing down the validation process with an intense computational problem that consumes substantial energy is key to making public blockchains irreversible and reliable without a trusted third party. Thus, the process is extremely wasteful.²³⁶ Ethereum mining consumed about as much electricity as Iceland in 2018, and Bitcoin mining consumed two to four times that amount.²³⁷ Such a massive waste of energy is not sustainable, especially if blockchain technology is going to make the leap from relatively esoteric cryptocurrencies to mainstream decentralized applications.

Innovators are experimenting with a variety of approaches to solve this power consumption problem.²³⁸ However, many variations of the PoW scheme compromise important characteristics of the blockchain ideal introduced by Satoshi Nakamoto.²³⁹ Further, even the scheme proposed by Satoshi is showing unanticipated vulnerabilities in its real-world applications, as discussed below.²⁴⁰

a. Alternate Approaches to Proof-of-Work

One alternate approach is the “permissioned” ledger, as opposed to Satoshi’s ideal “permissionless” ledger.²⁴¹ This is a huge compromise to the open and anonymous blockchain ideal. A permissioned ledger is a closed—i.e., private—blockchain in which “the identity of people adding blocks is known, and data in the system is viewable by selected parties.”²⁴² This approach eliminates the need for the PoW incentive scheme because miners are appointed by a trusted third party who knows their identities.²⁴³

235. See Fairley, *supra* note 29, at 36–37; Morgen E. Peck, *The Bitcoin Mines of China*, IEEE SPECTRUM, Oct. 2017, at 46, 48–53, <https://ieeexplore.ieee.org/document/8048840> [<https://perma.cc/64HE-TXV9>]; Fairley, *supra* note 190, at 29–31.

236. See Fairley, *supra* note 193, at 31 (“[E]ven Buterin says he suspects that Ethereum is consuming more resources than it returns in societal benefits.”).

237. *Id.* at 29.

238. See Fairley, *supra* note 29, at 58–59.

239. See *id.* at 59; see also Nakamoto, *supra* note 26, at 8 (noting that Bitcoin was visualized as a system that functioned without relying on trust).

240. See Fairley, *supra* note 193, at 31.

241. See Peck, *supra* note 144, at 33.

242. *Id.*

243. *Id.*

Utilizing a “permissioned” ledger may be useful for parties that “want to simulate the services of a *neutral* third party.”²⁴⁴ Nevertheless, the reliability of the data still depends on trusting that neutral third party.

Another approach is the proof-of-stake mechanism (PoS). As mentioned above, Ethereum plans to move to a PoS system soon. However, PoS, in general, can potentially be more susceptible to attack than PoW.²⁴⁵ Innovators in this space continue to think of new ways to improve the incentivizing logic behind these consensus mechanisms. On the Ethereum Blog, Ethereum’s founder discusses “a fundamentally new philosophy in the field of *public economic consensus*” called “consensus-by-bet,” a new variety of PoS.²⁴⁶

b. Unanticipated Real-World Weaknesses

As mining power becomes more concentrated, “the risk of collusion and fraud increases.”²⁴⁷ The idealized PoW method introduced by Satoshi is showing some unanticipated real-world weaknesses because of PoW power consumption requirements. Theoretically, the PoW method keeps mining distributed across parties.²⁴⁸ However, cryptocurrency power has become increasingly concentrated as firms in China have leveraged their proximity to cheap land, electricity, and ASIC manufacturers to produce the greatest concentration of mining power in the world.²⁴⁹

Further, the power requirements of mining activities can be unpredictable, which makes the business of supplying miners with energy risky. In January 2018, Ether’s value peaked at \$1,385, but plummeted to less than \$120 in November of 2018.²⁵⁰ The impact on Ethereum miners’ profit margins caused them to reduce their activities so much that their power consumption dropped off “by more than half in less than 20 days.”²⁵¹ Consequently, “some utilities . . . are setting higher electricity rates for miners[,]” which

244. *Id.* (emphasis added).

245. See Julian Martinez, *Understanding Proof of Stake: The Nothing at Stake Theory*, MEDIUM: COINMONKS (June 7, 2018), <https://medium.com/coinmonks/understanding-proof-of-stake-the-nothing-at-stake-theory-1f0d71bc027> [<https://perma.cc/WYY9-DQR9>] (noting that, in contrast to PoW, which requires 51% concentration of hash power to attack the network, PoS can be attacked with only a 1% stake).

246. See Buterin, *supra* note 195 (emphasis added).

247. Fairley, *supra* note 193, at 31.

248. *Id.*

249. See *id.*; Peck, *supra* note 235, at 48.

250. Fairley, *supra* note 193, at 31; see also COINMARKETCAP, <https://coinmarketcap.com/currencies/ethereum/> [<https://perma.cc/TS47-77BG>] (last visited Nov. 2, 2019) (showing historical prices for Ethereum).

251. Fairley, *supra* note 193, at 31.

may discourage the entrance of new miners who would otherwise make the game more distributed.²⁵²

3. Extremely Limited Data Storage

Vitalik Buterin may have revealed the true power of blockchain technology by pointing to its potential for applications beyond cryptocurrency.²⁵³ However, blockchain's ability to support many of the aspirations of decentralized application builders depends on finding solutions to its data storage limitations.²⁵⁴ First, in addition to storing the transaction information for each coin, there is only one "additional field that [only] allows for up to . . . 40 bytes of metadata per transaction."²⁵⁵ This means there is not enough room to store, for example, live-streaming video content.²⁵⁶ Second, real-time data, which would be necessary to determine whether a trigger condition in a smart contract has been satisfied, must be imported into the blockchain by third-party services called "oracles" because blockchains are not capable of querying websites for real-time information.²⁵⁷ Oracle service providers "get paid for reliably querying sources of real-time data" to ensure data is trustworthy before injecting it into a blockchain.²⁵⁸ Again, this is a compromise on the blockchain ideal because it requires introducing a trusted third party into the blockchain network.²⁵⁹

IV. AN ARGUMENT FOR BUSINESS METHOD PATENTS VIS-À-VIS BLOCKCHAIN

This Part IV will counter the arguments presented in Part II in three steps. First, this part reiterates how *Alice* requires modern business method patents to yield a technological improvement, which effectively excludes "pure" business methods from patent eligibility. Second, this part highlights aspects of blockchain technology that seem ripe for improvements through innovative business methods. Third, this part will apply Professor Surden's taxonomy from Part II to show that *Alice*-era business method patents promise to be more justifiable than problematic.

²⁵² *Id.*

²⁵³ See Peck, *supra* note 144, at 32.

²⁵⁴ See *id.* at 33.

²⁵⁵ *Id.*

²⁵⁶ *Id.*

²⁵⁷ *Id.* at 34.

²⁵⁸ *Id.*

²⁵⁹ *Id.*

A. *Alice and Its Progeny Have Eliminated the Pure Business Method Patent*

In the wake of *Alice*, one thing seems clear—the business method patents of today must be fundamentally different creatures than the pure business method patents of yesteryear.²⁶⁰ As discussed above, the *Alice/Mayo* two-step test for determining patent eligibility is, first, determining “whether the claims at issue are directed to a patent-ineligible concept”—laws of nature, natural phenomena, or abstract ideas.²⁶¹ The second part of the test is determining whether the claims have elements or combinations of elements that are “sufficient to ensure that the patent in practice amounts to *significantly more* than a patent upon the [ineligible concept] itself.”²⁶² Cases following *Alice*, such as *Enfish* and *BASCOM*, have shown that passing the test “requires an improvement to a ‘technical’ field or the functioning of . . . [a] device itself.”²⁶³ A pure business method patent could not pass the test.²⁶⁴ Therefore, *Alice* and its progeny have excluded pure business methods from patent eligibility.²⁶⁵

B. *Blockchain Is Ripe for Alice-era Business Method Improvements*

The challenges that blockchain developers face seem well-suited for *Alice*-era business method improvements. First, such improvements must involve an inventive concept beyond an uninspiring variation of, “a method, comprising: performing X—a conventional centralized-ledger business method—on a generic blockchain.” Such a claim would likely be rejected under the rationale of the *Alice* case itself. Without a technological improvement, performing a fundamental business practice on a generic blockchain is not likely to be considered much different than performing X on a generic computer.

Second, while the term “blockchain” is a convenient description of the blockchain ledger, it can make the underlying technology seem deceptively simple. There are a lot of moving parts that may be customized to better serve a particular application. In solving a practical application with a blockchain, developers may have a myriad of quasi-business-method variables to consider. For

260. See Natalya Dvorson, FINANCIER WORLDWIDE (June 2016), <https://www.financierworldwide.com/are-business-method-patents-dead-from-a-practical-standpoint/#.XE0dXWbMyCQ> [<https://perma.cc/4EV5-QPK3>].

261. *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2350, 2354 (2014).

262. *Id.* at 2355 (citing *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 73 (2012)) (emphasis added).

263. See Dvorson, *supra* note 260.

264. *Id.*

265. See *id.*

example, should the blockchain be permissioned or permissionless? Should it pay miners in newly minted coins or maintenance fees? Should the consensus algorithm be PoW or PoS? Could a novel PoW or PoS mechanism be used that would itself be considered an advancement in the field of public economic consensus? Could a novel cryptographic method be developed? What third-party oracle should be used to inject data into the blockchain for use in a smart contract? Could there be some new method for ensuring the oracle will not inject faulty data?

Further, it seems likely that different combinations of these quasi-business-method variables could yield improvements to the power consumption and data storage limitations discussed above, as well as improvements to the immutability, reliability, and security embodied in practical applications of blockchain technology. Therefore, if *Alice* has, indeed, eliminated the pure business method patent, the “new hybrid” model of the *Alice* era—focused on technical implementation and improvements to a specific technology or technical field—could contribute significantly to blockchain innovation.²⁶⁶

C. Alice-era Business Method Patents May Be More Justifiable Than Problematic

One can see how *Alice*-era business method patents may be more justifiable than problematic by applying Professor Surden’s taxonomy of problematic patent characteristics discussed in Part II.

1. Will Blockchain Inventions Be Expensive to Develop and Easy to Copy?

Blockchain inventions could be expensive to develop and easy to copy. Assuming that open/public blockchain technologies are easier to copy than closed/private blockchain technologies, an interesting characteristic of blockchain development may be deduced. On one hand, private blockchains—with known validators and less extensive networks—may be less expensive to develop and harder to copy. On the other hand, public blockchains—with unknown validators and more extensive networks—may be more expensive to develop and easier to copy. Thus, without the exclusivity provided by business method patents, innovators may be more likely to focus on developing private blockchains while neglecting development of public blockchains—Satoshi’s blockchain ideal. Therefore, *Alice*-era business method patents could be critical for encouraging innovators to invest in the research and

²⁶⁶. *See id.*

development to improve public blockchains and make them more sustainable.

2. Would Blockchain Inventions Be Produced Absent Exclusivity?

Blockchain inventions will likely be produced absent exclusivity. After all, Satoshi Nakamoto did not apply for a patent for the Bitcoin blockchain. However, with the assumption that public blockchains are more expensive to develop and easier to copy than private blockchains, it seems more likely that investors and inventors would focus on the development of private systems at the expense of public systems, absent exclusive patent rights. At the very least, fierce competition to dominate the blockchain space makes it less likely that competitors would provide enabling disclosures of their innovations absent exclusivity.

An array of well-capitalized projects . . . are hatching their own . . . blockchains. . . . [T]hey seek to prove that high security and high efficiency are not at odds. . . . “This environment is naturally quite predatory. . . . There will be a single platform that survives.”²⁶⁷

3. Will Society Receive Something Valuable in Exchange?

Society will likely receive valuable technological innovations in exchange for blockchain business method patents. Regardless of one’s opinion about the societal value of cryptocurrencies, there are many blockchain applications beyond cryptocurrency that show promise for providing tremendous value for the public welfare. The areas of blockchain innovation discussed above—product tracking/traceability, peer-to-peer energy trading, and medical record coordination—are a few examples of the valuable possibilities.

4. Will Blockchain Patents Unduly Inhibit Competitors?

Blockchain business method patents should not unduly inhibit competitors. *Alice’s* exclusion of pure business method patents from patent eligibility creates a substantial decrease in the risk that a fundamental building block of commercial innovation will be removed from the public domain. First, requiring business method patent applications to focus on technical implementation should make it easier for USPTO patent examiners to negotiate the

²⁶⁷ Fairley, *supra* note 193, at 32 (quoting Zaki Manian, who is an advisor of “the cryptocurrency upstart Cosmos”).

allowable claim scope with applicants under 35 U.S.C. § 101. Second, examiners could use the enablement hurdle of 35 U.S.C. § 112(a) for areas of blockchain innovation that have few prior-art patent applications with which to make a comparison. Finally, as an area of blockchain innovation becomes more crowded, the more standard hurdles of 35 U.S.C. §§ 102 and 103—novelty and nonobviousness, respectively—should become more effective in limiting claim scope.

5. Is the 20-year Term Needed to Capture Value?

While a 20-year patent term may not be necessary to capture the value of an *Alice*-era business method patent, the same could be said for many other areas of invention. Pharmaceuticals may be considered prime candidates for a 20-year term due to their commonly high fixed costs and lengthy regulatory approval process. However, other areas, such as electronics and mechanical arts do not necessarily share those same high costs and lengthy regulatory approval processes, yet their inventive value is rarely questioned categorically. The possibility of adjusting the patent term based on different categories of invention remains an aspect of patent law that should be debated beyond the realm of business method patents alone, and the topic is beyond the scope of this Note.

CONCLUSION

In our decentralized patent system, we must use care to avoid hindsight bias and overgeneralizations that all patents of a certain variety are useless. We should trust, but continually verify that the patent laws are promoting the progress of technology for the public good while ensuring the door remains open for unconventional solutions that could not have been foreseen by a single, central authority.²⁶⁸ This Note is intended to send a message of hope—that business method patents can earn their keep by contributing to blockchain innovation. Moreover, this Note lends support to the proposition that there should be no business-method exception to patent eligibility.

As of this writing, it is too early in the development of blockchain technology to gain much insight into whether or not *Alice*-era business method patents are providing significant contributions to blockchain innovation. Much of the outcome will depend on how the USPTO guides and develops the quality of examination of blockchain patents over the coming years. Of course, the quality of examination will depend on the application of all of

²⁶⁸ See U.S. CONST. art. I, § 8, cl. 8.

the statutory requirements for patentability, of which 35 U.S.C. § 101 is simply an initial hurdle. In addition to the novelty requirement of § 102 and the nonobviousness requirement of § 103, it will be critical for examiners to ensure that blockchain applications meet the enablement requirement of § 112(a). At the very least, this Note may provide insight into the early days of blockchain development for future patent system stakeholders. Time will tell what the future holds for blockchain and business method patents.

