

TSUNAMI OF BLOCKCHAIN TECHNOLOGY AND PATENTS: A STRATEGIC DATA- ANALYTIC OVERVIEW

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Earthquakes, volcanic eruptions, and massive landslides can unleash a torrential wave of water, a tsunami, racing to a distant coast. A tsunami is a singular event where a massive train of waves crashes the coastline until the energy created by the epic geologic event is dissipated and fades, leaving the landscape transformed. Blockchain arrived on to the scene of technology in 1991 through a scientific publication,¹ yet remained largely unnoticed until 2008 with the registration of the web domain for bitcoin and the publication of a white paper, *Bitcoin: A Peer-to-Peer Electronic Cash System*, by Satoshi Nakamoto.² In 2009, Satoshi Nakamoto created the fifty bitcoins through mining the genesis blockchain block of bitcoin that launched massive activity in cryptocurrency.³ The creation of bitcoin in 2009 was a massive technological and economic event that would dominate the succeeding decade. Like the very start of a tsunami, economic and technologic waters on the coast began to rise as bitcoin's value grew. Eventually, the value of bitcoin rose so significantly that interest in the cryptocurrency and its foundational technology, blockchain, began to drive innovation. The first patents with the term *blockchain* in the patent claims issued from the United States Patent and Trademark Office (USPTO) in 2016.⁴ Like a tsunami, the rise of blockchain patents surged from the USPTO driving massive

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1. Stuart Haber & W. Scott Stornetta, *How to Time-Stamp a Digital Document*, 3 J. CRYPTOLOGY 99 (1991).

2. SATOSHI NAKAMOTO, BITCOIN: A PEER-TO-PEER ELECTRONIC CASH SYSTEM (2008), <https://bitcoin.org/bitcoin.pdf> [<https://perma.cc/FKV6-P6CJ>].

3. Benjamin Wallace, *The Rise and Fall of Bitcoin*, WIRED (Nov. 23, 2011, 2:52 PM), <https://www.wired.com/2011/11/mf-bitcoin/> [<https://web.archive.org/web/20180726112318/https://www.wired.com/2011/11/mf-bitcoin/>].

4. These three patents were the first to issue from the USPTO with the term *blockchain* in a claim: U.S. Patent No. 9,513,627 B1 (filed Apr. 25, 2016) (issued Dec. 6, 2016); U.S. Patent No. 9,397,985 B1 (filed Apr. 14, 2015) (issued July 19, 2016); and U.S. Patent No. 9,338,148 B2 (filed Nov. 5, 2013) (issued May 10, 2016). Earlier patents exist that discuss blockchain-type technology or blockchain in other sections of the patent besides the claims (U.S. Patent No. 5,136,647; U.S. Patent No. 9,331,856 B1; and U.S. Patent No. 9,135,787 B1).

investment and innovation. The interest in blockchain patents grew as technologists dreamed of Web 3 built around NFTs and other blockchain technologies.⁵ However, like a tsunami, the energy behind cryptocurrency and blockchain faded after the previous peak valuation of bitcoin on November 10, 2021.⁶ After that peak valuation of bitcoin in 2021, cryptocurrency valuations collapsed alongside the discovery of massive fraud by leading crypto-exchanges.⁷ As interest rates pummeled cryptocurrency valuations, interest in Web 3 built on blockchain waned. With the pullback in cryptocurrency investments after 2021, the intellectual property sector followed suit resulting in a steep drop in the creation of new patented blockchain technologies. However, a careful analysis of blockchain patents reveals that a tremendous amount of intellectual property capital has gone into developing blockchain technologies for non-cryptocurrency applications. While bitcoin may have launched blockchain onto the technological scene, blockchain has wide application beyond its first commercialized technology such as Web 3⁸ and as shown by the patent portfolios discussed below.

Patents provide a key leading indicator to how blockchain will impact future technology. Innovation, research, and development on technology are captured through patents where innovators and the companies they work for secure legal rights for their inventions. Patents are a key indicator of innovation capacity and focus.⁹ Patents reveal where companies believe that blockchain technology is going. This article provides a strategic overview on blockchain patents, the key leading indicator of the future of blockchain technology. What companies are leading the race for securing blockchain patents? How are companies integrating blockchain into data technology? What is the future of blockchain? Will inflation cool resulting in a resurgence of cryptocurrency valuations and

5. See Matthew Bartlett, *Web3 and NFTs Explained*, NASDAQ (Aug. 29, 2022, 10:00 AM), <https://www.nasdaq.com/articles/web3-and-nfts-explained> [<https://perma.cc/5ZYY-NZLS>].

6. Bitcoin reached a peak value on November 7, 2021 of \$68,789.625 before its resurgence in 2024. Bitcoin financial data acquired from Yahoo Finance. *Bitcoin USD (BTC-USD)*, YAHOO FINANCE, <https://finance.yahoo.com/quote/BTC-USD/history> (last visited Feb. 15, 2024).

7. See David Gura, *Sam Bankman-Fried Is Found Guilty of All Charges in FTX's Spectacular Collapse*, NPR (Nov. 2, 2023, 10:20 PM), <https://www.npr.org/2023/11/02/1210100678/sam-bankman-fried-trial-verdict-ftx-crypto> [<https://perma.cc/JWG6-MFTV>].

8. Thomas Stackpole, *What Is Web3*, HARV. BUS. REV. (May 10, 2022), <https://hbr.org/2022/05/what-is-web3> [<https://perma.cc/8G69-G4Q5>] (“Crypto, however, is just the tip of the spear. The underlying technology, blockchain, is what’s called a ‘distributed ledger’—a database hosted by a network of computers instead of a single server—that offers users an immutable and transparent way to store information. Blockchain is now being deployed to new ends: for instance, to create ‘digital deed’ ownership records of unique digital objects—or nonfungible tokens. . . . ‘Web3.’ The moniker is a convenient shorthand for the project of rewiring how the web works, using blockchain to change how information is stored, shared, and owned. In theory, a blockchain-based web could shatter the monopolies on who controls information, who makes money, and even how networks and corporations work.”); see also Barry R. Levin, *Blockchain and Patents*, THOMSON REUTERS 2 (May 9, 2018), <https://grr.com/wp-content/uploads/2018/05/Blockchain-and-Patents-May-2018.pdf> [<https://perma.cc/WZ4Y-7CBL>] (“[T]he state of Illinois is investigating the use of blockchain to manage its residents’ personal histories, including tax, voting and driver’s license data.”).

9. Ping-Sheng Koh et al., *Measuring Innovation Around the World*, Presented at the Annual Meeting of the Academy of International Business, New Orleans (Jun. 29, 2016), https://www.law.northwestern.edu/research-faculty/clbe/events/innovation/documents/Sojli_Measuring_Innovation_Around_the_World.pdf [<https://perma.cc/32LG-BJHB>].

interest in blockchain? Are other legal forces driving innovators from the patent system into seeking trade secret protection for blockchain technologies through Software as a Service (SaaS) business models? Will digitalization of the U.S. dollar and China's yuan drive adoption of blockchain technologies? Will blockchain come out from under the cloud of the fraud of crypto-exchanges and shine on its own for its widespread non-crypto applications? The rapid resurgence of cryptocurrency valuations in the first quarter of 2024 raises the prospect that blockchain innovation and patenting may follow suit and reach new highs.¹⁰

I. BLOCKCHAIN THE TECHNOLOGY

Blockchain is a technology for making data tamper resistant to hacking. Data records are contained within blockchain blocks linked to prior blockchain blocks through cryptographic hash digests. These cryptographic hash digests interlink the blockchain blocks, as shown in Figure 1. Attempting to alter any block in the chain disrupts the values in the succeeding blocks, making tampering evident. Further, the ledger recording the cryptographic hashes linking the blockchain blocks is stored in multiple instances across multiple nodes of a distributed network. Blockchain technology has utility anywhere data is threatened by hacking and is in need of tamper resistance. Blockchain makes data tampering impossible for nearly anyone who would ordinarily tamper with data, financial, or medical records to commit fraud. Committing fraud with blockchain encoded data requires extremely sophisticated computer science hacking knowledge and the resources to hack a majority of instances of the ledger stored across the various nodes of a computer network to alter a blockchain record. No longer can an accountant at a major corporation merely alter past spreadsheets to manipulate earnings. Altering blockchain data once recorded is a massive and near impossible undertaking.

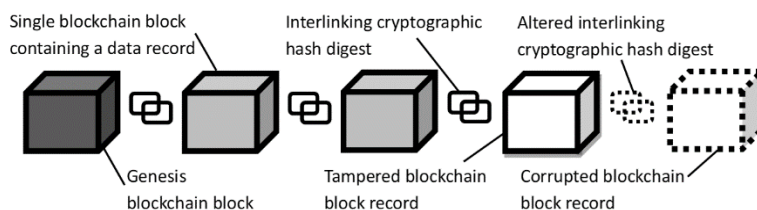


Figure 1. Schematic of a Blockchain and the Impact of Tampering on the Data Records

Bitcoin is the first successful implementation of blockchain technology. Although bitcoin's financial surge focused the world's attention on blockchain, blockchain can trace its technological roots much farther back. In 1991, Stuart Haber and W. Scott Stornetta created blockchain and published the original

¹⁰ Jack Pitcher et al., *Bitcoin's Stunning Climb to New Records*, WALL ST. J., <https://www.wsj.com/finance/currencies/bitcoin-price-record-charts-86a00638> (Mar. 5, 2024, 4:50 PM).

groundbreaking paper on blockchain technology, which focused on timestamping documents.¹¹ According to their paper, a timestamping server could link a document to a previous document with hash values stored in a timestamped block on the blockchain, enabling a client to prove that a document existed at a certain time in a certain version. The use of interlinking hashes in a blockchain format made the data in these documents more resistant to unauthorized modification. Modern society's near total dependence on secure data and the ongoing threat of hacking from malicious governments, terrorists, and thieves demonstrate the utility of blockchain's tamper resistant data structure. In addition to publishing the original paper on blockchain technology, Haber and Stornetta obtained four related patents on their blockchain innovation.¹² By August 2020, each of these four original blockchain patents became separately cited as related art by approximately 150 to 270 published patent applications showing how influential they are in the field of blockchain innovation.

In 2008, Satoshi Nakamoto invented bitcoin, the ubiquitous digital currency founded on blockchain technology. Bitcoin bypasses government currency controls and secures transactions with a distributed ledger based on blockchain technology. Bitcoin transactions are stored and transferred using a blockchain-based distributed ledger on a peer-to-peer network that is open, public, and anonymous. Blockchain's distributed nature and inherent tamper resistance provided the necessary data security to make bitcoin a viable cryptocurrency.¹³

Bitcoin's huge success has greatly focused the attention of the financial services and technology industries on further applicability of blockchain to financial transactions, which became the focus of initial blockchain innovation. However, with time, blockchain technology has found applicability wherever there is data threatened by hacking. This vast potential of blockchain to secure data with stronger tamper resistance has led to a surge in blockchain innovation that can be tracked at the USPTO.

II. BLOCKCHAIN PATENTING AROUND THE WORLD

To conduct a comprehensive search of all patents related to core blockchain technology, all issued patent families that have the terms *blockchain* or *digital ledger* in family members claims were researched on Espacenet.¹⁴ Generally speaking, a patent is divided into a specification, drawings, and patent claims.¹⁵

11. Haber & Stornetta, *supra* note 1.

12. Method for Secure Time-Stamping of Digit. Documents, U.S. Patent No. 5,136,647 (filed Aug. 2, 1990) (issued Aug. 4, 1992); Digit. Document Time-Stamping with Catenate Certificate, U.S. Patent No. 5,136,646 (filed Mar. 8, 1991) (issued Aug. 4, 1992); Method of Extending the Validity of a Cryptographic Certificate, U.S. Patent No. 5,373,561 (filed Dec. 21, 1992) (issued Dec. 13, 1994); Digit. Document Authentication Sys., U.S. Patent No. 5,781,629 (filed Feb. 21, 1997) (issued July 14, 1998).

13. NAKAMOTO, *supra* note 2.

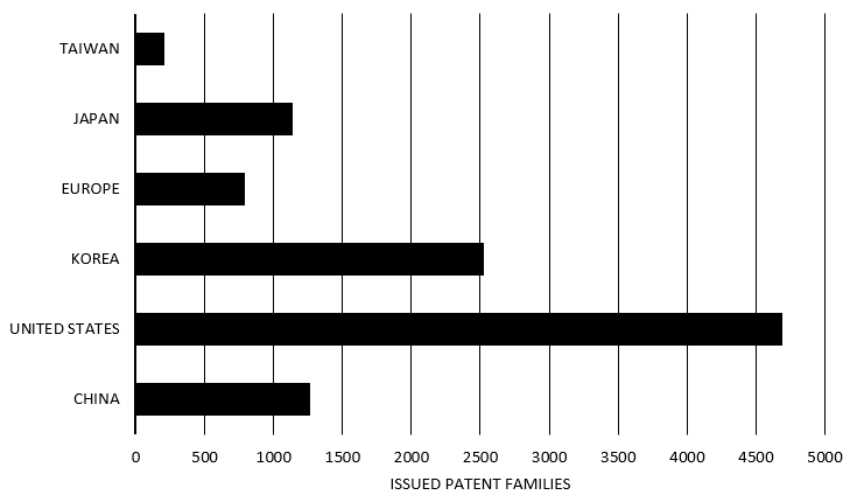
14. Espacenet is a free online service for searching patents and patent applications. Espacenet was developed by the European Patent Office (EPO) together with the member states of the European Patent Organization. ESPACENET, <https://worldwide.espacenet.com/> (last visited Jan. 11, 2024).

15. 35 U.S.C. § 112.

The patent claims define the exclusive right of inventions, like the metes and bounds to a deed of land. The remaining parts of the patent application facilitate understanding of the claimed inventions. Patent families are regarded as a stronger metric for examining unique blockchain innovations, as many individual patents are largely duplicative of their disclosure with varying claim scopes.

Globally, the top six entities patenting blockchain are the United States, China, Europe, Japan, Korea, and Taiwan, as shown in Figure 2. As the United States is both the world's largest economy and is unique for extending liberal protection to software, it is unsurprising to see the largest share of blockchain patent families in the United States, with over 4,600 patent families including a claim with the term *blockchain*. Korea ranked second with over 2,600 patent families. Despite its strong interest in digital currency and blockchain, China ranks third with nearly 1,300 patent families. Japan, Europe, and Taiwan round out the top six for patenting of blockchain technologies. With the United States the clear leader in patenting blockchain technologies, this Article will turn to a deeper dive in the statistics and strategies of patenting blockchain with the USPTO.

Figure 2. Global Race for Blockchain Patents



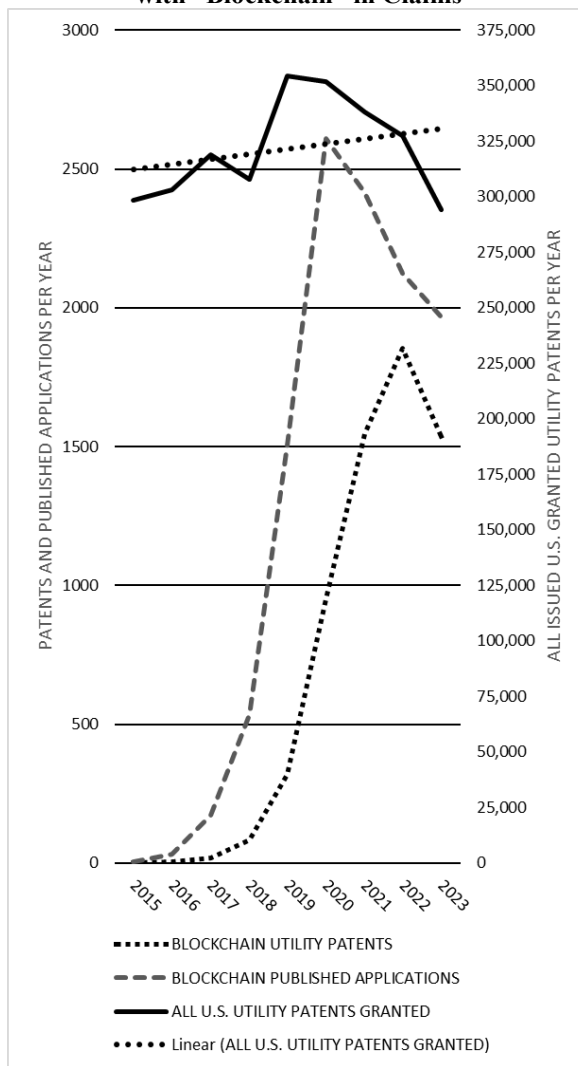
III. PEAK BLOCKCHAIN PATENTS AT THE USPTO?

The data on U.S. patents and publications from the USPTO¹⁶ shows a compelling trajectory for blockchain technology, as shown in Figure 3. The USPTO began issuing patents with the term *blockchain* recited in the claims in 2016. The massive growth in and volume of new patents issuing from the USPTO in

16. The USPTO maintains an online searchable database of all issued U.S. patents and published patent applications. *Patent Public Search 2.1.1*, U.S. PAT. & TRADEMARK OFF., <https://pubs.uspto.gov/pubwebapp/> (last visited Jan. 11, 2024).

succeeding years shows vastly stronger interest in blockchain technology. From 2016 to 2019, the rate at which patents claiming “blockchain” issued increased year after year exponentially. While there were only 3 blockchain patents issued in 2016, by 2019 that number skyrocketed to 1,182. From this initial surge, the rate at which new patents issued peaked in 2022 with 1,854 patents. From this peak in 2022, the rate at which blockchain patents are issuing from the USPTO has fallen significantly to a projected 1,535 for 2023, a 17 percent drop.

Figure 3. U.S. Patents and Published Applications with “Blockchain” in Claims



The data from the USPTO shows a more profound trajectory for publication of patent applications with the term *blockchain* in the claims. Published patent applications with the claim term *blockchain* first appeared in meaningful numbers in 2015 when there were five. The rate of publication of patent applications claiming “blockchain” surged through 2020, reaching a peak of 2,611 published applications. However, since 2020, the number of published patent applications claiming “blockchain” has declined year after year. The decline of 8 percent in 2021 accelerated to 13 percent in 2022. Projections for 2023, however, show that the decline is slowing back to 8 percent.

All U.S. Patent Applications are published eighteen months after filing, absent a request not to publish. As such, published patent applications are a leading indicator of the trends for issued patents. The data shows that the 2022 inflection point for issued patents going into decline came about eighteen months after the 2020 inflection point, when blockchain patent applications began a steep decline. Since the number of published blockchain patent applications has continued to decrease from 2020 through 2023, the number of issued blockchain patents will likely continue to decline for at least the next two years.

The issued patent and published application data in Figure 3 appear to indicate that interest in blockchain innovation is declining sharply. Various articles have referenced this significant drop in blockchain patent activity.¹⁷ However, the patent issuance trends for all utility patents in every technology have a declining trend over the same time frame.¹⁸ Patent issuances from the USPTO peaked in 2019 and have progressively declined since falling 16.9 percent to a projected 294,000 issued U.S. utility patents in 2023.¹⁹ In contrast, blockchain patent issuances continued to increase until 2022, three years after the inflection year for all utility patents. It has taken four years for utility patent grants to fall 16.9 percent, whereas blockchain patent grants fell 16.6 percent from 2022 to 2023. Also, published blockchain patent applications have fallen over 24 percent since 2019. Various causes for the drop in overall utility patents have received attention, including internal processes at the USPTO,²⁰ declines in productivity

17. See, e.g., Jon Lea, *Blockchain Patent Report 2023*, COINCUB, <https://coincub.com/ranking/blockchain-patent-report-2023/#> (last visited Jan. 11, 2024); *Blockchain Related Patent Filings Decreased in the Retail Industry in Q3 2023*, RETAIL INSIGHT NETWORK, <https://www.retail-insight-network.com/dashboards/patents/patent-activity-blockchain-retail-industry/#> (Jan. 30, 2024); Raj Paul et al., *Patenting for Blockchain and Crypto Tech*, COVINGTON (Aug. 21, 2023), <https://www.globalpolicywatch.com/2023/08/patenting-for-blockchain-and-crypto-tech/> [<https://perma.cc/BZ5V-LLPD>].

18. *U.S. Patent Statistics Chart Calendar Years 1963–2020*, U.S. PAT. & TRADEMARK OFF., https://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm [<https://perma.cc/92JK-VY8P>]; Jason Rantanen, *Utility Patents Granted per Calendar Year, 1840–2022*, PATENTLY-O (Aug. 21, 2023), <https://patentlyo.com/patent/2023/08/utility-patents-granted-calendar.html> [<https://perma.cc/KT2P-47BW>]; Dennis Crouch, PATENTLY-O (Dec. 29, 2023), <https://patentlyo.com/patent/2023/12/patent-grant-total.html> [<https://perma.cc/4V3D-KQTJ>]; see also *Anaqua Analysis of USPTO Patenting Statistics 2023*, ANAQUA: BLOG (Jan. 19, 2024), https://www.anaqua.com/resource/anaqua_analysis_of_uspto_patenting_statistics_final-2023/ [<https://perma.cc/2J6E-NQFP>].

19. Rantanen, *supra* note 18.

20. *Id.*

from COVID and working from home,²¹ a potential recession,²² and an evolving landscape and uncertainty for patent valuations and enforceability.²³ In fact, 2022 showed a global 14 percent reduction year over year in patent filings.²⁴ Whatever the causes for the decline in patent grants since 2019, one cannot view the decline in blockchain patent grants in isolation from the larger context of trends in the U.S. and global patent systems. As such, an alarmist outlook for blockchain innovation and patenting may not prove accurate. Despite all of the headwinds faced by the U.S. Patent System in the past eight years, the overall trendline for patent grants remains positive.

Tracking patent families yields insight into new innovation, whereas individual patent grants may reflect refined claims over prior art or potential infringers. Publication trends for all U.S. utility patents and U.S. utility blockchain patents are nearly identical for the last few years when tracking the first published application for each patent family, as shown in Figure 4 below.²⁵ First, one would expect this curve to reflect something of a bell curve. In the United States, patent applications are published after eighteen months and are granted generally two to three years from the filing date, if allowed. As such, the current year should have a very low number of first published applications in a family as those publications are from requests for early publication (which happen infrequently) or patents granted within that year. One would expect higher numbers of first published applications in a family in previous years as that would afford applications the time to publish in their normal course or issue through prosecution. Going back further in time, the number of filings at the USPTO decreased, which led to decreasing numbers of first published applications for patent families. As such, one would expect a general bell curve shape, which is what we see for all U.S. utility patent application families. In comparison, examining the curve for first published applications for blockchain patent families, we see a sharp rise from 2015 to 2020. Blockchain patents showed a far steeper drop in the rate of first published applications for patent families from 2020 to 2021. However, from 2021 to 2023, blockchain patents and all U.S. utility patents show a near identical curve for first published applications in patent families. Given the near identical publication trends for the past two years, one might posit that similar pressures are acting on both blockchain patents and all utility

21. Jacob Rowden, *Slowing Patent Application Volumes Show Innovation Suffering Since the Pandemic*, JONES LANG LASALLE (Apr. 12, 2023), <https://www.usjll.com/en/trends-and-insights/research/office-research-snapshot-04-12-2023#> [<https://perma.cc/Q67L-HLHU>]; Shayne Phillips, *Patent Grants Decrease 8%, the Steepest Decline in More than a Decade*, ANAQUA (Feb. 13, 2023), https://www.anaqua.com/resource/anaqua_analysis_of_uspto_patenting_statistics_final/# [<https://perma.cc/P52Z-A6Y9>].

22. *Patent Application in Inflationary Times 2022*, TT CONSULTANTS (Dec. 19, 2022), <https://ttconsultants.com/patent-application-in-inflationary-times-2022/>; Phillips, *supra* note 21.

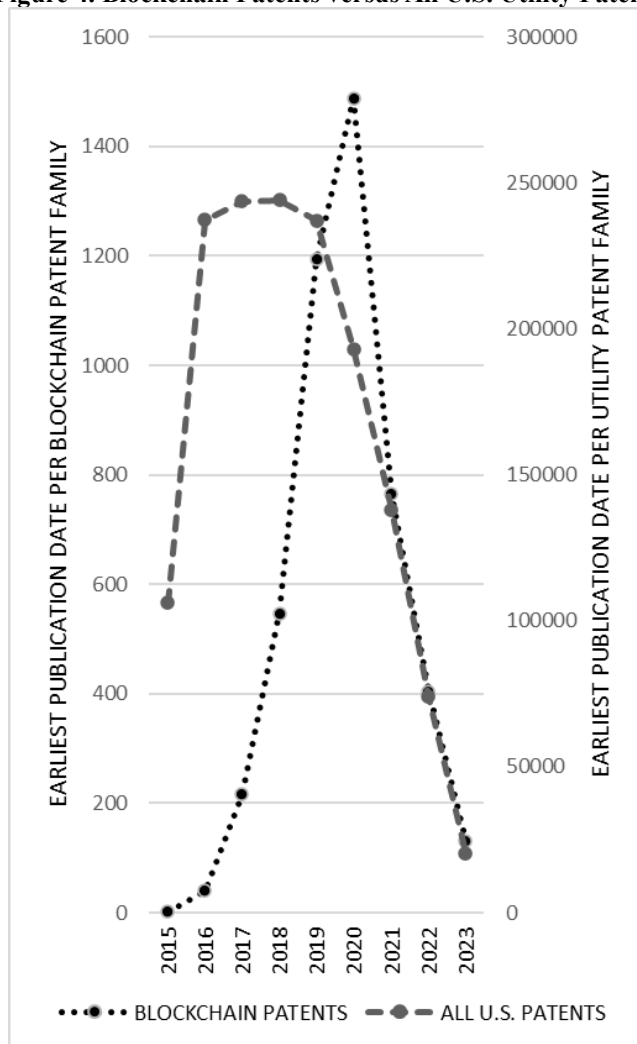
23. See Michael Gzybowski, *It's Not Just COVID: Understanding the Drop in U.S. Patent Application Filings*, IP WATCHDOG (Feb. 9, 2022, 7:15 AM), <https://ipwatchdog.com/2022/02/09/its-not-just-covid-understanding-the-drop-in-u-s-patent-application-filings/id=145491/> [<https://perma.cc/PG43-AY98>].

24. *Patent Application in Inflationary Times 2022*, *supra* note 22.

25. All first publication for patent families data acquired from Espacenet. ESPACENET, *supra* note 14.

patents. This curve would tend to suggest that companies are not sharply turning away from blockchain innovation.

Figure 4. Blockchain Patents versus All U.S. Utility Patents



Examining U.S. Patents and Published Applications based that use *blockchain* in the claims is one key metric for reviewing trends with blockchain patent applications and issuances. While the claim term *blockchain* does not capture every technology involving blockchain, it does provide a clear snapshot of patenting trends. Not all blockchain patents recite the term *blockchain* in the claims. However, a huge number of patents and published applications refer to

blockchain in the specification without claiming a blockchain technology.²⁶ Reviewing USPTO data for the issuance of patents and publishing of applications based on other terms recited in the claim, such as *distributed ledger*, showed similar trends to those discussed above in Figures 3 and 4.

The trends uncovered from the issuance and publication of blockchain applications raise a key question. What is driving the behavior of innovation in the field of blockchain?

IV. BITCOIN VALUE DROVE THE SURGE IN BLOCKCHAIN TECHNOLOGY INNOVATION

The first dramatic surges in the price of bitcoin were seen in 2016 and 2017. January 2017 witnessed bitcoin breach the \$1,100 level for the first time.²⁷ Twelve months later, the value of bitcoin increased 2000 percent, reaching a high of nearly \$20,000.²⁸ On May 22, 1849, Abraham Lincoln became the first U.S. President to receive a granted patent.²⁹ In a later speech, he proudly stated that the patent system “added the fuel of *interest* to the fire of *genius*.”³⁰ Clearly, over the last decade, the valuation of bitcoin “added the fuel of interest to the fire of genius” by driving innovation in the technology underlying bitcoin, blockchain. The issuance of blockchain patents surged dramatically following the rise of the bitcoin price that began around 2015. A major part of the lag between the trends of issued blockchain patents and the valuation of bitcoin stems from the substantial time delay in the patenting process, where on average there is a two-to-three-year delay from the filing of a patent application until its issuance, if it issues at all.

While bitcoin surged tremendously in 2017, it is unsurprising that its valuation fell in 2018 and 2019 with profit taking. However, turning to 2020, the valuation of bitcoin again surged dramatically, reaching an all-time high at over \$68,500 in November 2021. From this all-time high, the valuation of bitcoin sank 30 percent by the end of the year to \$47,000.³¹ One key factor behind this price drop was China outlawing bitcoin operations, because a substantial portion

26. For example, cryptography is a technology that is a part of blockchain that preexisted blockchain and has wide application beyond blockchain. A search of patents and published applications reciting the term *cryptography* in the claims and specifications in the USPTO database, *supra* note 16, results in over 90,000 patents and published applications, which would have to be manually sorted through for a subjective determination of whether they are a blockchain-related technology. The over inclusiveness of the *cryptography* search term makes analysis of filing trends difficult because of the subjective nature of the technology analysis and the volume of labor involved. On the other hand, a more restrictive search on patent claims that recite the term *blockchain* narrowly targets the search results on technology that includes just blockchain technology and reveals trends in blockchain technology patenting.

27. *Bitcoin USD (BTC-USD)*, *supra* note 6.

28. *Id.*

29. Owen Edwards, *Abraham Lincoln Is the Only President Ever to Have a Patent*, SMITHSONIAN MAG. (Oct. 2006), <https://www.smithsonianmag.com/history/abraham-lincoln-only-president-have-patent-131184751/> [<https://perma.cc/M5H3-Y7CM>].

30. ABRAHAM LINCOLN, *Second Lecture on Discoveries and Inventions (Feb. 11, 1859)*, in 3 THE COLLECTED WORKS OF ABRAHAM LINCOLN 356, 363 (Roy B. Basler et al. eds., 1953).

31. *Id.*

of bitcoin-mining nodes were located in China.³² This loss in bitcoin-mining capacity has placed significant downward pressure on the price of bitcoin.

Originally, cryptocurrencies were regarded as a hedge against inflation that would buck inflationary pressures on traditional currencies and investments.³³ Data from 2021 and 2022 proved that cryptocurrencies like bitcoin could not fight the pressures of inflation, and the value of bitcoin dropped below \$30,000 in May 2022. Global energy demand and oil shocks played a significant role in driving inflation and the devaluation of bitcoin. Although bitcoin is a virtual currency, it is very much a consumer of real-world resources, in particular computing resources and energy. In fact, the bitcoin network consumes more energy than the entire nation of Argentina.³⁴ By December 2022, the value of bitcoin fell to \$16,000, hitting the depths of the current crypto-winter.

The devaluation of bitcoin and other cryptocurrencies placed significant pressure on various stablecoins and exchanges. Stablecoins Luna and TerraUSD collapsed.³⁵ Crypto exchanges like FTX collapsed because of steeply declining crypto values. FTX's lack of liquidity also exposed rampant fraud and misuse of funds by its founders.³⁶ The fraud at FTX and resulting criminal convictions, along with the resulting collapse of other crypto-schemes, has cast a pall over the crypto-economy and blockchain as a technology.

All of these downward pressures on bitcoin and the crypto-economy significantly impacted innovation in blockchain technologies. As seen in the above figures, the numbers of blockchain issued patents and published applications started to decline after bitcoin fell from its all-time high at the end of 2021. Because all U.S. patent applications are published eighteen months from the filing date unless non-publication is requested,³⁷ the U.S. patent application publication trend responded to the fall in bitcoin price before the issued patent trend. Issued U.S. patents take on average two to three years to work their way through the patent system during the prosecution process.³⁸ As such, the turn away from blockchain patents is just beginning to show in the current year.

The steep decline in bitcoin value and loss of confidence in cryptocurrency exchanges have impacted the transaction market for patents in the blockchain space. In 2022, patent buyer Allied Security Trust eagerly solicited blockchain

32. Hiroko Tabuchi, *China Banished Cryptocurrencies. Now, 'Mining' Is Even Dirtier.*, N.Y. TIMES (Feb. 25, 2022), <https://www.nytimes.com/2022/02/25/climate/bitcoin-china-energy-pollution.html>.

33. See Dan Weil, *Is Bitcoin an Inflation Hedge? Here Are the Arguments on Both Sides*, WALL ST. J. (Oct. 8, 2023, 11:00 AM), <https://www.wsj.com/finance/currencies/bitcoin-inflation-hedge-84f6b840>.

34. Cristina Criddle, *Bitcoin Consumes 'More Electricity than Argentina'*, BBC (Feb. 10, 2021), <https://www.bbc.com/news/technology-56012952> [<https://perma.cc/K2FZ-S5TJ>].

35. Q.ai, *What Really Happened to LUNA Crypto?*, FORBES (Sept. 20, 2022, 11:57 AM), <https://www.forbes.com/sites/qai/2022/09/20/what-really-happened-to-luna-crypto/> [<https://perma.cc/LMN4-PC5G>].

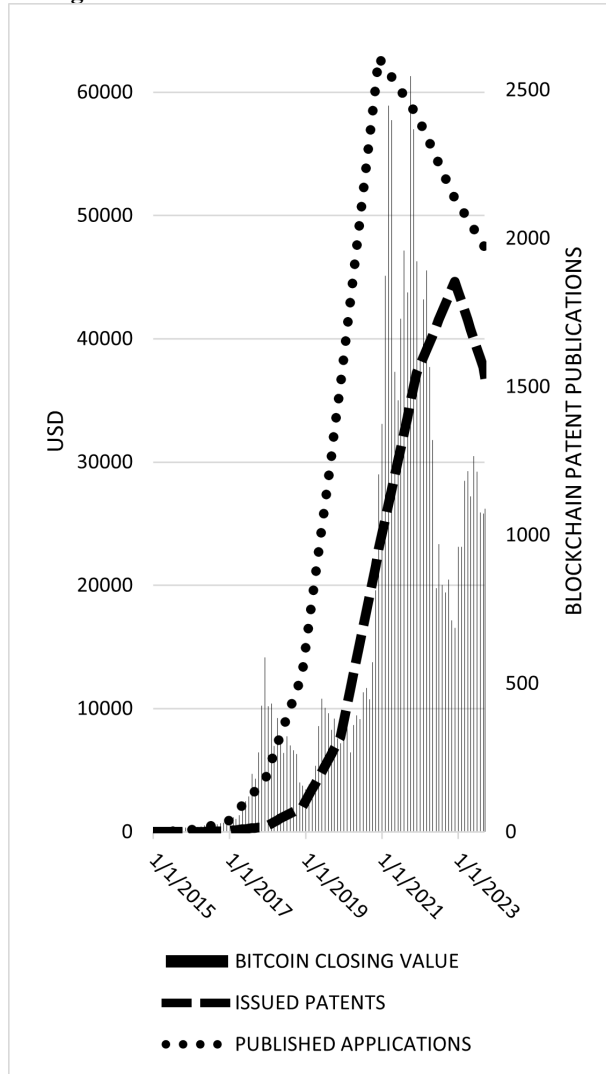
36. See Gura, *supra* note 7.

37. 35 U.S.C. § 122.

38. *Patents Pendency Data*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/dash-board/patents/pendency.html> (last visited Jan. 12, 2024).

technologies as a part of its IP3 patent acquisition program.³⁹ In 2023, blockchain technologies were notably absent from the list for Allied Security Trust’s IP3 program.⁴⁰

Figure 5. Bitcoin Value and Blockchain Patents



39. See *AST Announces Results for IP3 2022—Collaborative Patent Purchase Program*, ALLIED SEC. TR. (May 22, 2023), https://www.ast.com/news_article/ast-announces-results-for-ip3-2022-collaborative-patent-purchase-program/ [https://perma.cc/M3AH-RUGL].

40. *IP3 Window Is Closed*, ALLIED SEC. TR., <https://www.ast.com/ip3/> [https://perma.cc/2V26-NTD2].

Energy consumption from bitcoin is a major issue for the ongoing viability of the cryptocurrency, particularly facing real-world impacts of global warming.⁴¹ The problem with bitcoin stems from its use of a proof-of-work (PoW) system, where every node of a computer network competes to generate the next blockchain block and receive the reward of bitcoin. As a competitive system, PoW effectively wastes all of the energy of all of the computers in a distributed network that failed to compute a particular blockchain block first.⁴² To address the steep energy cost of PoW systems, innovation has resulted in the creation of alternative systems like proof of stake (PoS). In a PoS system, a key stakeholder in the network is selected to generate the next blockchain block, thereby reducing energy consumption compared to PoW by over 99 percent.⁴³

Bitcoin is currently surging out of its crypto-winter to new highs in the first quarter of 2024.⁴⁴ This resurgence mirrors bitcoin's rebounding from depressed valuations of the past, as seen after the record valuations in 2017 and 2021 with an intervening crypto-winter in 2018 and 2019. The future of bitcoin and blockchain is unwritten. Will a rebounding bitcoin valuation drive a renewed interest in blockchain patenting, pushing numbers of published applications and issued patents well above their current levels? Or will blockchain surge as other technologies based on blockchain enter the market?

V. BLOCKCHAIN-INNOVATING ORGANIZATIONS

The top fourteen organizations patenting blockchain technologies provide deeper insight into the macro trends of cryptocurrency swings and blockchain patent activity surges. Figure 6 below ranks the top fourteen organizations by the number of distinct patent families they applied for from the USPTO, as opposed to acquiring them through mergers and acquisitions transactions.⁴⁵ In this study, blockchain patents are those patents that recite the term *blockchain* in the claims of at least one family member.

The top owner of U.S. blockchain patents is International Business Machines Corporation (IBM) with 651 blockchain patents. IBM is consistently one of the most prolific patent innovators at the USPTO. IBM bet heavily on blockchain technology and had 1,500 employees working on more than 500 blockchain projects in 2018.⁴⁶ However, by 2022, IBM began pulling back from the blockchain market with the collapse of its blockchain project for tracking ship-

41. Criddle, *supra* note 34.

42. See Ellen Meijer, *Blockchain and Our Planet: Why Such High Energy Use?*, PRÉ SUSTAINABILITY (June 6, 2022), <https://pre-sustainability.com/articles/blockchain-and-our-planet-why-such-high-energy-use/> [<https://perma.cc/E3QP-NRTL>].

43. *Is Proof-of-Stake REALLY More Energy-Efficient than Proof-of-Work?*, BITWAVE: BLOG, <https://www.bitwave.io/blog/is-proof-of-stake-really-more-energy-efficient-than-proof-of-work> (last visited Jan. 12, 2024) [<https://perma.cc/QUG2-H65D>].

44. Pitcher et al., *supra* note 10.

45. All patent application statistics were pulled from Espacenet. ESPACENET, *supra* note 14.

46. Ahiza Garcia, *IBM Is Betting Big on Blockchain Technology. Is It Worth the Risk?*, CNN BUS. (Sept. 12, 2018, 3:46 PM), <https://money.cnn.com/2018/09/06/technology/ibm-blockchain-gamble/index.html> [<https://perma.cc/B3MG-TTWM>].

ping containers with Maersk due to “a lack of commercial traction.”⁴⁷ Coming in a tight second is Alibaba Group with 646 patents.⁴⁸ Alibaba is a Chinese multinational conglomerate specializing in e-commerce, retail, internet, and technology. As Ana Alexandre reported: “Alibaba is in the process of upgrading the filing of intellectual property rights by utilizing blockchain.”⁴⁹ Rounding out the top five blockchain patent owners are the following: Advanced New Technologies with 414 blockchain patents, Alipay with 198 blockchain patents, and nChain Holdings with 124 blockchain patents.⁵⁰ Advanced New Technologies is a mobile and web software applications company.⁵¹ Alipay surged into prominence under Jack Ma as the world’s largest payment platform,⁵² and nChain’s website states that the company “is a leading global provider of blockchain technology, IP licensing, and consulting services.”⁵³ While the top five blockchain patent owners are a diverse set of companies, it is notable that IBM is in the pole position—as it is a major technology supplier for financial services companies with cryptocurrency remaining the primary use for blockchain.⁵⁴

Major traditional financial services companies rank prominently in the top fourteen organizations for development of blockchain technology including Mastercard International (98 blockchain patents), Bank of America (61 blockchain patents), Visa International (44 blockchain patents), and Capital One Services (43 blockchain patents).⁵⁵ Historically leading technology companies also feature prominently in the top fourteen blockchain patenting organizations such as Toyota (62 blockchain patents), Intel (48 blockchain patents), and EMC (44 blockchain patents).⁵⁶ Also placing in the top fourteen is Accenture,⁵⁷ the Irish-based business services company specializing in information technology (IT) services and consulting, with 58 blockchain patents. Coming in at number 14

47. Ian Allison, *IBM and Australian Stock Market’s Blockchain Projects Failed, a Blow to Private Ledgers*, COINDESK, <https://www.coindesk.com/business/2022/11/30/ibm-and-australian-stock-markets-blockchain-projects-failed-a-blow-to-private-ledgers/> [https://perma.cc/6PPD-MF2A] (May 8, 2023, 9:03 PM).

48. ESPACENET, *supra* note 14.

49. Ana Alexandre, *E-Commerce Giant Alibaba to Integrate Blockchain into Intellectual Property System*, COINTELEGRAPH (May 23, 2019), <https://cointelegraph.com/news/e-commerce-giant-alibaba-to-integrate-blockchain-into-intellectual-property-system> [https://web.archive.org/web/20190531112241/https://cointelegraph.com/news/e-commerce-giant-alibaba-to-integrate-blockchain-into-intellectual-property-system].

50. ESPACENET, *supra* note 14.

51. *Advanced New Technology Ltd*, SMARTAA, <https://www.a-n-t.com/about> [https://perma.cc/A8C6-7L5B].

52. Valentina Romeo, *Alipay Announces It Is World’s Biggest Mobile Payment Company*, ELEC. PAYMENTS INT’L (Feb. 10, 2014), <https://www.electronicpaymentsinternational.com/news/alipay-announces-it-is-worlds-biggest-mobile-payment-company-4174980/> [https://perma.cc/2M52-UMR7].

53. *About Us*, NCHAIN, <https://nchain.com/company/about-nchain/> (last visited Jan. 13, 2024) [http://perma.cc/67DA-XEB2].

54. *See Financial Services for Industry Transformation*, IBM, <https://www.ibm.com/industries/financial-services> [https://perma.cc/5VFR-7PAX].

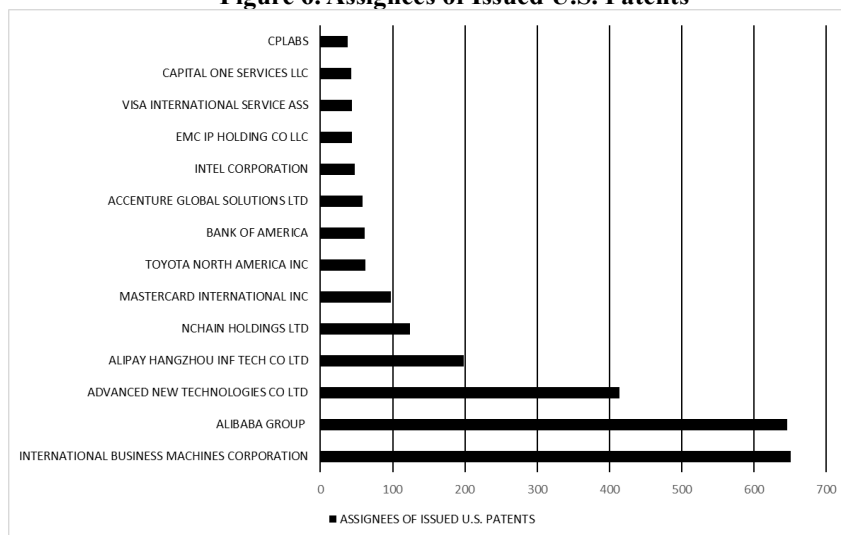
55. ESPACENET, *supra* note 14.

56. *Id.*

57. *See About Our Company*, ACCENTURE, <https://www.accenture.com/us-en/about/company-index-1> (last visited Feb. 28, 2024).

with 38 blockchain patents⁵⁸ is CPLABS (formerly Coinplug), the next generation of blockchain-based solutions and services company.⁵⁹

Figure 6. Assignees of Issued U.S. Patents



Since 1920, IBM has received more than 140,000 U.S. patents. It should therefore come as no surprise that IBM currently holds the largest portfolio of issued blockchain patents totaling 651 patents. IBM’s blockchain innovation shows remarkable breadth across an incredibly diverse range of technologies and applications. While IBM has patents related to blockchain fintech, its portfolio covers far more. IBM’s blockchain patents include core blockchain technology such as self-correction of blockchain ledgers,⁶⁰ blockchain self-governance,⁶¹ partitioning blockchain ledgers,⁶² and limiting blockchain size to optimize performance.⁶³ IBM’s diverse portfolio includes blockchain for peer-

58. ESPACENET, *supra* note 14.

59. *CPLABS Is a Blockchain Development Company Leading the Web3 Market.*, CPLABS, <https://cplabs.io/en/company> (last visited Feb. 3, 2024).

60. Runtime Self-Correction for Blockchain Ledgers, U.S. Patent No. 10,754,989 B2 (filed Mar. 27, 2018) (issued Aug. 25, 2020).

61. On-Chain Governance of Blockchain, U.S. Patent No. 10,756,884 B2 (filed July 2, 2018) (issued Aug. 25, 2020).

62. Partitioning of a Blockchain Ledger, U.S. Patent No. 10,601,911 B2 (filed Nov. 16, 2017) (issued Mar. 24, 2020).

63. Limiting Blockchain Size to Optimize Performance, U.S. Patent No. 10,445,302 B2 (filed Jan. 3, 2017) (issued Oct. 15, 2019).

to-peer energy networks,⁶⁴ vehicle control⁶⁵ and communication,⁶⁶ switching of mobile devices,⁶⁷ and enterprise blockchains.⁶⁸ Core software applications such as databases⁶⁹ and software updates⁷⁰ have patented blockchain solutions in IBM's blockchain portfolio as well. The breadth of IBM's blockchain portfolio shows the true promise that blockchain has for the future of data technology. Where once blockchain was just thought of as a cryptocurrency, blockchain now holds the potential to truly upgrade any and all systems and applications that use digital data.

Like IBM, Alibaba has a highly diverse blockchain portfolio not focused directly on fintech. Alibaba's portfolio primarily covers blockchain infrastructure technologies. These are the technologies upon which fintech applications would be built. Alibaba's contributions to blockchain infrastructure technology include innovation in blockchain ledger compression,⁷¹ adding⁷² and deleting⁷³ nodes in a blockchain distributed network, and blockchain-based, cross-entity authentication.⁷⁴ The portfolio includes numerous blockchain security systems for addressing attacks,⁷⁵ digital certificates,⁷⁶ and encryption.⁷⁷

VI. BLOCKCHAIN PATENTS COVER DIVERSE TECHNOLOGIES

Currently, there are 4,693 issued U.S. patent families that include at least one family member with the term *blockchain* in the claims. A class code analysis of these patents shows that patented blockchain technological applications are

64. Autonomous Peer-To-Peer Energy Networks Operating on a Blockchain, U.S. Patent No. 10,762,564 B2 (filed Nov. 10, 2016) (issued Sept. 1, 2020).

65. Vehicle Control for Reducing Road Wear, U.S. Patent No. 10,640,121 B2 (filed Apr. 28, 2017) (issued May. 5, 2020).

66. Managing Vehicle to Vehicle Comm'n to Facilitate Operational Safety via Risk Assessment, U.S. Patent No. 10,696,299 B2 (filed July 3, 2018) (issued June 30, 2020).

67. Switching Mobile Serv. Provider Using Blockchain, U.S. Patent No. 10,511,964 B1 (filed Apr. 4, 2019) (issued Dec. 17, 2019).

68. Enter. Blockchains & Transactional Sys., U.S. Patent No. 10,713,654 B2 (filed Jan. 21, 2016) (issued July 14, 2020).

69. Managing a Database Mgmt. Sys. Using a Blockchain Database, U.S. Patent No. 10,225,078 B2 (filed Feb. 9, 2017) (issued Mar. 5, 2019).

70. Decentralized Automated Software Updates via Blockchain, U.S. Patent No. 10,698,675 B2 (filed Dec. 19, 2016) (issued June 30, 2020).

71. Blockchain Ledger Compression, U.S. Patent No. 10,764,062 B2 (filed Feb. 28, 2020) (issued Sept. 1, 2020).

72. Sys. & Method for Adding Node in Blockchain Network, U.S. Patent No. 10,693,958 B2 (filed Jan. 13, 2020) (issued June 23, 2020).

73. Sys. & Method for Deleting Node in Blockchain Network, U.S. Patent No. 10,740,325 B2 (filed Dec. 16, 2019) (issued Aug. 11, 2020).

74. Sys. & Method for Blockchain-Based Cross-Entity Authentication, U.S. Patent No. 10,728,042 B2 (filed Jan. 8, 2020) (issued July 28, 2020).

75. Sys. & Method for Detecting Replay Attack, U.S. Patent No. 10,735,464 B2 (filed Dec. 17, 2019) (issued Aug. 4, 2020).

76. Sys. & for Implementing Blockchain-Based Digit. Certificates, U.S. Patent No. 10,735,207 B2 (filed Jan. 9, 2020) (issued Aug. 4, 2020).

77. Blockchain Data Prot. Using Homomorphic Encryption, U.S. Patent No. 10,664,835 B2 (filed Apr. 22, 2019) (issued May 26, 2020).

vastly more diverse than the current commercial applications of blockchain in cryptocurrency, as shown below in Table 1.⁷⁸ Cryptography technologies in Cooperative Patent Classification (CPC) H04L9 are the single largest classification of blockchain patents, owing undoubtedly to the hash digests and hash algorithms core to blockchain technology. Coming in second are blockchain technologies for network architectures and network communications protocols for security in CPC H04L63. Information retrieval and file system structures is the third largest classification of blockchain patents. The category one would most easily associate with blockchain due to bitcoin is the fourth largest classification of blockchain patents: payment architectures in CPC G06Q20. Coming in at the fifth spot is security for computer protection in CPC G06F21.

Table 1. Top Five Patent Class Codes for Blockchain Patents

CPC	TECHNOLOGY	# OF PATENTS
H04L9	Cryptography	3,490
H04L63	Network Architectures/Communication Protocols for Security	1,745
G06F16	Information Retrieval and File System Structures	1,606
G06Q20	Payment Architectures	1,531
G06F21	Security for Computer Protection	1,492

VII. TRENDS FOR ACQUIRING PATENTS FOR BLOCKCHAIN INNOVATION

Overall blockchain patent activity remains robust despite the recent drop in patent application publications and issuance of blockchain patents. Inventors and companies seeking patent protection for blockchain inventions face significant legal challenges. Succeeding against these legal challenges requires diligent strategies. Data from the USPTO suggests important practices for those pursuing patent applications on blockchain technology.

A. Successful Drafting of Blockchain Applications

In the United States, securing patent rights consists of two major processes: the preparation of a patent application, and the review of that patent application by the USPTO. When the USPTO determines that an invention claimed in a patent application covers statutory subject matter,⁷⁹ is novel,⁸⁰ and is nonobvious,⁸¹ the USPTO grants the patent. The USPTO will reject patent applications that fail to meet these criteria. During review of the patent application at the USPTO, a single USPTO official, an examiner, is assigned to handle the appli-

78. All patent application statistics were pulled from Espacenet. ESPACENET, *supra* note 14.

79. 35 U.S.C. § 101.

80. 35 U.S.C. § 102.

81. 35 U.S.C. § 103.

cation. The assigned examiner reviews the applications and determines whether the claimed technology lacks novelty based on prior art, or is an obvious variant of the prior art. The USPTO will also reject patent applications if the subject matter of the patent lies outside of the statutory scope of what is patentable.

This scope of patentable subject matter under 35 U.S.C. § 101 has proven to be a critical hurdle for the patentability of software and data technologies like blockchain. There are serious legal considerations for every applicant and inventor seeking patent protection for a blockchain technology.

Blockchain primarily exists as software. Successful preparation and prosecution of a blockchain patent depends on a clear understanding of the legal landscape of software patenting and how to navigate it. The legal landscape for the patentability for software in the United States has undergone a dramatic adjustment since the Supreme Court's 2014 decision of *Alice Corp. v. CLS Bank International*.⁸² Subsequent opinions from the Federal Circuit have applied *Alice* and provided further clarity.⁸³ While federal courts provide primary guidance on strategies for the successful drafting of software patents, an analysis of data and rulings from the Patent Trial and Appeals Board reveals critical prosecution strategies for applicants when navigating the application process at the USPTO.

Successful blockchain patenting begins with drafting the application. A key risk facing blockchain patents is that they could be described at too high a level, using broad generic terms covering a general concept or business or financial application. Broad and generic patent applications may appear promising in that they cover such a wide idea, but this promise is actually a trap. Broad and generic applications are likely to be considered to describe abstract ideas, which are ineligible for patent protection.

To avoid having a patent fall into the trap of being a mere abstract idea, patent applicants need to dive deep into the technology and create a technologically detailed and rich patent application filled with technological parameters including flow charts, block diagrams, computer code, and actual data from created prototypes. A technologically heavy patent application provides greater opportunities to avoid the trap of abstract ideas and clear the hurdle of what qualifies as 35 U.S.C. § 101 patentable subject matter.

Not every invention is patentable. Three categories of subject matter for which one may not obtain patent protection include laws of nature, natural phenomena, and abstract ideas. For example, one can patent inventive applications of the laws of physics, but not the laws of physics themselves. One can patent inventive processes for artificially manufacturing a substance that may occur in nature, but not something found in nature. With respect to abstract ideas, one can patent specific technological implementations of an abstract idea, but not the abstract idea itself. The topic of blockchain may seem to include many abstract ideas. The challenge for innovators and companies is to explain software

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

83. *See, e.g.*, *DDR Holdings LLP v. Hotels.com, L.P.*, 773 F.3d 1245 (Fed. Cir. 2014); *Enfish LLC v. Microsoft Corp.*, 822 F.3d 1327 (Fed. Cir. 2016); *BASCOM Glob. Internet Servs., Inc. v. AT&T Mobility LLC*, 827 F.3d 1341 (Fed. Cir. 2016).

and blockchain in sufficiently concrete technological terms to secure valuable blockchain patents.

The *Alice* decision was handed down by the U.S. Supreme Court in 2014.⁸⁴ The Supreme Court determined that patent claims for a computer-implemented, electronic escrow service for facilitating financial transactions were not patent eligible, as they were abstract ideas under 35 U.S.C. § 101. Thus, the decision had a powerful negative impact on the patentability of software after it issued in 2014. In 2015, over 60 percent of the software patents challenged under *Alice* were found to have at least one claim unpatentable.⁸⁵ Subsequent Federal Circuit Court decisions placed the *Alice* decision in perspective and created more certainty about the type of patent disclosure and claim elements needed to avoid the trap of software being ineligible for patenting as an abstract idea.⁸⁶ For example, Joseph Saltiel notes that “[i]n 2019, the percentage of successful or partially successful *Alice* challenges [was] less than 50 percent.”⁸⁷ Essentially, software and blockchain patents, to be held valid, need technologically rich specifications with claims focused on specific technological implementations of a software or blockchain concept, and cannot focus on the concept alone. In support of the patentability of software, the USPTO issued guidance on software eligibility under 35 U.S.C. § 101 in 2019 to ensure uniform application of the law to software patent applications.⁸⁸

A further hurdle for the patent is prior technology. To qualify as an issued patent, the invention must be novel under 35 U.S.C. § 102 and not have been published previously, or be an obvious variant of published information under 35 U.S.C. § 103. A great strategy for ensuring that applications avoid rejections for a lack of novelty or non-obviousness is through conducting a rigorous prior art search. With these key strategies, blockchain patent applicants are positioned best for success at the USPTO.

B. Successful Prosecution of Patent Applications

Prosecuting patent applications at the USPTO is a process. When prosecution of a patent reaches an impasse due to examiner rejections, applicants and inventors can pursue an appeals process with the Patent Trial and Appeal Board (PTAB) at the USPTO. The PTAB is a panel of three attorney judges who preside over ex parte patent prosecution appeals from patent applications that have

84. *Alice Corp.*, 573 U.S. at 208.

85. James Cosgrove, *The Most Likely Art Units for Alice Rejections*, IPWATCHDOG (Dec. 14, 2015, 10:00 AM), <https://www.ipwatchdog.com/2015/12/14/the-most-likely-art-units-for-alice-rejections/id=63829/> [<https://perma.cc/NGF6-K5J5>].

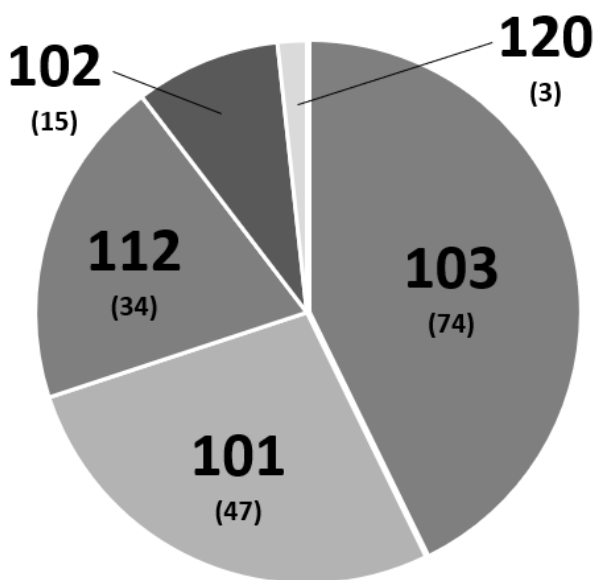
86. See *DDR Holdings LLP*, 773 F.3d at 1245; *Enfish LLC*, 822 F.3d at 1327; *BASCOCOM*, 827 F.3d at 1341.

87. Joseph Saltiel, *In the Courts: Five Years After Alice—Five Lessons Learned from the Treatment of Software Patents in Litigation*, WIPO (Aug. 2019), https://www.wipo.int/wipo_magazine/en/2019/04/article_0006.html#:~:text=Since%202015%2C%20however%2C%20the%20percentage,challenges%20will%20continue%20to%20drop [<https://perma.cc/F3YN-R7KW>].

88. 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (Jan. 7, 2019), <https://www.govinfo.gov/content/pkg/FR-2019-01-07/pdf/2018-28282.pdf> [<https://perma.cc/NY9A-FRUV>].

claims twice rejected by an examiner. The PTAB has rendered decisions in 90 ex parte appeals involving blockchain patents to date.⁸⁹ The single largest issue on appeal is prior art rejections under 35 U.S.C. § 103 for obviousness, which was raised in 74 appeals.⁹⁰ Subject matter eligibility of blockchain claimed inventions under 35 U.S.C. § 101 was raised as the second most often appealed issue in 47 appeals.⁹¹ Issues involving indefiniteness and enablement under 35 U.S.C. § 112 were the third most raised issue in 34 appeals.⁹² Prior art issues under 35 U.S.C. § 102, fifteen in total, and priority under 35 U.S.C. § 120, three in total, round out the top five most appealed issues in front of the PTAB.⁹³

Figure 7. Appealed Blockchain Patent Issues to USPTO Patent Trial and Appeal Board



The type of decisions rendered by the USPTO PTAB on appeal should sober applicants and inventors eager to pursue the appeals route, as shown in Table 2. Out of 90 decisions issued by the PTAB on ex parte appeals involving blockchain inventions, only 22 of those decisions reversed the examiner’s rejection and handed a win to the applicants and inventors, a success rate of just 24 per-

89. All USPTO PTAB data was acquired from the online USPTO database of PTAB decisions. *PTAB Open Data*, U.S. PAT. & TRADEMARK OFF., <https://developer.uspto.gov/ptab-web/#/search/decisions> (last visited Jan. 12, 2024). The term “blockchain” was entered into the global search tool and the data on types of rejections and whether the rejections were affirmed or reversed is provided by the USPTO PTAB tool.

90. *Id.*
91. *Id.*
92. *Id.*
93. *Id.*

cent.⁹⁴ The remaining 76 percent of decisions upheld rejections of claims in the pending blockchain patent applications.⁹⁵ In 62 percent of the decisions, 56 decisions in total, the examiner’s rejection was affirmed by the PTAB, with one rejection affirmed in part.⁹⁶ In the remaining 9 decisions, the blockchain patent applications remained rejected under the PTAB decision under new grounds determined by the PTAB.⁹⁷

Table 2. USPTO PTAB Decisions on Rejection of Blockchain Claims

OUTCOME OF EXAMINER REJECTION	NUMBER OF DECISIONS
AFFIRMED	56
AFFIRMED WITH NEW GROUND OF REJECTION	7
REVERSED WITH NEW GROUND OF REJECTION	2
AFFIRMED IN PART	1
REVERSED	22

C. Strategic Advice

Reaching a roadblock with an examiner in prosecution may energize an applicant or inventor to pursue an appeals path with the PTAB. However, the strong rate of decisions in favor of examiners should caution the use of the appeals option. USPTO Technology Center 3600 has the single largest group of blockchain patent applications on appeal,⁹⁸ with an average pendency of 10.9 months⁹⁹ in contrast to the 1.9-month pendency from a request for continued examination (RCE) to a next office action.¹⁰⁰ Given the low rate of successful appeals at the PTAB and the added nine-month average pendency of appeals, inventors and applicants may find additional rounds of prosecution through the RCE process a more attractive option. When comparing an appeal brief to an office action response, investors and applicants may wish to attempt a robust office action response with the heft and substance of an appeal brief to avoid the pendency and risk of the appeals process. Critically, applicants and inventors are advised to prepare a robust office action response after conducting an in-

94. *Id.*

95. *Id.*

96. *Id.*

97. *Id.*

98. All USPTO PTAB data were acquired from the online USPTO database of PTAB decisions. *PTAB Open Data*, *supra* note 89.

99. For USPTO PTAB pendency data on ex parte appeals, see *Appeal and Interference Statistics*, U.S. PAT. & TRADEMARK OFF. (Oct. 31, 2022), https://www.uspto.gov/sites/default/files/documents/appeal_and_interference_statistics_2022_october.pdf.

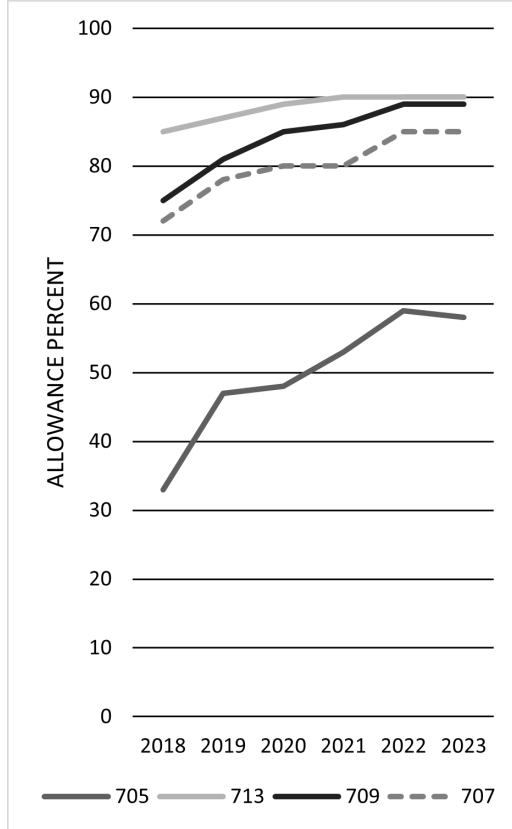
100. For USPTO prosecution pendency data on time from RCE to first office action, see *Patents Pendency Data*, *supra* note 38.

depth oral interview with the examiner to clarify the examiner’s opinion on the claims and prior art to obviate any unnecessary misunderstandings.

D. Classification of Patents Ballparks Patentability

Patents are classified at the USPTO based on the technology disclosed within them using a United States Patent Classification code (USPC). The four USPC classifications containing the most patents for the largest blockchain portfolios from Figure 6 are shown below in Figure 8.¹⁰¹ Each of these classifications has its own unique rate at which patent applications mature into issued patents. Examining these allowance statistics is instructive for predicting a “ballpark rate” at which a group of patent applications will be allowed based on their classification. Entities looking to build blockchain portfolios can use the predicted allowance rates to guide the contents of their patent applications and portfolios.

Figure 8. USPTO Allowance Rate (by Class Code)



101. Allowance rate data was acquired from JURISTAT, <https://www.juristat.com/> (last visited Nov. 29, 2023) (subscription required).

In 2018, patent allowance rates for these top four patent classifications varied from as low as 33 percent to as high as 85 percent. The classification with the lowest allowance rate is class 705, which covers patent applications focused on data processing for financial, business, management, or price related inventions. Class 705 is the class most directly impacted by the Supreme Court's *Alice* decision, which invalidated a financial process on a generic computer. Notably, the allowance rate of class 705 plummeted in 2014 after the *Alice* decision was issued from a high allowance rate of over 31 percent in 2013 to a low of 5 percent in 2016. The subsequent case law placing *Alice* into a clearer perspective has driven higher allowance rates in class 705. Class 713 has held the highest allowance rate since 2008. Class 713 covers operating parameters of components on computers, protection of computer hardware and software from hacking, computer timing and synchronization, and other core elements of digital processing systems. Class 713 is more focused on technology and hardware than class 705, thereby pushing class 713 further away from the impact of the *Alice* decision. The other top two patent classifications containing blockchain patents are class 709 (for multi-computer data transfer) and class 707 (for database file management). The allowance rates for these classifications have remained generally between 70 and 90 percent from 2018 to 2023.

The top four patent classifications should come as no surprise when one considers blockchain and its applications. Blockchain, the foundation for cryptocurrencies, is included in class 705 (for financial and business inventions). The core of blockchain is a distributed ledger, clearly corresponding to class 707 (for database management). Blockchain exists on computers and computer networks, which correspond logically to class 713 (for digital processing systems) and class 709 (for multi-computer data transfers).

E. Strategic Advice

The chances of receiving a patent depend on the patent's classification code, and classification codes are determined based on the patent's claims. Taking a skillful look at an invention can reveal opportunities to make different categories of claims. Applicants can draft claims focused on the financial aspects of a blockchain invention, or instead focus on the hardware and networks the blockchain invention interacts with. In short, the applicant could write claims for the same invention that fall within class 713 with a high allowance rate by focusing on the technological digital processing system aspects of the invention, or instead focus on the more financial/business elements of the invention and fall within class 705 with a drastically lower allowance rate. Alternatively, the applicant could focus on the more financial or business-related elements of the invention that fall within class 705, which has a drastically lower allowance rate.



The recent crypto-winter and the huge fraud exposed in major crypto exchanges have cast a shadow over the future of blockchain. Blockchain was once the star of future technology, but artificial intelligence has taken the spotlight

Winarski

away as the new critical, must-have technology. However, blockchain's future remains uncertain. Despite the crypto-winters of 2022 and 2024, blockchain has utility far beyond crypto. Blockchain remains the key go-to technology for stopping fraud and manipulation in data records, giving it broad application in financial and medical records industries. Blockchain activity has surged in the past in response to growing crypto valuations. The current all-time high valuations of bitcoin may drive another wave of blockchain patent activity.