Before the
United States Patent and Trademark Office
Alexandria, VA 22313

In re:	)	
Request for Comments on Patent Eligibility Jurisprudence Study	)	Docket No. PTO-P-2021-0032
	)	
	)	

COMMENTS OF GOOGLE LLC

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I. INTRODUCTION

Google is pleased to submit these comments in response to the U.S. Patent and Trademark Office's (PTO) request for information (RFI) on the current state of patent eligibility jurisprudence in the United States. We previously submitted comments in response to the PTO's 2017 invitation to comment on the legal contours of patent subject-matter eligibility.[1] In these comments, Google is focusing on the critical technology areas of artificial intelligence and quantum computing, areas for which we are uniquely positioned to provide substantive feedback.

Artificial intelligence (AI) and quantum computing (QC) technologies are expected to drive substantial economic growth, with one report estimating that AI could contribute up to $15.7 trillion to the global economy by 2030, with approximately $3.7 trillion of that growth in North America.[2] This growth is dependent on a number of factors, including "labor automation, innovation, and new competition" along with "pace of adoption of AI" and "the global connectedness or labor-market structure of a country."[3] Notably, intellectual property policies are not specifically mentioned in these reports as a driving factor of economic growth with respect to AI and QC technologies. However, balanced intellectual property policies may be complementary to this growth and support continued innovation. Current policies already promote investment and progress in AI and QC technologies, with upwards of $46 billion being used to fund AI-related companies in 2018.[4]

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[1] *See* Comments of Google Inc. (January 18, 2017), https://www.uspto.gov/sites/default/files/documents/comments_google_jan182017.pdf.

[2] "Sizing the prize: What's the real value of AI for your business and how can you capitalize?," PwC, https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html.

[3] "Notes from the AI frontier: Modeling the impact of AI on the world economy," Bughin et al., McKinsey & Company, September 4, 2018, https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy.

[4] "WIPO Technology Trends 2019: Artificial Intelligence," World Intellectual Property Office, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf.

Other government policies, such as the National Quantum Initiative Act and recent increases in federal AI research budgets, are also driving more growth in AI and QC technologies. Going forward, we expect the National AI Act to also drive R&D and growth. This activity, coupled with academic and private investments, such as MIT's $1 billion commitment to AI[5] and Alphabet's $105 billion R&D investment over the past five years,[6] will serve to drive additional innovation in these areas. The timing of these funding commitments shows that current policies provide sufficient incentives for private industries, academic institutions, and government agencies to invest in AI and QC technologies.

Within this environment, the IP system is playing its proper role to allow development in AI and QC technologies to thrive through balanced policies, and any disruption to this balance would harm innovation in these technologies, not help it. Many others share our view. The PTO's own 2020 AI Report highlights that "[a]cross all IP topics, a majority of public commenters expressed a general sense that the existing U.S. intellectual property laws are calibrated correctly to address the evolution of AI."[7] Patent law in particular strikes the right balance to protect true technological advances while making sure that abstract ideas do not hinder follow-on research. This approach helps drive the strong investment, innovation, and patenting in AI and QC technologies that exist today.

As we discuss in more detail in these comments, robust data supports that the balance in our IP system has allowed patenting in emerging technologies to flourish. In the 16 years from

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[5] *Id*. at 130.

[6] *See* Alphabet Inc. 2020 10-K, 55 and Alphabet Inc. 2018 10-K, 47 (showing over $105 million invested between 2016 and 2020 with an increase in expenditure each year), https://www.sec.gov/Archives/edgar/data/1652044/000165204421000010/goog-20201231.htm; https://www.sec.gov/Archives/edgar/data/1652044/000165204419000004/goog10-kq42018.htm.

[7] "Public Views on Artificial Intelligence and Intellectual Property Policy," USPTO, October 2020, https://www.uspto.gov/sites/default/files/documents/USPTO_AI-Report_2020-10-07.pdf.

2002 to 2018, annual AI patent application filings in the U.S. increased by more than 100%, rising from 30,000 in 2002 to more than 60,000 applications by 2018.[8] Over the same period, the share of all U.S. patent applications that contain AI subject matter nearly doubled from 9% to almost 16%,[9] and US companies were issued more than 70% of all AI-related patents.[10]

Google's own portfolio, which counts more than 57,000 patents worldwide and 26,000 patents in the US, focuses heavily on AI and QC technologies. The PTO's report on AI shows that Google obtained nearly 11,000 U.S. patents related to AI technology through 2018.[11] The current patent eligibility jurisprudence has not affected our ability to get patents on AI or QC innovations. What has changed since the *Alice* decision is that we need to make sure that we are providing enough detail in our patent applications at the outset. We need to make sure that we are going into depth on the technological problem we are addressing and our technological solution to that problem. And we need to make sure that we are specifically claiming that solution and not just the result.

To be even more effective at this, Google includes foreign outside counsel in the preparation process, where before it was typically just U.S.-based counsel who drafted our patent applications. In this sense, *Alice* was a "forcing function" for Google and others to include more detail in patent applications, and to be more focused on global patent prosecution from the outset. This is the way things should have been operating all along, and it has beneficially resulted in even

[8] "Inventing AI: Tracing the diffusion of artificial intelligence with U.S. patents," USPTO Office of the Chief Economist, Number 5, October 2020, https://www.uspto.gov/sites/default/files/documents/OCE-DH-AI.pdf ("Inventing AI Report").
[9] *Id.*
[10] "Artificial Intelligence Trends Based on the Patents Granted by the United States Patent and Trademark Office," H. Abadi and M. Pecht, 2020, IEEE Access, Volume 8, https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=9072177.
[11] Inventing AI Report, Figure 6 at 10.

more information being provided in patent specifications, which means there is more information overall for researchers to access and to build on than ever before.

We urge the PTO to reject the premise set forth in the RFI that "the current jurisprudence has adversely impacted investment and innovation in critical technologies like quantum computing and artificial intelligence." Instead, we encourage the PTO to take a neutral and data-driven approach that will allow for a robust understanding of the extensive public and private activity in these fields and the role that our balanced patent system has played in allowing that activity to flourish.

Google's Interest in the Patent System. Of the various roles (1) through (9) set forth in the RFI, Google can be categorized as (1) inventors, patent owners, and investors in AI and QC technologies, (2) a licensee and user of patented technology, and (4) a recipient of demand letters, as well as defendants to patent litigation.

As a patent owner, Google has a global portfolio of over 57,000 granted patents and more than 9,000 published applications, with more than 26,000 U.S. patents and 2,300 U.S. published applications. In addition, Google has a large and growing patent portfolio covering AI and QC innovations and is a top patent holder in both technology areas. Google has nearly 11,000 U.S. patents related to AI technology.[12] In quantum computing, Google has over 100 U.S. patents and applications and is a leading filer of patent applications,[13] with growth of more than 450% in the last five years.

[12] Inventing AI Report, Figure 6 at 10, https://www.uspto.gov/sites/default/files/documents/OCE-DH-AI.pdf.
[13] "IFI Top Ten Fastest Growing Technologies," https://www.ificlaims.com/uploads/website_specific/2020/Top%20ten%20fastest%20growing%20technologies.pdf.

Google engages in extensive licensing activity, both as a licensor and licensee. Since *Bilski*, Google has licensed tens of thousands of patents and sold hundreds of patents outside of transactions resulting from M&A activity. Google is also extensively involved in developing and promoting novel patent programs, including our participation in community licenses such as LOT Network[14] and Open Invention Network,[15] and other initiatives like the Open Patent Non-Assert Pledge[16] and the VP8 License.[17]

Google has been involved in hundreds of patent cases since the *Bilski* decision, mainly as a defendant.

II. SPECIFIC RESPONSES

A. Section I—Observations and Experiences

1. How the current state of patent eligibility jurisprudence affects the conduct of business in your technology area(s).

Our investment and innovation in emerging technologies, such as in AI and QC, has continued a strong upward trajectory since *Alice* – and so have our efforts to patent these innovations. In addition to supporting our own efforts to patent AI-related inventions, another important impact of the current patent eligibility jurisprudence is that it supports the democratization of AI. This allows for technologies such as Google's TensorFlow platform to be

[14] LOT Network licenses over 3 million worldwide patent assets held by 1600+ participants in the network; https://lotnet.com/.
[15] Open Invention Network includes over 3,540 corporate licensees and protects Linux and adjacent open-source technologies from over 1.57m active granted worldwide patents; https://openinventionnetwork.com/.
[16] The OPN Pledge is a promise by Google to developers, distributors, and users of free or open source software that Google will not assert infringement of certain Google patents against them, unless first attacked; https://www.google.com/patents/opnpledge/pledge/.
[17] VP8 is Google's open and royalty-free video compression format. Any company, organization or individual can participate in the VP8 patent cross-license and benefit from royalty-free rights that Google obtained from twelve key technology companies on behalf of all cross-license participants; https://www.webmproject.org/cross-license/.

leveraged by smaller companies, academic institutions, non-profits, and governments so that they can build AI applications to meet their businesses and technology goals. Our TensorFlow and open source quantum computing software frameworks (e.g., Cirq, OpenFermion, TensorFlow Quantum) are subject to patent rights in the AI and QC space that we have been able to extend to developers and researchers.

Additionally, we are able to provide TensorFlow as a free, open-source software library that users can integrate into their platforms for training and inference. TensorFlow has helped numerous organizations build out their AI applications, including a large and diverse community of developers that continue to innovate and expand on its many applications.[18] Our Quantum AI team further provides open-source libraries for developers to use to advance research and development in the field.[19]

2. What impacts, if any, you have experienced as a result of the current state of patent eligibility jurisprudence in the United States.

The *Alice* decision served as an important confirmation that, in order to secure a patent for innovations in AI, QC, and other emerging technologies, the invention must provide a technological solution to a technological problem.

Limiting patent-eligible subject matter to genuine technological advancements is important for AI, QC, and other computer-related inventions. The patent laws must balance rewarding past innovation by protecting inventors' rights in their specific technological solutions with promoting future innovation by protecting the public's right to solve the same problems in better and more efficient ways. Otherwise, undeserving patents could block further research and impact access to

[18] TensorFlow Case Studies, https://www.tensorflow.org/about/case-studies (listing numerous companies benefitting from TensorFlow).
[19] Google Quantum AI tools, https://quantumai.google/.

the technologies.

In our experience, drafting patent applications post-*Alice* confirms the utility and importance of the technological-problem/solution test. We ensure that our patent applications clearly explain how the invention provides a new technical solution to a technical problem, and incorporate that technical solution into the claims. In doing so, we generate higher-quality patent applications that meet with more success both in the U.S. and in foreign patent offices. In this way, *Alice* acted as a "forcing function" to bring about greater detail and clarity in patent applications, thereby resulting in more useful information being shared with the public, and a clearer definition of the rights being claimed.

3. How the current state of patent eligibility jurisprudence in the United States impacts particular technological fields.

As mentioned above, Google invests significantly in AI and QC research and development to serve its customers and partners. Our investments are also representative of the industry as a whole. For example, private investment in AI continues to increase, totaling approximately $67.9 billion in 2020.[20] By requiring that claims recite a technological solution to a technological problem, companies can be confident that their innovation can be rewarded with issued patents directed toward meaningful, technological improvements.

4. How do your experiences with the application of subject matter eligibility requirements in other jurisdictions differ from your experiences in the United States.

Google, like many companies, has a global patent portfolio. In our experience, the approach to patent eligibility post-*Alice* has brought greater harmonization to the global approach to patenting, with jurisdictions coalescing around the question of whether the patent claims recite a

[20] "Artificial Intelligence Index Report 2021," Stanford University, Chapter 3 at Figure 3.2.1, https://aiindex.stanford.edu/wp-content/uploads/2021/03/2021-AI-Index-Report-_Chapter-3.pdf.

technical contribution.

For example, China's patent law has long had a requirement that a patent claim a "technical solution,"[21] which also applies to AI cases.[22] Additionally, European patent law evaluates whether the claims involve "the use of technical means" or whether the claimed subject matter "has a technical character as a whole."[23]

5. Identify instances where you have been denied patent protection for an invention in the United States solely on the basis of patent subject matter ineligibility, but obtained protection for the same invention in a foreign jurisdiction, or vice versa.

Google has not experienced issues obtaining patent protection in the U.S. for inventions on AI and QC technology, as compared to foreign jurisdictions. In a sampling of our patent prosecution for these technologies in which we compared results for patent families having applications in the United States, Europe, and China, we did not identify any instances in which we were denied patent protection in the United States on the basis of subject matter eligibility but obtained a patent in Europe or China. To the best of our knowledge, only the opposite has happened – patent protection was denied in Europe or China, but granted in the United States. For example, patents on natural language processing technology were granted in the U.S. (US10474671 and US10635725), while the corresponding European patent applications were deemed non-technical and rejected.[24] In another example, a deep learning AI patent was granted by

[21] "Order of the President of the People's Republic of China, No.8," December 27, 2008, https://www.wipo.int/edocs/lexdocs/laws/en/cn/cn028en.pdf.
[22] "China Amended its Guidelines for Patent Examination Once Again," The Legal 500, July 9, 2020, https://www.legal500.com/developments/thought-leadership/china-amended-its-guidelines-for-patent-examination-once-again/.
[23] European Patent Convention, Article 52 at Chapter G-II, 3.3.
[24] EP15167265.6; EP16164096.6

the USPTO (US10380482), while the corresponding Chinese and European applications[25] were both deemed non-technical and rejected.

6. Explain whether the state of patent eligibility jurisprudence in the United States has caused you to modify or shift investment, research and development activities, or jobs from the United States to other jurisdictions, or to the United States from other jurisdictions. If so, please identify the relevant modifications and their associated impacts.

We disagree strongly with the premise and framing of this question. Under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement), the ability to secure a patent is not limited to the specific jurisdictions where research and development efforts are conducted. In other words, a patent applicant can obtain a patent in the U.S. for research and development conducted elsewhere, just as that same applicant could obtain a patent in other countries on research and development conducted in the U.S.

The current U.S. patent eligibility jurisprudence gives comfort to businesses investing and innovating in both AI and QC technologies because it is less likely to allow the issuance of patents that do not cover actual technology. And if such patents are issued and asserted, businesses will have a path to invalidate them under *Alice*.

Google makes significant investments in the U.S. and globally. Google Research, which is responsible for our AI and QC innovations, has teams throughout the U.S. and across the globe.[26] Patent eligibility law has had no bearing on where we conduct our cutting-edge research. In the U.S, Google is investing over $7 billion in offices and data centers and creating at least 10,000 new full-time jobs this year.[27] Among these investments, Google has built a new Quantum AI

[25] CN201580031864.2 and EP15782192.7
[26] Google Research careers, https://research.google/careers/.
[27] "Investing in America in 2021," The Keyword, March 18, 2021, https://blog.google/inside-google/company-announcements/investing-america-2021/.

campus in Santa Barbara, California, which includes our first quantum data center, quantum hardware research laboratories, and our own quantum process chip fabrication facilities.[28]

7. Please explain whether the state of patent eligibility jurisprudence in the United States has caused you to change business strategies for protecting your intellectual property (e.g., shifting from patents to trade secrets, or vice versa).

Whether to keep technology secret is a gating question. It is asked first, and it is a business-driven inquiry that is based on the nature of the technology. If it is decided that the technology in question does *not* need to be kept secret, then the question of whether to pursue a patent on that technology is explored. Thus, patent eligibility jurisprudence has in no way caused Google to change business strategies for protection of intellectual property, and there has been no shift from patents to trade secrets.

As we have shared throughout these comments, Google has obtained numerous patents covering our AI and QC innovations under the current jurisprudence. Our approach to determining whether to pursue a patent is a holistic one, and includes considerations such as the nature of the technology, our business goals with respect to the technology, including whether it will be implemented in products or services or is only intended for internal usage, detectability of any use of the technology by others, and the extent of our existing intellectual property coverage of related innovations.

8. Please explain whether you have changed your behavior with regard to filing, purchasing, licensing, selling, or maintaining patent applications and patents in the United States as a result of the current state of patent eligibility jurisprudence in the United States

Since the *Alice* decision, we have adapted our patent prosecution strategy to ensure that sufficient technical detail is included in our patent specifications at the outset. To do so, we have

[28] "Unveiling our new Quantum AI campus," The Keyword, May 18, 2021, https://blog.google/technology/ai/unveiling-our-new-quantum-ai-campus/.

engaged in more robust pre-filing conversations with our inventors to adequately cover the technological problem the invention is addressing, and the technological solution that is to be claimed. As a company with a global patent strategy, we have also involved our patent prosecution counsel from outside the U.S. in these conversations so that they can ask questions and provide early feedback, and to allow for preparation of a patent application that is suitable for global filing. With the clarifications of *Alice* bringing the U.S. patent system closer to substantive harmonization with other global patent offices, we have experienced efficiencies in our global filing strategy.

Our approach to maintaining patent applications, and making pruning decisions on issued patents, involves regular review of patent assets at every stage of their lifecycle. This review includes assessing how the patent or application fits into our broader patent portfolio and whether that has changed over time, and for patent applications, whether they are facing rejections on any of the statutory requirements that would be difficult to overcome.

We have continued our robust patent transactional practice since *Alice*, with continued purchasing, selling, and licensing of patent assets. While the clarifications of *Alice* have resulted in reduced interest in pure business method patents, directed to no more than an abstract idea carried out on a computer or over the internet, patents covering technological advances have not been impacted from a transactional perspective, and our practice has not changed.

9. Please explain how, in your experience, the status of patent eligibility jurisprudence in the United States has affected any litigation for patent infringement in the United States

Prior to the Supreme Court's clarification of patent eligibility jurisprudence in *Alice*, it was challenging to obtain early disposition of a patent litigation on the basis of patent eligibility. This made patent eligibility an outlier as compared to the other statutory requirements, which were all

generally available as bases for early dismissal and could be successful in straightforward cases. The *Alice* decision brought patent eligibility to equal footing with the other statutory requirements with respect to the potential for early disposition when the court could easily make such a decision, leaving the more complicated cases to continue on through litigation.

An example of a patent litigation where the court was able to resolve the case early on by applying the clarified patent eligibility jurisprudence is *buySAFE, Inc. v. Google, Inc.*, 964 F.Supp.2d 331 (D.Del. 2013). In *buySAFE,* the district court found that the patent "describes a well-known, and widely-understood concept—a third party guarantee of a sales transaction—and then applied that concept using conventional computer technology and the Internet." The Federal Circuit affirmed the district court's decision, pointing to "the simplicity of the present case" under the Supreme Court's renewed patent eligibility jurisprudence, and noting that "[t]he claims in this case do not push or even test the boundaries of the Supreme Court precedents under section 101." 765 F.3d 1350, 1355 (Fed. Cir. 2014).

Another case in which Google obtained early disposition from a motion for judgment on the pleadings was *Makor Issues & Rights Ltd. v. Google LLC and Waze, Inc.*, No. 16-00100-CFC (D.Del. 2020). The patent in *Makor* was asserted against the use of real-time traffic information to provide driving directions in Google Maps. During the pendency of the case, Google's Navigation engineering team was working to develop improvements to driving direction technology that leveraged AI in order to make traffic predictions and route calculations. A patent like the one at issue in *Makor,* which claimed only an abstract idea, could have impacted these AI innovations without actually inventing or claiming this technology. The straightforward and early resolution of this case allowed Google's AI-enabled technology to provide safe and efficient routing for users of

Google Maps.[29]

B. Section II—Impact of Subject Matter Eligibility on the General Marketplace

10. Identify how the current state of patent eligibility jurisprudence in the United States impacts the global strength of U.S. intellectual property.

See response to question 12 below.

11. Identify how the current state of patent eligibility jurisprudence in the United States impacts the U.S. economy as a whole.

See response to question 12 below.

12. Please identify how the current state of subject matter eligibility jurisprudence in the United States impacts the global strength of U.S. intellectual property and the U.S. economy in specified areas.

Google is answering questions 10 and 11 of the RFI in the context of question 12, specific to the enumerated areas of artificial intelligence and quantum computing.

In 2019, the digital economy accounted for 9.6% of the U.S. GDP (or $2.1 trillion), with 6.5% average annual growth from 2005 to 2019.[30] This growth was driven by tremendous investment into research and development activities by U.S. technology companies.[31] The U.S. also remains a leading destination for private investment in AI and QC technologies, with more than $23.6 billion in private investment in 2020, followed by China ($9.9 billion) and the United

[29] "A smoother ride and a more detailed Map thanks to AI," The Keyword, May 18, 2021, https://blog.google/products/maps/google-maps-101-ai-power-new-features-io-2021/.

[30] Digital Economy, US Bureau of Economic Analysis, https://www.bea.gov/data/special-topics/digital-economy; "Technology helped America's economy way more than we thought," Lydia DePillis, CNN Business, August 3, 2018, https://money.cnn.com/2018/08/03/news/economy/gdp-economic-growth-technology/index.html.

[31] "American Tech Firms Are Winning the R&D Spending Race With China," The Wall Street Journal, Timothy W. Martin, October 30, 2018, https://www.wsj.com/articles/american-tech-firms-are-winning-the-r-d-spending-race-with-china-1540873318.

Kingdom ($1.9 billion).[32] The U.S. continues to lead as an AI hub, with U.S.-based companies accounting for 41% of AI-focused transactions in the previous quarter, and with those deal levels being up 39% year-over-year.[33]

At the same time, AI and QC are among the fastest growing technologies at the PTO.[34] In AI specifically, U.S. companies were issued more than 70% of all AI-related patents through 2018.[35] The balance achieved by the U.S. patent system's approach to patent eligibility has supported tremendous investment and growth in AI and QC technologies in the U.S., while also allowing for patenting of those technologies at rates that are greater than other technology areas.

13. Please identify how the current state of patent eligibility jurisprudence in the United States affects the public.

As detailed elsewhere in this comment, *Alice* served as a "forcing function" for Google and others to include more detail in patent applications. Patent applications must explain the technological problem that the invention addresses and the technological solution to that problem, and the patent claims must clearly reflect that. This is how the patent system should have been operating all along, and has benefited the public by making available even more information through patent specifications, which means there is more information overall for researchers to access and build on than ever before.

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[32] "Artificial Intelligence Index Report 2021," Stanford University, Chapter 3 at Figure 3.2.4, https://aiindex.stanford.edu/wp-content/uploads/2021/03/2021-AI-Index-Report-_Chapter-3.pdf.

[33] "Artificial Intelligence in Numbers Q2 2021," CB Insights, at 12, https://www.cbinsights.com/reports/CB-Insights_AI-In-Numbers-Q2-2021.pdf.

[34] "Fastest Growing Technologies of 2020," IFI Claims, https://www.ificlaims.com/rankings-tech-growth-2020.htm.

[35] "Artificial Intelligence Trends Based on the Patents Granted by the United States Patent and Trademark Office," H. Abadi and M. Pecht, 2020, IEEE Access, Volume 8, at Table 1, https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=9072177.