IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Request for Information regarding
Patent Eligibility Jurisprudence Study

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Docket No.: PTO–P–2021–0032

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COMMENTS OF
THE HIGH TECH INVENTORS ALLIANCE

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The High Tech Inventors Alliance (HTIA)[1] is pleased to submit the following comments in response to the July 9, 2021, Request for Information from the U.S. Patent and Trademark Office ("USPTO" or "Office").[2]

HTIA represents leading technology providers and includes some of the most innovative companies in the world. HTIA member companies are global leaders in software, e-commerce, cloud computing, artificial intelligence, quantum computing, digital advertising and marketing, streaming, networking and telecommunications hardware, computers, smartphones, and semiconductors. HTIA includes four of the top six software companies in the world, two of the top ten providers of 5G network infrastructure, three of the ten largest tech hardware companies, and three of the ten largest semiconductor companies in the world.

HTIA exists to promote innovation and American jobs through equitable patent policies and a more efficient, effective, and inclusive patent system. HTIA's member companies are some of the world's largest funders of corporate research and development, collectively investing more than $146 billion in these activities annually. They are also some of the world's largest patent owners and have collectively been granted nearly 350,000 patents. HTIA members are also among the top innovators and largest patent owners in many of the technology fields identified as being of particular interest in the RFI, including quantum computing, AI, and each of the enumerated computer-related fields (*i.e.*, software, business methods, security, databases and data structures, computer networking, and graphical user interfaces).

Our comments below are provided in two parts. The first consists of general observations regarding the impact of current patent eligibility jurisprudence and the validity of several criticisms and concerns that are frequently cited as justifications for abrogating the existing patent eligibility jurisprudence in its entirety. The second contains HTIA's comments on the specific topics for public comment listed in the Request for Information.

I. General observations and discussion

As discussed in the RFI, the USPTO is commencing a study on the current state of patent eligibility jurisprudence in the United States and how it has impacted investment and innovation, with a particular focus on critical technologies such as quantum computing, artificial intelligence, precision medicine, diagnostic methods, and pharmaceutical treatments. The

[1] A list of HTIA members is available online at https://www.hightechinventors.com.
[2] *Patent Eligibility Jurisprudence Study*, 86 Fed. Reg. 36257 (July 9, 2021) (hereinafter "Request for Information").

USPTO is undertaking this effort at the request of several members of the U.S. Senate, who requested that the USPTO "publish a request for information on the current state of patent eligibility jurisprudence in the United States, evaluate the responses, and provide . . . a detailed summary of [its] findings."[3] HTIA and its member companies have considerable legal and technical expertise relating to the matters raised in the Request for Information and a strong interest in the scope and definition of patent eligible subject matter in the U.S.[4] Accordingly, HTIA is pleased to provide the following in the hopes that these comments will aid the USPTO in completing its study.

A. The USPTO should rely on economic data and empirical evidence in preference to the types of anecdotal evidence and subjective assessments that interested parties are likely to convey in their responses to the RFI.

As described in the RFI, a primary goal of the requested study is to assess "how the current jurisprudence has impacted investment and innovation, particularly in critical technologies like quantum computing, artificial intelligence, precision medicine, diagnostic methods, and pharmaceutical treatments."[5] Many of the effects of the current jurisprudence are susceptible to empirical analysis, and many of the matters relevant to this study have already been the subject of significant empirical work by academics. HTIA would respectfully urge the USPTO to carefully review this body of work and to give the results of these studies significant weight in making its findings.

Although the responses to the RFI will no doubt convey some useful information, the bulk of the topics for public comment are identified as subjective "Observations and Experiences," and the responses to these will necessarily be anecdotal and frequently based on subjective opinions and perceptions.[6] Even in the aggregate, these responses cannot provide an adequate basis for a neutral or reliable assessment because the commenters will not be

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[3] U.S. Senators Thom Tillis, Mazie K. Hirono, Tom Cotton, and Christopher A. Coons, *Letter to Drew Hirshfeld, Commissioner for Patents performing the functions and duties of the Director of the USPTO*, March 5, 2021.

[4] The RFI asks commenters to identify their interests in the U.S. patent system and to indicate whether they fall within one or more of nine enumerated stakeholder categories. Either HTIA or its individual member companies fall within all of the enumerated categories except for numbers six and seven ("government agencies of officials" and "academic or research institutions") and possibly five ("entities that represent accused infringers") depending on whether that category is intended to be limited to legal representation. Notably, many HTIA members' businesses focus in significant part on software and software-implemented business processes, which are areas substantially affected by patent eligibility.

[5] *Id.* at 36257.

[6] Beyond being subjective, as discussed below in response to question 5, many of the complaints that patent applications are being abandoned due to statutory subject matter rejections and that related applications are being allowed by other jurisdictions are generally inaccurate or speculative. Similarly, subjective statements about the impact of current jurisprudence on particular products or markets must be heavily discounted unless backed up with actual data.

adequately representative. This is due to the selection bias that is inherent in any survey that relies on voluntary respondents.[7] HTIA respectfully suggests that empirical analyses based on public data are much more likely to provide an adequate basis for reaching accurate and informed conclusions and urges the USPTO to seek out and rely on empirical analyses in preference to the types of subjective judgments and anecdotal information that will likely be conveyed in responses to the RFI.

B. The available empirical evidence indicates that the *Bilski* and *Alice* decisions have increased innovation and substantially benefit technology companies of all sizes.

As discussed in several of the responses below, there are a significant number of empirical studies that examine the impact of the changes in patent eligibility jurisprudence over the past decade. Many of these have found that the changes to patent eligibility produced by the Supreme Court's *Bilski* and *Alice* decisions – which are consistent with previous Supreme Court precedents – either caused or were associated with significant beneficial effects. For example, one study found that the decreased availability of business method patents as a result of changes to patent eligibility jurisprudence directly resulted in increased R&D investment.[8] Another study found that "software firms exhibited a significant *increase* [of 10.6 percent] in sales after *Alice*, when they patented fewer software innovations"[9] and that "narrowing the scope of software patents had no detectable downside for the value of software firms."[10] It also concluded that "narrowing the scope of software patent protection would have no detectable downside to the likelihood of VC funding and exit in nascent startups."[11] To the contrary, the results "indicate[] that *Alice* was associated with a significantly higher likelihood of receiving a new round of VC funding."[12]

There is also an extensive body of empirical literature seeking to assess how changes to patent laws have affected innovation and economic growth more generally. While these

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[7] This selection bias – sometimes referred to as "voluntary response bias" – is well established. *See, e.g.,* the discussion of bias in survey sampling at https://stattrek.com/survey-research/survey-bias.aspx.

[8] Sridhar Srinivasan, *Do Weaker Patents Induce Greater Research Investments? (*December, 2018) (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3185148) (finding that firms that had previously sought patent protection for business methods decreased patenting while increasing R&D investment as a result of the *Alice* decision). *See also* Filippo Mezzanotti*, Roadblock to Innovation: The Role of Patent Litigation in Corporate R&D* (July 22, 2020), https://www.kellogg.northwestern.edu/faculty/mezzanotti/documents/innovation.pdf (similarly finding that another of the Supreme Court's decisions that was perceived to have weakened patent rights – *eBay v. MercExchange* – also resulted in increased investment in corporate R&D).

[9] Lin, Yu-Kai and Rai, Arun, *Patent Protection and Software Innovation: Evidence from Alice,* at 16-17 (September 9, 2020); https://ssrn.com/abstract=3703055.

[10] *Id.* at 3.

[11] *Id.* at 24.

[12] *Id.* at 22.

studies do not specifically examine the impact of the Supreme Court's patent eligibility decisions, their general conclusions are potentially applicable to questions raised in the RFI. For example, one study analyzed the effects of 177 changes to patent laws occurring in sixty different countries over a 150-year period and found changes that "strengthened" patent protection generally resulted in decreased patenting by the residents of the country that enacted the change in law.[13] There are scores of such empirical analyses that either directly assess the impact of the Supreme Court's patent eligibility decisions or that reach general conclusions that are applicable to predicting the likely impact of reversing these decisions through legislative reforms. Concerningly, many of these economic studies appear to indicate that when a government acts on calls from patent attorneys and owners to strengthen protection, the consequences for domestic innovation and the national economy are anything but positive.

Finally, there is an enormous body of publicly available data relating to economic and patenting activity that strongly suggests the Supreme Court's decisions have been substantially beneficial or, at the very least, not harmful to innovation, economic growth, or the availability of patent protection. For example, investment in R&D has grown rapidly in the wake of the Supreme Court's decision in *Alice Corp. v. CLS Bank Int'l*. R&D spend significantly increased as a percentage of gross domestic product in every year between 2015 and 2019 (the last year for which data are available).[14] Notably, investment in R&D has been particularly strong in the industries associated with "*Alice*-affected technologies."[15] Growth in venture capital and investments in startup companies has been similarly strong, with 2021 on track to be "another consecutive record-setting year."[16] And investment in startups involved with technologies that were most affected by the Supreme Court's decisions – *e.g.*, artificial intelligence – has been particularly impressive. For example, in Q2 of calendar year 2021, funding for artificial intelligence firms reached a record high of $20 billion, up from $9 billion two years earlier.[17]

No study could credibly purport to assess how patent eligibility jurisprudence "has impacted investment and innovation" without addressing the types of empirical analyses described above or considering basic trends that are evident from available economic data.

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[13] *See, e.g.,* Joshua Lerner, *Patent Protection and Innovation Over 150 Years*, National Bureau of Economic Research Working Paper 8977 (2002); http://www.nber.org/papers/w8977.

[14] National Patterns of R&D Resources: 2018–19 Data Update; https://ncses.nsf.gov/pubs/nsf21325/assets/data-tables/tables/nsf21325-tab001.pdf; see generally https://ncses.nsf.gov/pubs/nsf21325.

[15] PWC, *2018 Global Innovation Fact Pack*, slide 28; https://www.strategyand.pwc.com/gx/en/insights/innovation1000/2018-global-innovation-1000-fact-pack.pdf#page=29.

[16] National Venture Capital Association, *Venture Monitor 2Q 2021;* https://nvca.org/wp-content/uploads/2021/07/Q2_2021_PitchBook-NVCA_Venture_Monitor-1.pdf, at 3.

[17] CB Insights, *Artificial Intelligence in Numbers*; https://www.cbinsights.com/reports/CB-Insights_AI-In-Numbers-Q2-2021.pdf, at 7.

Certainly, such an assessment cannot be reasonably made based on individual, subjective impressions of the impact. Although economic data of the type discussed above may not be conclusive on their own, they paint a picture that is virtually impossible to reconcile with claims that the Supreme Court's decisions have had a dramatic and catastrophic impact on innovation, R&D, and investment activity.

C. The data contradict factual claims commonly relied on by stakeholders in advocating an expansion of patent eligibility.

In the letter that initiated this process, Senators Tillis, Hirono, Cotton, and Coons requested that the USPTO undertake three tasks: publishing a request for information, evaluating the responses, and providing a detailed summary of its findings. In conducting the second of these tasks – evaluating the responses to the RFI – the USPTO will encounter a series of well-worn arguments regarding the purported harmful effects of the current eligibility jurisprudence. The most common of these are susceptible to evaluation using knowledge and information that are in the possession of or readily available to the USPTO. HTIA would respectfully urge the USPTO to rigorously evaluate these claims and explicitly address their accuracy and validity in the detailed findings that are to be communicated back to Congress. It is critically important to the credibility of any legislative process undertaken to address this issue – and to the perceived legitimacy of the USPTO's role in that process – that Congress's decision regarding the necessity of legislative reform be based on a reasoned and factually accurate assessment of the effects of the current jurisprudence.

Unfortunately, much of the ongoing policy debate over the past decade has centered on aggressive arguments and false claims regarding purported harms caused by the current patent eligibility jurisprudence that appear to be neither well-reasoned nor factually supported. These include arguments that dramatically exaggerate the impact of the jurisprudence on patent examination; largely unsupported claims that the Supreme Court's *Alice-Mayo* test produces fundamentally unpredictable results and has resulted in debilitating uncertainty; contentions that the current jurisprudence has caused the migration of R&D activities out of the U.S.; and that the Supreme Court's precedents have radically disincentivized U.S. innovation and pose a serious and direct threat to U.S. competitiveness. While it is possible that some aspects of these claims may be based at least in part on legitimate underlying concerns, the arguments have exaggerated any potentially valid challenges to such an extent as to completely obscure any underlying basis in fact or reason.

1. Stakeholder claims vastly exaggerate impact on the ability to obtain patents

Empirical analyses of USPTO office actions indicate that *Mayo* and *Alice* have had little or no impact on patent applications in most fields, with significant effects limited largely to business methods, diagnostics/bioinformatics, and a few narrow art units within the field of software.[18] Even in most of what the USPTO itself identified as "*Alice*-affected technologies," the impact has not been substantial. Contrary to the common assumption that the Supreme Court's eligibility decisions have resulted in an explosion of indiscriminate Section 101 rejections, the USPTO's own analysis shows that the share of first office actions containing a Section 101 rejection is significantly lower in the wake of the USPTO's 2019 Revised Patent Subject Matter Eligibility Guidance ("2019 PEG") than it was during the two years prior to *Alice*.[19] Although the pre-*Alice* rejection rates were calculated using a different sample of patent applications and therefore cannot be directly compared to the rate calculated in the wake of the 2019 PEG, the fact that current rejection rates are in the same ballpark as the rate prior to *Alice* is impossible to reconcile with claims that the impact on examination has verged on the apocalyptic and requires aggressive legislative intervention.

In contrast to the overblown assertions by stakeholders, empirical studies have found that "[t]he proportion of office actions in software with initial and final § 101 rejections did not increase much after the *Alice* decision or its implementation by the PTO."[20] In virtually all fields – including almost all of those that were identified by the Office as *Alice*-affected technologies – the likelihood of receiving a first office action eligibility rejection appears to be similar to or lower than it was in the years prior to the *Alice* decision. Although the current patent eligibility jurisprudence has had a fairly dramatic negative impact on the availability of patent protection for business methods, bioinformatics, and a few narrow categories of software, it appears to be having little or no ongoing impact on the vast majority of applications in virtually all the other fields of technology. Moreover, as discussed below, there are good reasons to believe that the decreased availability of business method has had socially beneficial effects that have encouraged innovation, decreased legal risk and unnecessary litigation costs, and increased investment in R&D.

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[18] Colleen Chien & Jiun Ying Wu, *Decoding Patentable Subject Matter*, 2018 PATENTLY-O PAT. L.J. 1 (Oct. 16, 2018); https://patentlyo.com/media/2018/10/Chien.Decoding101.2018.pdf. *See also* Andrew A. Toole & Nicholas A. Pairolero, U.S. Patent & Trademark Office, *Adjusting to Alice*, at 3 n.9 (2020) (noting that "increase in first office action Section 101 rejection rates is reflected only in applications in the Alice-affected technologies and not in applications in the other technologies").

[19] *Adjusting to Alice* at 5 (showing percentage of office actions containing a Section 101 rejection below 20%).

[20] Jay P. Kesan and Runhua Wang, *Eligible Subject Matter at the Patent Office: An Empirical Study of the Influence of Alice on Patent Examiners and Patent Applicants*, 105 Minn. L.J. 527, 591 (2020); https://minnesotalawreview.org/wp-content/uploads/2020/12/Kesan-Wang_MLR.pdf.

2. There is no support for claims of debilitating uncertainty

The same data also undercut the frequent complaints about the inherent unpredictability of eligibility determinations under *Alice* and the contention that this has produced debilitating levels of uncertainty. The fact that Section 101 rejection rates have decreased so substantially itself contradicts these claims. Such a reduction indicates that many applicants have been able to correctly predict the risk of a rejection, and – at least in most fields – have been successful in ameliorating that risk by altering their application and prosecution strategies. In what is likely the most extensive empirical study of the impact of *Alice* on examination decisions, the authors found that – contrary to stakeholder claims regarding insurmountable uncertainties – applicants in most fields were able to predict eligibility determinations with sufficient accuracy to allow them to identify ways to substantially increase their odds of avoiding or overcoming Section 101 rejections.[21] Allegations of widespread, insoluble uncertainty regarding eligibility determinations are even more directly refuted by a project that provided an empirical demonstration – using real patent claims – that "it is possible to predict, with a reasonably high degree of confidence, whether a patent claim is patent eligible under the *Alice* test."[22] In this project, artificial intelligence (specifically, a machine classifier) was successfully trained to predict with reasonable accuracy whether patent claims were eligible under *Alice.* Claims about the impossibility of predicting such outcomes are refuted by the fact that both patent applicants and computers have actually done so.

As with allegations about the impact of *Alice* on rejections, the exaggerated claims of uncertainty have served to obscure rather than illuminate legitimate underlying concerns. Empirical analyses suggest that there are a handful of areas – most notably bioinformatics – in which applicants are faced with ongoing and substantial uncertainty. However, the fact that such uncertainty is limited to a tiny subset of the overall population of applications suggests that any effort to address these challenges should be limited to the narrow areas that exhibit

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[21] *Id.* at 590. The analysis conducted by Kesan and Wang found that the *Alice* decision resulted in business method applications filed prior to the date of the decision being 14 times more likely to be unsuccessful in overcoming a Section 101 rejection than equivalent applications that were examined before *Alice*. However, business method applications filed after the *Alice* decision were only two times more likely to fail to overcome a Section 101 rejection than equivalent applications that were examined before the *Alice* decision was handed down. This large difference indicates that applicants were able to substantially increase their likelihood of overcoming an rejection through changes to their application strategy. If uncertainty regarding the application of *Alice* actually did make eligibility substantially impossible to predict, applicants would have been unable to improve their odds of overcoming a Section 101 rejection by altering their application behavior and the applications filed after the *Alice* decision would have fared no better than those filed before.

[22] Ben Dugan, *Mechanizing Alice: Automating the Subject Matter Eligibility Test of Alice v. CLS Bank*, 2018 U. Ill. J.L. Tech. & Pol'y 33 (2018).

serious problems and that any solution should be tailored to the specific characteristics of the subject matter that are causing or substantially exacerbating uncertainty.

3. Claims that R&D activities are migrating to jurisdictions with more liberal patent eligibility as a result of Section 101 jurisprudence are directly contradicted by international law

It Is regularly argued that the current state of eligibility jurisprudence in the U.S. is causing innovators to move their R&D to jurisdictions with more favorable eligibility rules and that this presents a direct threat to U.S. competitiveness, global technology leadership, and even national security. However, those making this claim have thus far been unable to explain what benefit or advantage with respect to patent protection an innovator could hope to gain by relocating R&D to a foreign jurisdiction. This is because the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)[23] requires that "[e]ach Member shall accord to the nationals of other Members treatment no less favourable than that it accords to its own nationals with regard to the protection of intellectual property."[24] And Article 27.1 prohibits "discrimination as to the place of invention" in the grant or enforcement of patent rights.[25] In other words, an inventor in any country that belongs to the World Trade Organization (WTO) is entitled to receive a patent in each of the other 163 WTO member states irrespective of which country the inventor lives in or where the invention was conceived.

This means that a U.S. inventor is entitled to all of the rights and protections provided by the patent systems of other WTO member countries and would gain no additional benefit or advantage by relocating R&D to another jurisdiction. As a result, differences among countries with respect to the strength of patent rights or the effectiveness of enforcement are literally incapable of creating an incentive to relocate inventive activities from one country to another. Irrespective of how good or bad the state of patent eligibility jurisprudence in a jurisdiction might be, it simply has no bearing on choices about where to locate R&D unless the U.S. or other countries are actively violating their obligations under TRIPS.

4. Claims regarding harm to U.S. competitiveness are baseless

Another common but equally implausible argument is that current patent eligibility jurisprudence poses an existential risk to U.S. competitiveness by undermining American

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[23] Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299, 33 I.L.M. 1197 (1994) (hereinafter "TRIPS Agreement").
[24] TRIPS Agreement, art. 3(1).
[25] *Id.* art. 27(1).

innovation, thereby enabling rival nations like China to become dominant in the development of critical emerging technologies. For the same reasons that a country's failure to provide effective patent rights does not create an incentive to relocate R&D to another jurisdiction, the availability of strong patent rights in a particular country does not differentially incentivize domestic innovation in that country. As discussed above, the national treatment and non-discrimination mandates imposed by the TRIPS agreement ensure that foreign nationals are allowed to benefit from U.S. patent rights to the same extent as domestic inventors. Converting the patent system into a tool for attracting R&D into the U.S. would require violation of the TRIPS agreement. The USPTO should recognize in its report that Section 101 has no relevance to the question of competitiveness.

Claims regarding a purported impact on U.S. competitiveness are not just precluded by the TRIPS agreement, they are refuted by the USPTO's own patenting data. Because a majority of the U.S. patents issued each year are granted to foreign entities, foreign inventors would capture a proportionally greater share of any benefits resulting from an increase in the availability or "strength" of U.S. patent rights.[26] Moreover, because U.S. patents can typically only be asserted against infringing activities within the borders of the U.S., virtually all of the additional legal costs and business risks associated with infringement of the additional patents issued as a result of the expansion would fall on commercial activity in the U.S. These additional litigation costs, legal liability, and business risks place U.S. firms at a competitive disadvantage relative to their foreign competitors and create incentives for them to offshore business activities and associated jobs. Additionally, in most cases some portion of these costs will be passed along to American consumers in the form of higher prices. In sum, expanding the scope of eligible subject matter will not increase U.S. competitiveness. Rather, such an expansion would place U.S. businesses at a competitive disadvantage, decreasing U.S. employment and the domestic production of goods and services, while increasing consumer prices. The combination of these negative effects would substantially *harm* rather than strengthen the international competitiveness of the U.S.

While HTIA members strongly believe that patents incentivize global innovation, empirical studies do not support the contention that a country's unilateral expansion of patent protection has a positive effect on domestic patenting or innovation. Nor do such studies support the proposition that unilateral strengthening of patent rights has any potential to generate a durable competitive advantage over other countries. In fact, they indicate the opposite. A study by Josh Lerner, professor at Harvard Business School and Director of the Productivity, Innovation, and Entrepreneurship Program at the National Bureau of Economic

[26] *See* U.S. Patent and Trademark Office, *U.S. Patent Statistics Chart: Calendar Years 1963 – 2020*; https://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm.

Research, considered 177 policy changes affecting national patent systems in 60 countries over a 150-year period and concluded that:

> *The basic patterns are striking. Consider, for instance, policy changes that strengthen patent protection. Once overall trends in patenting are adjusted for, the changes in patenting by residents of the country undertaking the policy change are negative, both in Great Britain and in the country itself. Subject to the caveats noted in the conclusion, this evidence suggests that these policy changes did not spur innovation.*[27]

In other words, the historical record indicates that the unilateral adoption of policy changes that purport to strengthen patent rights is very likely to reduce rather than increase patenting and innovation by domestic entities.

Empirical studies also suggest that excessively strong patent rights can harm growth in domestic productivity, which necessarily decreases national competitiveness. In one such study, the strength of patent rights was found to be inversely correlated to total production factor growth.[28] Beyond such empirical analysis, there exists ample evidence in the historical record that stronger patent rights can threaten rather than incentivize the development and rapid adoption of emerging technologies.[29] There is also substantial historical evidence that stronger patent rights can decrease competitiveness by harming national security.[30]

Put simply, the evidence suggests that seeking to "strengthen" the U.S. patent system by abrogating the Supreme Court's eligibility precedents to expand the scope of patent eligibility would not enhance U.S. competitiveness or increase domestic innovation as many stakeholders have argued. Such a course of action is dramatically more likely to have the opposite effect and reduce competitiveness, impair economic efficiency, deter inventive activities, weaken national security, and impose unnecessary costs and legal risk on domestic businesses.

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[27] Lerner, *supra* note 13; http://www.nber.org/papers/w8977.

[28] Chang, Xin., et al., *Patents and Productivity Growth: Evidence from Global Patent Awards*, 26 (SSRN working paper, Feb. 20, 2014), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2371600.

[29] *See, e.g.,* Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 Colum. L. Rev. 839 (1990).

[30] *See, e.g.*, Charles Duan, *Of Monopolies and Monocultures: The Intersection of Patents and National Security*, 36 Santa Clara High Technology Law Journal 369 (2020) (demonstrating how patenting can produce harmful technological "monocultures" and "how the competition-suppressing effects of aggressive patent assertion can diminish national security").

D. Claims that the reduced availability of patents for software and business methods threatens U.S. innovation and economic growth are unfounded

HTIA members are among the largest recipients of U.S. software patents and include global market leaders in the development of both software and various types of computer-implemented business processes. As such, they are uniquely qualified to comment on the impact of current patent eligibility jurisprudence on innovation and commercial activity in these areas. Based on their collective experience, HTIA members unanimously and unequivocally reject the suggestion that there has been a significant diminution in the availability of appropriate patent protection for software-related inventions. Member companies routinely obtain patents directed to software innovations and have not encountered any meaningful obstacles to securing appropriate patent protection in the wake of the *Alice* decision or as a result of other changes to patent eligibility jurisprudence.

In contrast, HTIA members recognize that current patent eligibility jurisprudence imposes severe impediments to the grant of patents for business methods and limits their availability to such an extent so as to preclude their issuance in many cases. However, they do not perceive this as being problematic or harmful in any way. To the contrary, HTIA and its members believe that the exclusion of business methods from patenting is substantially beneficial to innovation, economic efficiency, and productive commercial activity.

This conclusion is consistent with HTIA's strongly-held view that the patenting of abstract subject matter is counterproductive to the goal of incentivizing technological innovation. A variety of empirical studies have assessed the impact of business method patenting on innovation and economic growth. These studies have generally concluded that there is no evidence that business method patents have a positive impact in either respect.[31] A smaller number of studies have found evidence that the availability of business method patents has a negative impact on incentives to innovate or to invest in R&D activity. One such study found that the decreased ability to obtain business method patents in the wake of the *Alice* decision caused firms that had previously sought business method patents to increase their R&D expenditures once these patents became unavailable.[32] Other studies have demonstrated

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[31] *See, e.g.,* Robert M. Hunt, *Business Method Patents and U.S. Financial Services*, 28 Contemporary Economic Policy 322 (2010) (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1627385) (finding no evidence that the availability of business method patents in the wake of the *State Street Bank* decision had a positive effect on research intensity in the financial services sector).

[32] *See, e.g.,* Sridhar Srinivasan, *Do Weaker Patents Induce Greater Research Investments?* (December, 2018) (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3185148) (finding that firms that had previously sought patent protection for business methods decreased patenting while increasing R&D investment as a result of the *Alice* decision).

that patents on financial methods are vastly more likely to be asserted in litigation and on average impose substantially more economic and social costs than a typical patent.[33]

In sum, there is evidence that business method patents decrease incentives to innovate and impose disproportionate costs on third parties, while there is no countervailing evidence of any substantial positive impact. Accordingly, it seems clear that their decreased availability has net positive effects and that their exclusion is a socially beneficial policy rather than a problematic gap in the availability of patent protection that needs to be remedied.

E. Conclusion

In general, HTIA and its members believe that the Supreme Court's eligibility decisions and the current patent eligibility jurisprudence more generally are consistent with the fundamental purpose of the patent system and provide substantial benefits to innovation and economic efficiency. Within the tech industry, the positive impacts associated with decreased litigation costs, legal risk, and potential for business disruptions associated with litigation vastly outweigh any costs or minor inconveniences associated with the *Alice* test or other features of current jurisprudence.

[33] *See, e.g.,* Joshua Lerner, *The Litigation of Financial Innovations*, 53 The Journal of Law & Economics 807 (2010) (finding that financial patents were litigated at a rate 27 to 39 times greater than that of other patents).

Part 2: Specific topics for public comment enumerated in the USPTO's Request for Information

1. Please explain how the current state of patent eligibility jurisprudence affects the conduct of business in your technology area(s). Please identify the technology area(s) in your response.

Please see general discussion and observations above.

2. Please explain what impacts, if any, you have experienced as a result of the current state of patent eligibility jurisprudence in the United States. Please include impacts on as many of the following areas as you can, identifying concrete examples and supporting facts when possible:

a. Patent prosecution strategy and portfolio management

HTIA members have experienced no significant difficulties in prosecution or portfolio management or diminution in the availability of patent protection for inventions in their respective technology areas. The increased incentives to more fully disclose the invention and to seek marginally narrower claims are the most notable effects with respect to prosecution practice and strategy. On balance, this has resulted in clearer patents that more fully support the disclosure function of the patent system. The *Bilski* and *Alice* decisions have also brought the scope of patent eligible subject matter and the level of detail required in disclosing the invention much closer to that of other major offices, such as the European Patent Office, potentially enabling minor additional efficiencies in application and prosecution. In HTIA members' experience, Section 101 rejections have not increased substantially, and when such a rejection occurs it can typically be overcome with reasonable claim amendments. The current jurisprudence does not appear to have had any significant impact on the overall costs of obtaining patent protection. Nor has it substantially decreased the availability of patent protection. Overall, members have experienced no significant negative impact on prosecution and have observed improvements in the specificity and quality of issued patents.

In new and fast-evolving technologies such as quantum computing and artificial intelligence, HTIA would urge the USPTO to apply Section 101 in a manner consistent with the controlling Supreme Court precedents. In addition, for these technologies, HTIA would also urge the USPTO to more rigorously apply the requirements of Section 112 to ensure that future inventions in these new fields are not unduly foreclosed. The USPTO plays a key role as gatekeeper in ensuring that an initial disclosure is adequate to support the requested claims.

b. Patent enforcement and litigation

HTIA members have experienced no significant impact with respect to patent enforcement. It seems likely that the potential for early disposition of litigation has had a small positive effect on litigation costs, but it is not feasible to confirm the existence of such benefits or to estimate their magnitude. In members' experience, high-quality patents that reflect legitimate technological innovation are still being successfully enforced.

c. Patent counseling and opinions

No significant impact.

d. Research and development

HTIA includes the top five corporate funders of R&D in the U.S. and four of the top five R&D funders in the world. Most of the R&D conducted by HTIA members focuses on technology areas that are among the most affected by the changes in jurisprudence. Despite this, HTIA member companies have not experienced any perceptible diminution in incentives to engage in innovative activities. To the contrary, HTIA members have more than doubled their collective investment in R&D since *Alice*, from $70.3 billion in 2014 to $145.6 billion in 2020.

This is consistent with the strong growth in R&D more generally. In the 12 months prior to the *Alice* decision, R&D spending by the software and Internet industry was a healthy 16.5 percent.[34] During the year ending on June 30, 2015 (which roughly corresponds to the 12 months after *Alice*) the software and internet industry had the highest R&D growth rate of any industry, at 27 percent.[35] This trend continued in subsequent years, with the computer and software companies outperforming all others with respect to R&D.[36]

e. Employment

No impact.

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[34] See PwC, *The 2014 Global Innovation 1000* at 3.
[35] PwC, *The 2015 Global Innovation 1000: Innovation's New World Order* at 13; https://www.pwc.com/gr/en/publications/2015-global-innovation-1000.pdf.
[36] PwC, *2017 Global 1000* ("Continuing the tradition of recent years, computer and software industries still shine in the R&D stakes, outperforming all other organisations in terms of billions spent."); https://www.pwc.com.au/digitalpulse/report-2017-global-innovation-1000.html.

f. Procurement

No impact.

g. Marketing

No perceived impact.

h. Licensing of patents and patent applications

Patent eligibility jurisprudence has not had any significant discernable impact on HTIA members with respect to either inbound or outbound patent licensing.

i. Product development

HTIA members have experienced no negative impact on product development due to eligibility jurisprudence. However, changes to Section 101 jurisprudence have likely resulted in a small reduction in legal risk associated with launch of new products and features, which has had a small but positive impact on product development.

Additionally, the decrease in business disruptions association with patent litigation has also benefitted product development efforts. Unlike some other types of commercial litigation, patent infringement litigation often has a direct impact on senior technical personnel who are directly engaged in R&D work. Patent infringement disputes generally involve a commitment of at least some engineering resources to the litigation itself, and further technical resources are often expended in efforts to design around an asserted patent for purposes of reducing the business and liability risk presented by an infringement case. Prior to the *Alice* decision, large technology companies were commonly defending dozens – and sometimes hundreds – of patent cases at any given time. Such litigation produced substantial costs, pulled engineers away from working on innovation, and diverted development resources into litigation. Not only does this harm innovation, but the substantial costs reduce a company's return on R&D investments and are often passed on – at least in part – to consumers in the form of higher prices. Lower returns on investment decrease the incentive to engage in product development and generally reduce the resources available to do so.[37]

[37] *See* Filippo Mezzanotti, *Roadblock to Innovation: The Role of Patent Litigation in Corporate R&D* (July 22, 2020), https://www.kellogg.northwestern.edu/faculty/mezzanotti/documents/innovation.pdf (reporting on empirical study demonstrating that patent litigation negatively affects investment because it lowers the returns from R&D and increases financing constraints). HTIA members are among the defendants who are most frequently sued for infringement of patents that purport to relate to critical emerging technologies such as AI. *See, e.g., WIPO*

j. Sales, including downstream and upstream sales

As discussed above, third-party studies have found that *Alice* was associated with increased sales by some.[38] However, it is unclear whether increased sales by HTIA members are causally related to patent eligibility jurisprudence.

k. Innovation

HTIA members believe that section 101 jurisprudence has generally benefitted innovation by both large and small entities. Innovation cannot be directly measured or quantified. However, investment in R&D is generally considered to be a reliable proxy for innovation. As discussed above, investment in R&D both by HTIA members and by the tech industry more generally has grown rapidly in the wake of *Alice.* Further, as discussed above, the reduced availability of business method patents has increased incentives to innovate, resulting in increased investment in R&D. Lastly, HTIA members believe that *Alice* and its progeny have appropriately resulted in patent protection being more consistently reserved for genuine technological advances, which has increased incentives to engage in technological innovation and the overall effectiveness of the patent system in fulfilling its core mission of promoting progress in the "useful arts."

3. Please explain how the current state of patent eligibility jurisprudence in the United States impacts particular technological fields, including investment and innovation in any of the following technological areas:

a. Quantum computing

HTIA members include several of the world's leaders and largest funders of R&D in quantum computing.[39] Multiple HTIA members are among the small handful of organizations that have successfully developed a working quantum processor or that will provide commercial

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Technology Trends 2019, at 117 (showing that seven of the twenty defendants most sued on AI patents are HTIA members). As such, the decrease in diversion of resources and in distractions caused by litigation has had a significant and direct benefit on HTIA members' ability to engage in product development in these key technology areas.

[38] *Id.* at 3.

[39] *See* https://quantumcomputingreport.com/public-companies/; https://en.wikipedia.org/wiki/List_of_companies_involved_in_quantum_computing_or_communication.

access to quantum computing to customers. And HTIA members include two of the eight largest corporate owners of quantum computing patents issued by USPTO.[40]

As leading companies in this field, HTIA members do not believe the current eligibility jurisprudence presents an obstacle to obtaining appropriate patent protection. While only a small number of quantum computing patents have been issued to date, nearly a quarter of these have been issued to HTIA members, making HTIA uniquely qualified to comment on this question. HTIA members have not perceived any negative impact of changes to the jurisprudence in question with respect to research, innovation, or investment in quantum computing. To the contrary, HTIA strongly believes that *Alice* and its progeny have encouraged greater innovation and investment in this area. This view is supported by the substantial growth in R&D investment in this area and the rapid increase in the number of quantum computing patents issued by the USPTO in recent years.[41]

HTIA is not alone in this view. While HTIA believes that current levels of patent protection are appropriate, some experts argue that the overlapping protection that is available under current IP regimes poses a risk to innovation in quantum computing and that reducing IP protection would further increase innovation in this area.[42]

b. Artificial Intelligence (AI)

HTIA members are global industry leaders in artificial intelligence and are also among the largest owners of AI patents.[43] HTIA members have not perceived any negative impact from changes to Section 101 jurisprudence on research, innovation, or investment in artificial intelligence. To the contrary, *Alice* and its progeny have encouraged greater innovation and investment in this area.

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[40] Brian S. Haney, *Quantum Patents*, 27 B.U. J. Sci. & Tech. L. 91 (2020), https://ssrn.com/abstract=3554925.

[41] See Brian S. Haney, *Quantum Patents*, 27 B.U. J. Sci. & Tech. L. 64, 89 (2020) (finding that annual issuances of quantum computing patents by the USPTO more than doubled in 2018 and almost tripled in 2019); https://ssrn.com/abstract=3554925.

[42] *See, e.g.,* Mauritz Kop, *Quantum Computing and Intellectual Property*, Berkeley Technology Law Journal, Vol. 35, No. 3 (2021) (proposing that reducing duration of IP protection to between 3 to 10 years would increase innovation in quantum computing and artificial intelligence); https://ssrn.com/abstract=3860456.

[43] *See, e.g.,* World Intellectual Property Organization, *WIPO Technology Trends 2019: Artificial Intelligence*, at 60 (2019) ((listing three HTIA members among the top ten patentees in artificial intelligence); https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf.; *id* at 65 (listing an HTIA member company as one or both of the two top patentees in more than 30 AI technology subcategories); *id.* at 68 (listing HTIA members as one of the two top patentees in most AI fields of application); Brian S. Haney, *AI Patents: A Data Driven Approach*, 19 Chi.-Kent J. Intell. Prop. 407, 425 (2020) (listing six HTIA members among the top twelve corporate owners of deep learning patents); https://ssrn.com/abstract=3527154; *id.* at 434 (listing four HTIA members among the top ten owners of reinforcement learning AI patents); *id.* at 444 (listing one HTIA member company among the top four owners of deep reinforcement learning patents); *id.* at 454 (listing four HTIA members among the top ten owners of natural language processing patents).

HTIA members are not alone in the view that current 101 jurisprudence poses no threat to AI innovation or that an expansion of patent eligible subject matter is likely to do more harm than good.[44] Further, HTIA members believe that AI is an area in which applying the proper scrutiny on 35 U.S.C. § 112 issues as discussed above is particularly important.

c. Precision medicine

HTIA members do not have significant expertise in this area.

d. Diagnostic methods

HTIA members do not have significant expertise in this area.

e. Pharmaceutical treatments

HTIA members do not have significant expertise in this area.

f. Other computer-related inventions (e.g., software, business methods, computer security, databases and data structures, computer networking, and graphical user interfaces).

HTIA members are global leaders in many of the technology fields related to computers and computing. HTIA includes four of the ten largest technology companies in the world;[45] four of the top six software companies;[46] four of the top ten U.S.-based suppliers of computer hardware;[47] two of the top ten 5G network infrastructure providers;[48] and the two largest semiconductor companies in the world.[49]

In HTIA members' experience, the impact of changes to eligibility jurisprudence in computer-related fields of technology has been generally consistent with the impact in

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[44] *See* Asay, Clark D., *Artificial Stupidity*, 61 William & Mary Law Review 1187 (2020) (arguing that expanding patent eligible subject matter is unlikely to be beneficial and "may actively harm AI innovation"), https://ssrn.com/abstract=3399170; Peter R. Slowinski, Rethinking Software Protection (June 1, 2020). Draft chapter. Forthcoming in: J.-A. Lee, K.-C. Liu, R. M. Hilty (eds.), *Artificial Intelligence & Intellectual Property*, Oxford, Oxford University Press, 2020 (noting "anecdotal evidence suggesting that patent protection may not be required" and patent protection "may be detrimental if it covers basic concepts of AI"); https://ssrn.com/abstract=3708110.

[45] https://en.wikipedia.org/wiki/List_of_largest_technology_companies_by_revenue.

[46] https://en.wikipedia.org/wiki/List_of_the_largest_software_companies.

[47] https://www.thomasnet.com/articles/top-suppliers/computer-hardware-companies/.

[48] https://www.crn.com/slide-shows/networking/gartner-s-top-10-global-5g-network-infrastructure-companies/1.

[49] https://www.statista.com/statistics/283359/top-20-semiconductor-companies/.

narrower fields of emerging technology such as AI and quantum computing. Overall, the changes have resulted in increased investment in R&D, stronger incentives to innovate, and increased availability of resources to devote to productive commercial activities.

There has not been a significant diminution in the availability of patent protection as a result of changes in eligibility jurisprudence. While Section 101 rejections increased in the wake of *Alice*, most of that increase is attributable to rejections of business method claims.[50] While applicants in a few software-related art areas have experienced increased challenges in the wake of *Alice*, the current jurisprudence has predominantly affected business methods. The decreased availability of patents directed to business methods and other abstract ideas has benefitted innovation and has increased investments in R&D.

There is no evidence that issuance of business method patents has a positive impact on industry participants or on innovation.[51] In fact, business method patents actively harm incentives to innovate, and the reduced patenting of business methods has *increased* R&D investments by technology companies. The decrease in business method patenting not only benefitted firms at risk of being sued for infringement but has also increased R&D investment by firms that themselves have a high propensity to obtain business method patents (i.e., firms most likely to be owners of business method patents). There is also ample evidence that business method patents are vastly more likely to impose significant litigation costs and business risk on practicing entities. For example, one study found that financial patents were litigated at a rate 27 to 39 times greater than that of other patents.[52] In sum, while the current Section 101 jurisprudence has resulted in reduced availability of patent protection for business methods, this has benefitted rather than harmed technological innovation, which is the principal goal of the patent system.

4. Please explain how your experiences with the application of subject matter eligibility requirements in other jurisdictions, including China, Japan, Korea, and Europe, differ from your experiences in the United States.

HTIA focuses on U.S. patent policy and is not in a position to provide a detailed comparison of the application of subject matter eligibility by the major patent offices. However, at a high level, HTIA would note that due to its fairly radical departure from traditional limits on statutory subject matter starting in the 1990s, the U.S. was an outlier with respect to the scope of patent

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[50] Colleen Chien and Jiun Ying Wu, *Decoding Patentable Subject Matter*, 2018 Patently-O Patent L.J. 1 (2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3267742. Outside of computer-implemented business methods, "the vast majority of inventions examined by the office are not significantly impacted by 101."

[51] *See, e.g.*, Hunt, *supra* note 31 (finding no evidence that the availability of business method patents in the wake of the *State Street Bank* decision had a positive effect on research intensity in the financial services sector).

[52] Lerner, *supra* note 33.

eligible subject matter during the 1990s and – in many ways – until the *Bilski*, *Mayo*, and *Alice* decisions. These decisions have resulted in the scope of statutory subject matter in the U.S. being substantially more consistent with the scope of patent eligibility in other jurisdictions. In general, other jurisdictions require innovation to be "technical" in nature, and most exclude categories of abstract subject matter such as scientific discoveries, mathematical formulas, presentations of information, and pure business methods. While practices in the various patent offices may differ, they generally produce similar outcomes. In sum, the scope of eligible subject matter defined in current USPTO guidance is relatively consistent with the scope of statutory subject matter in these other jurisdictions and is substantially more aligned with the requirements imposed by other patent regimes than in the decades prior to *Bilski* and *Alice*.

5. Please 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. Please provide specific examples, such as the technology(ies) and jurisdiction(s) involved, and the reason the invention was held ineligible in the United States or other jurisdiction.

As noted briefly above in our general observations and discussion, many of the claims that patent applications are being routinely rejected based on ineligibility by the USPTO but granted by other offices are speculative, overblown, or simply inaccurate. In particular, commenters are likely to offer the conclusions of a particular academic article as "proof" that this is happening and that this supposed trend is undermining U.S. leadership in innovation. [53] Unfortunately, the study that is most frequently cited by proponents of this theory is deeply flawed and inaccurate in its findings, as demonstrated by a review of a random sampling consisting of 10 percent of the cases cited in the Madigan and Mossoff article.[54] That independent review found that in nearly a quarter of the applications cited as having been abandoned due to Section 101, there was *no* rejection relating to patent eligibility pending at the time of abandonment.[55] A further 61 percent of applications had multiple rejections – not just an eligibility rejection – pending, making it purely speculative that the application was abandoned due to a Section 101 rejection.[56] Ultimately, it was found that "only 15 percent of [the cited] applications faced a sole, eligibility-related § 101 rejection when they were

[53] Kevin Madigan & Adam Mossoff, *Turning Gold to Lead: How Patent Eligibility Doctrine is Undermining U.S. Leadership in Innovation*, 24 Geo. Mason L. Rev. 939 (2017).
[54] Abby Rives, *A Brief Case Study in Policy-Relevant Empirical Assessments: The Shortcomings of Counting Patent Grants by Country to Inform Patent Eligibility in The U.S.*, Engine Advocacy (2021), https://static1.squarespace.com/static/571681753c44d835a440c8b5/t/6165c59179b6af76135e53cf/1634059665361/2021.10.12_Case+Study+on+Patent+Data.pdf.
[55] *Id.* at 1.
[56] *Id.* at 1-2.

abandoned."[57] And even for this small minority of applications where there was a sole eligibility rejection pending, it is unclear that that the eligibility rejections caused an abandonment. In some cases, related applications were allowed or are still pending, which means that the applicant has or may be granted a patent on the invention. For the remainder, it is not clear that the eligibility-related rejection could not have been overcome with claim amendments, leading to an allowance. Finally, consistent with the discussion below in response to question 6, many of the abandoned applications were from foreign – rather than domestic – inventors and are thus incapable of enhancing "U.S. leadership in innovation." These flaws are fatal to any claim that the original study "proves" anything at all with respect to any potential effect on U.S. innovation.

6. Please 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 jurisdiction. If so, please identify the relevant modifications and their associated impacts.

The current state of patent eligibility jurisprudence in the U.S. has not caused any HTIA member company to modify or shift investment, research and development activities, or jobs from the United States to other jurisdictions, or vice versa. As discussed above, neither the scope of patent eligibility in a particular country or the strength of the national patent system more generally is capable of creating any significant incentive to locate investment, R&D activities, or jobs in that country.

As a result of obligations under the TRIPS agreement, in particular the principle of national treatment and the prohibition against discrimination based on place of invention, neither the location in which R&D is conducted or the residence of the person or company seeking to patent the resulting invention affects the entitlement to patent protection in any of the TRIPS member countries. This means that it is impossible to gain any advantage with respect to obtaining patent protection by changing the location of R&D activities or the national residence of the inventor or company seeking such protection. Therefore, unless a member country is violating its obligations under TRIPS by discriminating against foreign nationals, differences among national patent systems cannot create an incentive to move R&D activities, jobs, or corporate residence to that country.

If disparities in patent eligibility among national patent systems were in fact creating an incentive to relocate investment, R&D, or corporate residence from the U.S. to other countries, it would nevertheless be impossible to address this problem by means of changes to patent

[57] *Id.* at 2.

eligibility in the U.S. In most cases, the only effective mechanism for addressing this type of problem is the process provided by the TRIPS agreement itself.

Because the majority of U.S. patents are issued to foreign entities, it is largely impossible for the U.S. to address a competitive disadvantage by expanding the scope of patent eligibility or by means of any other unilateral change to its patent laws. Any expansion in U.S. patent eligibility will more frequently benefit foreign patent applicants and owners than U.S. citizens. As a result, foreign entities will receive a proportionally greater share of the benefits of any favorable change to U.S. patent law, precluding any possibility of gaining a competitive advantage by unilateral alterations to U.S. patent law.

Although it is impossible for a country like the U.S. to improve its relative competitiveness by expanding patent eligibility or otherwise "strengthening" patent rights, it is entirely possible for the U.S. to harm its competitiveness by doing so. Similarly, under the TRIPS agreement, such changes are incapable of creating an incentive to move R&D, employees, or other resources to the U.S. from another jurisdiction. However, there is nothing that prevents changes to patent law from creating an incentive to transfer R&D or employees out of the U.S.

Because U.S. patents can only be asserted within the U.S., virtually all the additional legal costs and business risks that result from changes to provide more patents or stronger patent rights falls on commercial activity in the U.S. These additional litigation costs, liability, and business risks place U.S. companies at a competitive disadvantage relative to their foreign competitors and create incentives for them to offshore business activities and associated jobs. In most cases, a portion of these additional costs would also be passed along to U.S. consumers in the form of higher prices. In sum, an expansion of patent eligibility cannot increase U.S. competitiveness. Rather, such an expansion would place U.S. businesses at a competitive disadvantage, decreasing U.S. employment and the domestic production of goods and services, while increasing consumer prices, which would substantially *harm* the international competitiveness and domestic economy of the U.S.

Anecdotal evidence strongly supports this conclusion. There are no examples of companies moving jobs or R&D to a particular jurisdiction to gain an advantage with respect to patent protection because the TRIPS national treatment/most-favored-nation provisions make that impossible. However, multiple examples exist of companies moving jobs and facilities *out* of a jurisdiction to avoid being subjected to disproportionately high legal costs and liability risk associated with excessive IP protection, litigation, or enforcement. This is particularly true for businesses such as semiconductor manufacturing that involve large capital investments, the productivity of which is threatened by aggressive patent assertion. Excessive patenting and aggressive patent assertion will deter such businesses from locating manufacturing facilities in the U.S., while a balanced patent system will encourage them to do so.

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). If so, please identify the changes and their associated impacts.

Patent eligibility jurisprudence has not led to any significant change in business strategies for IP protection for HTIA members.

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. If so, please describe how you changed your behavior.

Please see discussion in general observations above and in response to question 2.a.

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 in which you been involved as a party, as legal counsel, or as another participant (e.g., an expert witness). For example, please explain whether this jurisprudence has affected the cost or duration of such litigation, the ability to defend against claims of patent infringement, the certainty/uncertainty of litigation outcomes, or the likelihood of settlement.

The impact of patent eligibility jurisprudence in litigation has been strongly positive, decreasing litigation costs and allowing early disposition of cases.

10. Please 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.

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

See initial comments and response to question 12.

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 any of the following areas: Quantum computing; artificial intelligence; precision medicine; diagnostic methods; pharmaceutical treatments; and other computer-related inventions (e.g., software, business methods, computer security, databases and data structures, computer networking, and graphical user interfaces).

Intellectual property is territorially bounded. United States patents can generally only be asserted within the U.S., so they technically have no "global" strength. To the extent this topic is intended to inquire about whether the promise of a U.S. patent provides incentives outside the country to engage in inventive activities, there is no question that it does. As discussed above, the majority of U.S. patents are granted to foreign inventors, indicating that the strength of the incentives provided abroad by the U.S. system are more than adequate.

To the extent this is requesting information regarding the strength of patent protection in the U.S. relative to the strength of patent protection in other countries, there is no accepted or standard measure of such strength. However, HTIA notes that organizations that purport to measure the relative strength of the U.S. IP system rank the overall it as the strongest in the world and the U.S. patent system as tied for the second strongest.[58] It is worth noting that that the only country ranked above the U.S. with respect to its patent system is Singapore, which has a relatively small economy and is not considered a serious economic or competitive threat to the U.S. The U.S. Chamber of Commerce rankings also refute claims that eligibility jurisprudence has somehow elevated China to be a more attractive patent system than the U.S. China ranks close to the middle of the pack among the nations ranked, with more than 20 countries (including the U.S.) ahead of it.[59]

With respect to the impact on particular technologies and the U.S. economy, as discussed above, the evidence indicates that *Bilski* and *Alice* have been unambiguously positive for R&D, innovation, and economic growth in the technology markets that HTIA members participate in, including AI, quantum computing, and other computer-related fields. The data also suggest that the impact has been positive on the U.S. economy as a whole. Thus, if "global strength" is measured based on whether changes to eligibility have supported increased innovation and economic growth and the impact on the U.S. as a whole (instead of on patent owners as a special interest class), the effects have unquestionably been positive, strengthening both the U.S. patent system and the U.S. economy.

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[58] U.S. Chamber of Commerce, *2020 International IP Index* (2020); https://www.uschamber.com/report/2020-international-ip-index.

[59] *Id.* at 11.

13. Please identify how the current state of patent eligibility jurisprudence in the United States affects the public. For example, does the jurisprudence affect, either positively or negatively, the availability, effectiveness, or cost of personalized medicine, diagnostics, pharmaceutical treatments, software, or computer-implemented inventions?

HTIA believes that, in general, the current patent eligibility jurisprudence positively affects the availability, effectiveness, and cost of software-related and other computer-implemented inventions.