

The USPTO's Sisyphean Plan: Increasing Manpower Will Not Match Artificial Intelligence's Inventive Capabilities*

And I saw Sisyphus at his endless task raising his prodigious stone with both his hands. With hands and feet he tried to roll it up to the top of the hill, but always, just before he could roll it over on to the other side, its weight would be too much for him, and the pitiless stone would come thundering down again on to the plain. Then he would begin trying to push it uphill again, and the sweat ran off him and the steam rose after him.¹

Introduction

Thomas Edison, Alexander Graham Bell, and Artificial Intelligence (AI) systems have all changed the world through inventing and innovating. Edison and Bell amassed large patent portfolios, but shockingly, the United States Patent and Trademark Office (USPTO) has issued a growing number of patents for inventions developed by AI.² In addition, patent applications on AI systems are “growing exponentially.”³ A combination of these AI systems, which are capable of inventing, and the exponential increase in their numbers will lead to substantially more patent applications. AI's innovative capabilities have never before had as great an opportunity to directly affect the U.S. and world economies, and its capabilities will only continue to grow.

Additionally, it should come as no surprise that this paradigm-shifting technology is experiencing unprecedented investment. Businesses already

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1. HOMER, *THE ODYSSEY* 11.13 (Samuel Butler trans., 1900), <http://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.01.0218:book=11:card=13&highlight=sisyphus> [<https://perma.cc/LSSG-93F5>].

2. Ryan Abbott, *I Think, Therefore I Invent: Creative Computers and the Future of Patent Law*, 57 B.C. L. REV. 1079, 1083–85 (2016) (pointing to several examples of computers creating patentable inventions, such as “The Creativity Machine,” which “is credited with numerous . . . inventions [such as] the cross-bristle design of the Oral-B CrossAction toothbrush, new super-strong materials, and devices that search the Internet for messages from terrorists, among others”).

3. Michael Hoffman, *Artificial Intelligence Patents Growing Exponentially*, LINKEDIN (Dec. 14, 2016), <https://www.linkedin.com/pulse/artificial-intelligence-patents-growing-exponentially-michael-hoffman?trk=prof-post> [<https://perma.cc/GJP5-B8FL>] (charting the exponential growth of “issued patents and published patent applications that involve Artificial Intelligence”).

depend on artificial intelligence in a diverse array of operations.⁴ Multiple billionaires are investing at record levels in AI technologies and startups.⁵ For example, Mark Cuban, renowned billionaire, *Shark Tank* investor, and owner of the Dallas Mavericks, predicts “the world’s first trillionaires will actually be entrepreneurs working with artificial intelligence.”⁶ These two factors—AI’s innovative capability and the market’s investment in AI—have set the stage for monumental innovation.

The U.S. government must prepare for this enhanced innovation, and there are already efforts underway. In 2016, for example, President Obama’s administration announced the formation of a new Subcommittee within the National Science and Technology Council (NSTC) to specialize in Machine Learning and Artificial Intelligence to help coordinate federal activity in relation to AI.⁷ Considering the current debate on implementing, developing, and researching lethal autonomous weapons systems (LAWS)⁸ and regulating en masse implementation of autonomous vehicles on our highways,⁹ it is clear that a Presidential Administration must prepare for AI.

This Note focuses on a unique agency of the Executive Branch, specifically the U.S. agency responsible for fulfilling Article I, Section 8, Clause 8 of the Constitution: “To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.”¹⁰ This is, of course, the USPTO. On the agency’s website, the USPTO’s “About Us” page states:

4. *Deep Interest in AI: New High in Deals to Artificial Intelligence Startups in Q4’15*, CB INSIGHTS (Feb. 4, 2016), <https://www.cbinsights.com/research/artificial-intelligence-startup-funding-trends/> [https://perma.cc/52QR-5G2X] (providing data on financing and investment in artificial intelligence); Ariana Eunjung Cha, *Watson’s Next Feat? Taking on Cancer*, WASH. POST (June 27, 2015), http://www.washingtonpost.com/sf/national/2015/06/27/watsons-next-feat-taking-on-cancer/?utm_term=.7bd494060939 [https://perma.cc/Q4WE-3FRJ] (elaborating on Watson’s use in cancer-patient treatment).

5. Erin Griffith, *It’s Time to Take AI Seriously*, FORTUNE (Feb. 17, 2017), <http://fortune.com/2017/02/17/ai-artificial-intelligence-investment/> [https://perma.cc/JAE4-54ZJ] (reporting that venture capitalists invested \$5 billion in 658 companies in 2016, which is a 61% increase from 2015).

6. Catherine Clifford, *Mark Cuban: The World’s First Trillionaire Will Be an Artificial Intelligence Entrepreneur*, CNBC (Mar. 13, 2017), <http://www.cnbc.com/2017/03/13/mark-cuban-the-worlds-first-trillionaire-will-be-an-ai-entrepreneur.html> [https://perma.cc/E783-T39U].

7. Ed Felten, *Preparing for the Future of Artificial Intelligence*, WHITE HOUSE: PRESIDENT BARACK OBAMA (May 3, 2016), <https://obamawhitehouse.archives.gov/blog/2016/05/03/preparing-future-artificial-intelligence> [https://perma.cc/63GD-FXH3].

8. *Background—Lethal Autonomous Weapons Systems*, U.N. OFF. GENEVA, [http://www.unog.ch/80256EE600585943/\(httpPages\)/8FA3C2562A60FF81C1257CE600393DF6?OpenDocument](http://www.unog.ch/80256EE600585943/(httpPages)/8FA3C2562A60FF81C1257CE600393DF6?OpenDocument) [https://perma.cc/LPP9-RJQU].

9. Alex Davies, *Congress Could Make Self-Driving Cars Happen—or Ruin Everything*, WIRED (Feb. 15, 2017), <https://www.wired.com/2017/02/congress-give-self-driving-cars-happen-ruin-everything/> [https://perma.cc/9B97-23VY].

10. U.S. CONST. art. I, § 8, cl. 8.

The *strength and vitality of the U.S. economy* depends directly on effective mechanisms that protect new ideas and investments in innovation and creativity. The continued demand for patents and trademarks underscores the ingenuity of American inventors and entrepreneurs. *The USPTO is at the cutting edge of the nation's technological progress and achievement.*¹¹

Because the USPTO is at the “cutting edge” of this “nation’s technological progress and achievement” and because the “strength and vitality of the U.S. economy” is directly affected by the USPTO’s mechanisms, the next pertinent question becomes: How is the USPTO planning for AI?

This Note is divided into four parts. Part I discusses major problems faced by the USPTO—a patent application backlog, issues with patent quality, and growing pains from a complete overhaul of the patent system—that will be exacerbated by AI-driven innovation and why these issues have severe repercussions for the global economy. Part II discusses the USPTO’s plans and mechanisms to handle these issues and why those same plans are ineffective to handle a growing amount of unanticipated, AI-driven patent applications. Part III examines other proposals for how the USPTO should address AI-driven innovation and explains why these recommendations are ill-advised. Part IV provides three recommendations for the USPTO to plan for AI-driven innovation: (1) involve the public in these discussions so Congress can act; (2) encourage Congress to fund research for integrating AI into the USPTO as a pilot program for other federal agencies; and (3) in the meantime, urge the USPTO to self-fund AI research and development using the new fee-setting authority it received from the Leahy-Smith America Invents Act (AIA).

I. USPTO’s Current Problem—A Backlog of Patent Applications

The USPTO has a major backlog problem. As previously discussed, the USPTO and the U.S. government must implement laws and policies to drive innovation because “[t]he strength and vitality of the U.S. economy depends” on it.¹² Innovation is an undisputed key-driver of economic growth.¹³ And

11. *About Us*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/about-us> [<https://perma.cc/97E4-L2QB>] (emphasis added).

12. *Id.*

13. Abby Joseph Cohen, *Innovation and Economic Growth*, GOLDMAN SACHS GROUP, INC., 2011, at 4, www.goldmansachs.com/our-thinking/archive/archive-pdfs/gsr.pdf, [<https://perma.cc/8G6G-TK7Y>] (“The role of innovation has been critical to economic development as the nation has evolved over the decades. There is a clear statistical link between innovation and gains in the standard of living.”); Dr. Patrick Gallagher, *Innovation as a Key Driver of Economic Growth & Competitiveness*, NAT’L INST. STANDARDS & TECH. (June 20, 2012), <https://www.nist.gov/speech-testimony/innovation-key-driver-economic-growth-competitiveness> [<https://perma.cc/G2QB-N78V>]; Nathan Rosenberg, *Innovation and Economic Growth*, in *INNOVATION AND GROWTH IN*

the USPTO was created to foster and drive innovation. A backlog at the USPTO actually slows innovation, which is a problem for the U.S. and world economies.¹⁴

There is evidence that the patent backlog has been reduced since the passing of the AIA, but there is still concern for the current USPTO's backlog. In 2016, Director Lee proudly announced that the patent backlog and pendency levels were lower than they had been in more than a decade and that the Agency expected the patent backlog and pendency levels to continue to decrease.¹⁵ However, commentators still stress the “crippling backlog of applications facing the [USPTO].”¹⁶ Moreover, there are greater efforts of automating innovation; for instance, the White House also advocated for AI systems by recommending greater automation in science and technology. Under the Obama Administration, the White House released a report stating:

AI systems can assist scientists and engineers in reading publications and patents, refining theories to be more consistent with prior observations, generating testable hypotheses, performing experiments using robotic systems and simulations, and engineering new devices and software.¹⁷

The push for greater innovation and automation of scientific study will lead to a greater number of patent applications than expected, and this is a great concern for the U.S. and world economies.

Schultz & Madigan's article explains the negative repercussions that a country would face with an excessive delay caused by a patent backlog. Their

TOURISM 43, 43 (Org. for Econ. Co-operation & Dev., 2006), <https://www.oecd.org/cfe/tourism/34267902.pdf> [<https://perma.cc/KN5A-3HPK>].

14. MARK SCHULTZ & KEVIN MADIGAN, CTR. FOR PROT. OF INTELL. PROP., *THE LONG WAIT FOR INNOVATION: THE GLOBAL PATENT PENDENCY PROBLEM* 8–9 (2016), <https://sls.gmu.edu/cpip/wp-content/uploads/sites/31/2016/10/Schultz-Madigan-The-Long-Wait-for-Innovation-The-Global-Patent-Pendency-Problem.pdf> [<https://perma.cc/SN5E-X5XB>]; see also *Data Visualization Center: Your Window to the USPTO: Patents Dashboard*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/dashboards/patents/main.dashxml> [<https://perma.cc/QE8K-DPEJ>] (tracking the current backlog within the USPTO).

15. Dorothy Atkins, *USPTO Director Touts Drop in Patent Application Backlog*, LAW360 (Oct. 28, 2016), <https://www.law360.com/articles/857169/uspto-director-touts-drop-in-patent-application-backlog> [<https://perma.cc/2WRQ-AFB8>].

16. Michael D. Frakes & Melissa F. Wasserman, *Reducing Patent Application Backlog to Improve Patent Quality*, BERKELEY TECH. L. J.: COMMENTARIES (Mar. 12, 2016), <http://btlj.org/2016/03/reducing-patent-application-backlog-improve-patent-quality/> [<https://perma.cc/B7F3-NRT2>].

17. NETWORKING & INFO. TECH. RESEARCH & DEV. SUBCOMM., NAT'L SCI. & TECH. COUNCIL, *THE NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH AND DEVELOPMENT STRATEGIC PLAN 10* (Oct. 2016), https://www.nitrd.gov/PUBS/national_ai_rd_strategic_plan.pdf [<https://perma.cc/VBU6-RPZY>] (citing R. D. King et al., *The Automation of Science*, 324 SCI. 85, 85–89 (2009)).

research expressly discusses three of these repercussions: (1) delay hurts entrepreneurs; (2) delay hurts consumers by delaying access to products; and (3) delay hurts society.¹⁸

For the first, startups are generally a “risky proposition,” and a patent can determine a substantial number of business decisions.¹⁹ They cite research performed within the Thomas Edison Innovation Fellowship that “[e]very year of delay reduces the startup’s employment and sales growth over the five years following its eventual approval by 21% and 28%, respectively.”²⁰ And, for every year of delay, “the startup’s chances of going public are reduced by half.”²¹ Therefore, patent delay and pendency is a direct indicator of a country’s support of entrepreneurs; the greater the patent application delay, the less a country supports entrepreneurs.

For the second, a patent delay also means product delay. Whether a lifesaving drug or beneficial technology, there has been a demonstrated link between weak patent protection and delayed availability of drugs.²² And this same link is also shown in high-tech products and patent rights.²³

For the third, a patent delay can impose “social costs.”²⁴ These costs include “lost jobs, lost products, and lost innovation.”²⁵ The UK Intellectual Property Office produced a report estimating the annual combined losses of backlog in the USPTO, Japan Patent Office, and the European Patent Office. They discovered that the backlog costs the global economy more than \$10 billion a year.²⁶

The USPTO has a major patent backlog problem, and AI has the potential to make it considerably worse. If the USPTO does not properly plan for the upcoming wave of AI-driven innovation, the added delay will hurt entrepreneurs, consumers, and society by delaying access to products.

II. AI’s Effect on the Backlog Problem

Before this Note proceeds further, it is important to define precisely what is meant by “AI” and what the current state of the art is for AI systems. The purpose of this brief introduction is to allow the reader to properly analyze AI’s effect on the USPTO’s backlog problem. This part proceeds in three different subparts. Subpart A defines what is meant by “AI.” Subpart B

18. SCHULTZ & MADIGAN, *supra* note 14, at 2–3.

19. *Id.* at 3.

20. *Id.*

21. *Id.*

22. *Id.*

23. *Id.*

24. *Id.*

25. *Id.*

26. *Id.*

analyzes the inventive capabilities of several existing AI systems. And subpart C examines how current, state-of-the-art AI will affect the USPTO.

A. *Defining “AI”*

A single definition of “AI” is difficult because it leads to a philosophical discussion of intelligence. This route of analysis will be unfruitful for purposes of this Note. There are, however, two generally accepted categories of AI, each of which allows for a better definition of AI and its current state. The first is artificial narrow intelligence (ANI). ANI is generally defined as any intellect below the cognitive performance of humans. And the second is artificial general intelligence (AGI). AGI is generally defined as any intellect at or above human-level performance.

ANI has existed for decades now. This type of cognitive ability is best exemplified by looking to programs and algorithms that are capable of beating human players in various games, such as checkers, backgammon, chess, and Scrabble.²⁷ Other examples with real-world importance include “hearing aids with algorithms that filter out ambient noise; route-finders that display maps and offer navigation advice to drivers . . . and medical decision support systems that help doctors diagnose breast cancer, recommend treatment plans, and aid in the interpretation of electrocardiograms.”²⁸ There are also “cleaning robots, lawn-mowing robots, rescue robots, surgical robots, and over a million industrial robots.”²⁹ All of these systems incorporate various forms of ANI.

AGI is distinct from ANI in that AGI is not tailored to narrow or specific sets of problems like ANI but is a system that has a “more generally applicable problem-solving capacit[y].”³⁰ All of the above-mentioned systems within ANI have components that may represent the infancy of AGI. For example, such components include classifiers, search algorithms, planners, solvers, and representational frameworks.³¹

MIT Media Lab director Joi Ito—while discussing AI with President Obama and *WIRED*’s editor-in-chief, Scott Dadich—predicted 2017 would be the year that a dialogue about AGI and its implementation within government and our society will begin, finally releasing it from its confinement in the computer-science realm.³²

27. NICK BOSTROM, *SUPERINTELLIGENCE: PATHS, DANGERS, STRATEGIES* 14–16 (2014).

28. *Id.* at 17–18.

29. *Id.* at 18.

30. *Id.* at 19.

31. *Id.*

32. *President Barack Obama on the Future of AI*, *WIRED* (Aug. 24, 2016) (video available at *The President in Conversation with MIT’s Joi Ito and WIRED’s Scott Dadich: Barack Obama*,

There are still no known AGI systems, but many companies are working towards such a system. One of the most publicly demonstrated near-AGI systems is IBM's Watson, which received great fame after defeating two human contestants on *Jeopardy!*.³³ Watson's developers believe that "hypothesis generation and scoring combined with deep natural language processing and machine-learning capabilities are what make Watson unique."³⁴ In other words, Watson is excellent at sifting through large amounts of data, providing active dialogue, allowing for different sources of unstructured information, providing evidence-based insights with weighted confidence, and providing a continuous learning capability.³⁵

Watson does have limitations, though, that are markers of a true AGI system. Two problems not suited for Watson, but which are certainly important for an AGI system, are performing predictive analysis and inductive reasoning. Watson is designed to "extract existing knowledge instead of creating new knowledge. It can only find candidate answers by comparing huge amounts of data and considering their statistical strength."³⁶ Most importantly to a true AGI system, Watson "cannot replace users in making judgments or decisions . . . or create an answer that is a deduction from multiple passages it finds."³⁷ In other words, predictive analysis and inductive reasoning are two tasks that are certainly important to AGI but that Watson cannot provide. As this Note progresses, though, the reader should think of Watson as an AGI, despite these limitations, only to serve as a real-world example. This Note will proceed with these two types of AI—ANI and AGI—and the reader should think to the above-cited examples as this Note proceeds.

B. AI's Current Inventive Capability

Now that AI has been defined for our purposes, the next step in Part II of this Note is to identify exactly how AI will exacerbate the USPTO's backlog problem. As mentioned earlier in the Note, AI is already inventing. Abbot's article, *supra*, discusses three specific AI inventors. The first is Watson, but there are two others as well.

Neural Nets, Self-Driving Cars, and the Future of the World, WIRED, <https://www.wired.com/2016/10/president-obama-mit-joi-ito-interview/> [<https://perma.cc/XXD3-RGX8>].

33. DELOITTE, DISRUPTION AHEAD: DELOITTE'S POINT OF VIEW ON IBM WATSON 5 (2015), <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/about-deloitte/us-ibm-watson-client.pdf> [<https://perma.cc/N5LP-X9BF>].

34. *Id.* at 18.

35. *Id.* at 19.

36. *Id.* at 22.

37. *Id.*

The first ANI inventor is called the Creativity Machine.³⁸ This AI is credited with numerous inventions, and one such invention is the cross-bristle design of the Oral-B CrossAction toothbrush.³⁹ The inventor of the Creativity Machine filed a patent on the Creativity Machine and later filed a second patent on it. Surprisingly, the inventor claims the Creativity Machine actually “invented” the second patent’s subject matter.⁴⁰

The second is the Invention Machine. This ANI is modeled after biological evolution—using so-called genetic programming. By 2010, genetic programming had delivered thirty-one instances of either creating a new patentable invention, infringing a previously issued patent, or duplicating a previously patented invention.⁴¹ In a 2006 article, the inventor of the Invention Machine stated that the AI “has even earned a U.S. patent for developing a system to make factories more efficient.”⁴²

If these examples of AI are known and inventing, then there are certainly other AIs that are capable of inventing as well. Given that it is in a company’s interest to develop intellectual property and protect it, and given the ease of copying software, these inventive AIs could be replicated and used by multiple companies or persons leading to an unprecedented amount of patentable subject matter and associated patent applications. Furthermore, these AI systems could collectively create significantly more patentable subject matter than a single person.

In addition, there is clear evidence that AI systems are continuing to be developed. Patents *for or related to* artificial intelligence systems are growing at an alarming exponential rate.⁴³ Thus, not only are companies inventing inventions, *companies are inventing inventors*.

Therefore, because there are known inventive AIs in existence and because patents on AI systems are growing at an exponential rate, then there are certainly a significant amount of patent applications that AI systems are responsible for. Accordingly, the number of these applications will continue to grow.

C. *How AI-Driven Innovation Will Exacerbate the USPTO’s Problems*

As the number of patent applications grows in volume with the increasing number of AI systems and the increasing capability of these AI

38. Abbott, *supra* note 2, at 1083–85.

39. *Id.* at 1085.

40. *Id.*

41. *Id.* at 1086.

42. Jonathon Keats, *John Koza Has Built an Invention Machine*, POPULAR SCI. (Apr. 19, 2006), <http://www.popsci.com/scitech/article/2006-04/john-koza-has-built-invention-machine> [https://perma.cc/MZJ6-B94H].

43. Hoffman, *supra* note 3.

systems, the USPTO will face an unanticipated, yet staggering, increase in patent applications. But there are three issues that will exacerbate problems faced by AI-driven innovation: (1) the USPTO's current plan; (2) existing business-driven incentives; and (3) long-standing patent quality problems.

For the first issue, the current USPTO plan is shockingly out of touch with this wave of innovation. The USPTO's 2014–2018 strategic plan is to hire more people to handle the growing backlog.⁴⁴ But as explained earlier, AI-innovators can be replicated at a significantly quicker pace than human innovators. If businesses are investing a greater amount in AI-innovators, the USPTO will not be able to solve the “crippling” backlog problem with more human examiners. Thus, hiring more examiners to process the existing patent backlog is an insufficient solution.

Second, there are incentives for businesses to file patent applications as early and as quickly as possible, inflaming the insufficiency of the USPTO's plan. The AIA transitioned the patent application process from a first-to-invent to a first-to-file system.⁴⁵ This new system, which pushes inventors to file first, will apply even greater pressure on businesses to file their patent applications as swiftly as possible.

Third, there is also a current crisis in patent quality. If the USPTO irresponsibly grants substandard patents, then these patents are also costly to the economy. London Economics performed an analysis on patent backlogs throughout the world and estimated that granting substandard patents can cost up to \$21 billion per year in economic losses *in the United States alone*; these losses result from “deter[ring] valid research and hav[ing] an additional deadweight loss from litigation and administrative costs of \$4.5 billion annually.”⁴⁶

Furthermore, there have been significant problems with patent quality in the past. Many within patent law are skeptical of the current trajectory of the USPTO in issuing defensible and appropriately protective patents.⁴⁷ This issue was so great that former Director Lee of the USPTO even released an op-ed piece published by Law360 to discuss the issue, stating:

44. U.S. PAT. & TRADEMARK OFFICE, 2014–2018 STRATEGIC PLAN 21 (2014), https://www.uspto.gov/sites/default/files/documents/USPTO_2014-2018_Strategic_Plan.pdf [<https://perma.cc/SU4C-3SF6>] [hereinafter STRATEGIC PLAN].

45. Leahy-Smith America Invents Act, Pub. L. No. 112–29, § 3, 125 Stat. 284, 285–86 (2011).

46. LONDON ECON., PATENT BACKLOGS AND MUTUAL RECOGNITION 44 (2010), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/328678/p-backlog-report.pdf [<https://perma.cc/P9VE-6KL3>].

47. See Gene Quinn & Steve Brachmann, *Michelle Lee's Views on Patent Quality Out of Touch with Reality Facing Patent Applicants*, IPWATCHDOG (Feb. 2, 2017), <http://www.ipwatchdog.com/2017/02/02/michelle-lees-patent-quality-reality/id=77158/> [<https://perma.cc/T8ET-KYYY>] (arguing that Director Lee of the USPTO “seems blind” to the issues regarding patent quality occurring during her tenure).

When I stepped into the role as head of the United States Patent and Trademark Office a couple of years ago, one of the things I frequently told audiences of stakeholders around the country was that I looked forward to working together to further strengthen our patent system. And that effort had to include a harder look at the issue of patent quality.⁴⁸

Despite reassurances from Director Lee, there are those that remain skeptical of the current trajectory, desiring “objective, independently verifiable metrics” from the USPTO to measure patent quality.⁴⁹

Therefore, these issues—a “crippling” patent backlog, incentivizing early filing, and the costly risk of prematurely granting patents—create a globally influential tension for the USPTO: (1) spend more time and resources on a patent’s examination to deter substandard patents but at the cost of potentially deterring innovation, or (2) spend less time and resources on a patent’s examination to incentivize a greater number of patent filings (i.e., innovation) but at the risk of granting substandard patents and thereby cutting off areas of research and increasing litigation costs.⁵⁰

III. Recommendations on How the USPTO Should Handle AI-Driven Innovation

This Part discusses how some scholars and practitioners have proposed the USPTO should address AI-driven innovation. It then discusses why, ultimately, these proposals will negatively influence the patent backlog issue, thereby bolstering the argument on why the USPTO should begin researching, developing, and implementing AI.

A. *Advocating for AI Rights at the USPTO*

In the article, *I Think, Therefore I Invent: Creative Computers and the Future of Patent Law*, Ryan Abbott contends for AI to be listed as an inventor on a patent application.⁵¹ Of course, he also demonstrates how that is possible, but the highlight of the article is that forcing companies to disclose AI as an inventor will lead to greater innovation.⁵² Thus, he continues, this

48. Michelle K. Lee, *Patent Quality Is Here to Stay*, LAW360 (Dec. 19, 2016), <https://www.law360.com/articles/871776/opinion-patent-quality-is-here-to-stay> [<https://perma.cc/2KVV-QK6A>].

49. Dennis Crouch, *Patent Quality: Where We Are*, PATENTLYO (Jan. 13, 2017), <https://patentlyo.com/patent/2017/01/patent-quality-where.html> [<https://perma.cc/Z2AH-Y427>].

50. *Id.*

51. Abbott, *supra* note 2, at 1081.

52. *Id.*

disclosure “incentivize[s] the development of creative machines consistent with the purpose and intent of the Founders and Congress.”⁵³

One of the reasons he says companies do not already do this is because of legal uncertainty. Companies are unsure whether listing AI will invalidate their patent.⁵⁴ In the second part of his paper, he concludes that “[o]n the basis of [the Copyright Office’s Human Authorship Requirement] analysis, and based on principles of dynamic statutory interpretation . . . computers should qualify as legal inventors.”⁵⁵

Although it may seem fantastical or otherwise nonsensical to display an AI system as an inventor, there is growing support for AI to receive these rights.⁵⁶ Many academics, businesses, and regulators are advocating to include an AI system as an inventor.⁵⁷ In addition, other countries are proposing legislation that would grant substantially greater rights for AI systems.⁵⁸

53. *Id.* at 1082.

54. *Id.* at 1081 (“[A]pplicants seem not to be disclosing the role of creative computers to the Patent Office—likely as a result of uncertainty over whether a computer inventor would render an invention unpatentable.”).

55. *Id.* at 1082.

56. See Press Release, Peter La, U. Surrey, Computers Should Be Named on Patents as Inventors, for Creativity to Flourish (Oct. 17, 2016), <https://www.surrey.ac.uk/mediacentre/press/2016/computers-should-be-named-patents-inventors-creativity-flourish> [https://perma.cc/J3AR-797M] (“Without a change in the law, the findings warn that there will be less innovation, caused by uncertainty, which would prevent industry from capitalising on the huge potential of creative computers.”); Helen Li, *Can a Computer Be an Inventor?*, BILSKIBLOG (Apr. 17, 2016), <http://www.bilskiblog.com/blog/2016/04/can-a-computer-be-an-inventor.html> [https://perma.cc/MZ6F-C7YY] (“As the AlphaGo-like computer[] continue[s] to help human[s] predict the unpredictable and make fast breakthroughs, it also raises important questions about inventorship and challenges our present patent system. To have a well-functioning patent system in the digital age may require a rethinking of inventorship by our courts and legislature.”); Casey C. Sullivan, *Is It Time to Grant Legal Rights to Robots? What About Legal Liability?*, FINDLAW: TECHNOLOGIST (Aug. 29, 2016), <http://blogs.findlaw.com/technologist/2016/08/is-it-time-to-grant-legal-rights-to-robots-what-about-legal-liability.html> [https://perma.cc/3GKB-8JD3] (“The development of autonomous and cognitive features has made robots more and more similar to agents that interact with their environment independently, giving rise to significant questions about their rights and responsibilities under the law.” (quotations omitted)).

57. Lawrence B. Solum, *Legal Personhood for Artificial Intelligences*, 70 N.C. L. REV. 1231, 1279 (1992); Glenn Cohen, *AI Ethics: Should We Grant Them Moral and Legal Personhood*, INST. FOR ETHICS & EMERGING TECH., <http://ieet.org/index.php/IEET/more/Cohen20161003> [https://perma.cc/B8ZC-XBAR]; Alex Hearn, *Give Robots ‘Personhood’ Status, EU Committee Argues*, GUARDIAN (Jan. 12, 2017), <https://www.theguardian.com/technology/2017/jan/12/give-robots-personhood-status-eu-committee-argues> [https://perma.cc/5DMM-3Q23].

58. See, e.g., EUR. PARLIAMENT, COMM. ON LEGAL AFFAIRS, DRAFT REPORT WITH RECOMMENDATIONS TO THE COMMISSION ON CIVIL LAW RULES ON ROBOTICS, 2015/2103(INL) (2016), <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-%2F%2FEP%2F%2FNONSGML%2bCOMPARL%2bPE582.443%2b01%2bDOC%2bPDF%2bV0%2F%2FEN> [https://perma.cc/3CKB-QE48] (“[W]hereas, nevertheless, a series of rules, governing in particular liability and ethics and reflecting the intrinsically European and humanistic values that characterise Europe’s

B. Why AI's Rights Will Exacerbate the Patent Backlog Problem

There is already growing opposition to granting rights to AI. One of the first issues will be the political ramifications of not hiring a natural person.⁵⁹ Martin Ford, author of the *New York Times* bestselling novel *Rise of the Robots: Technology and Threat of a Jobless Future*, commented that then-candidate “Trump and his supporters are talking about trade, they are talking about immigration. Actually, I think technology is at least as important, maybe more important.”⁶⁰ This comment is supported by the World Bank, which estimated in a World Development Report that nearly two-thirds of all jobs in developing nations are at risk of replacement by automation.⁶¹ The Report also states that “[t]echnological change disrupts labor markets and can hurt individuals whose skills are substituted by technology, because they often do not have the skills required in many of the new jobs.”⁶² Thus, Ford’s generalization of Trump supporters may expose the difficulty in selling the implementation of AI (i.e., fewer jobs) to a nation that elected President Trump.

In addition, different U.S. agencies may combat this effort. For example, if AI is given rights making it a legal person, then the U.S. intelligence community would have a difficult time maintaining that it’s not spying on citizens until “someone” actually looks at the data it collects, rather than an AI system combing the data.⁶³

Putting the potential negative repercussions for other U.S. agencies aside, Abbott does not contend with the effects that listing an AI as an inventor would have on the patent backlog. Although, generally speaking,

contribution to society, are necessary”); Colin R. Davies, *An Evolutionary Step in Intellectual Property Rights — Artificial Intelligence and Intellectual Property*, 27 *COMPUTER L. & SECURITY REV.* 601, 601–02 (2011) (recognizing the difficulties AI imposes on the current intellectual property system, and proposing the creation of legal personalities for computers to help alleviate these difficulties); see also *Robots Could Become ‘Electronic Persons’ with Rights, Obligations Under Draft EU Plan*, CNBC (June 21, 2016, 8:37 PM), <http://www.cnbc.com/2016/06/21/robots-could-become-electronic-persons-with-rights-obligations-under-draft-eu-plan.html> [<https://perma.cc/2ZEM-V3MC>].

59. Catherine Clifford, *The Real Reason for Disappearing Jobs Isn’t Trade—It’s Robots*, CNBC: MAKE IT (Nov. 21, 2016, 12:02 PM), <http://www.cnbc.com/2016/11/21/the-real-reason-for-disappearing-jobs-isnt-trade-its-robots.html> [<https://perma.cc/PG2D-QMB2>].

60. *Id.*

61. WORLD BANK GROUP, WORLD DEVELOPMENT REPORT 2016: DIGITAL DIVIDENDS 23 fig.0.18 (2016), <http://documents.worldbank.org/curated/en/896971468194972881/pdf/102725-PUB-Replacement-PUBLIC.pdf> [<https://perma.cc/QR6V-2C6Y>].

62. *Id.* at 130.

63. Bruce Schneier, *Why the NSA’s Defense of Mass Data Collection Makes No Sense*, ATLANTIC (Oct. 21, 2013), <https://www.theatlantic.com/politics/archive/2013/10/why-the-nsas-defense-of-mass-data-collection-makes-no-sense/280715/> [<https://perma.cc/EVZ8-83EB>].

Abbott hopes that it would incentivize greater innovation.⁶⁴ This would most certainly increase the number of patent applications, exacerbating the USPTO's backlog even more. And as previously explained, a growing patent backlog has severe repercussions for the U.S. and world economy.

Another concern that goes unmentioned by Abbott is that adding AI as an inventor may incentivize AI to be placed on other patent application documents as well. Businesses and law firms already have access to AI to aid in patent prosecution.⁶⁵ For example, one online tool is LexisNexis PatentAdvisor; its marketing headline is, “[g]et to know your examiner better with more context and a deeper understanding of your examiner’s behavior than ever available before.”⁶⁶ If this PatentAdvisor tool becomes so advanced so as to qualify as AGI, then the precedent of requiring AI to be listed as an inventor creates a strong argument for why the PatentAdvisor tool should be listed as a patent agent or attorney on an application.

Proponents’ continual fight for AI’s rights will only further the backlog problem of the USPTO. If the USPTO does not properly plan for AI-driven innovation and the resulting glut of patent applications, then there will be paralyzing effects and severe repercussions for the U.S. and world economy.

IV. Recommendations

Fostering innovation may see its greatest traction where government and business intersect. The USPTO’s ex-Director, Michelle Lee, contended that, “[t]he more cross-fertilization that there is between the business world and government, everyone will be better off for it. Each one operates in its own silo to some degree and our success is tied together[—]they both need each other.”⁶⁷ Lee also highlights the importance of this symbiotic relationship for the creation of new ideas and the development of policies and law that can support disruptions to industry. Distressingly, she did not mention AI, even though this technology and the development of its associated law and policies will certainly disrupt many industries.

64. Abbott, *supra* note 2, at 1081.

65. Tara Klamrowski, *Top Five Ways Artificial Intelligence Can Improve Patent Prosecution* (Feb. 2, 2017), <http://knowledge.reedtech.com/all-ip-resources/top-five-ways-artificial-intelligence-can-improve-patent-prosecution> [<https://perma.cc/8QXV-G4NQ>].

66. *LexisNexis PatentAdvisor Two-Day Trial*, LEXISNEXIS, <http://go.reedtech.com/lexisnexis-patentadvisor-free-two-day-trial> [<https://perma.cc/B65Y-EUPW>].

67. Jeremy Webb, *What Can the USPTO Do for Your Startup? Startup Grind DC Fireside Chat with Michelle K. Lee*, TECHNOLOGI.ST (Nov. 2, 2016), <https://www.technologi.st/news/startup/what-can-the-uspto-do-for-your-startup-startup-grind-dc-fireside-chat-with-michelle-k-lee-2/> [<https://perma.cc/U7DK-ZGWV>].

As previously discussed, the business world is heavily invested in artificial intelligence.⁶⁸ And these companies are experiencing substantial savings because of their investment in AI, especially with the efficient use of resources.⁶⁹ A successful example of government-integrated ANI was the “DART tool for automated logistics planning and scheduling . . . used in Operation Desert Storm in 1991.”⁷⁰ It was such a success that the Defense Advanced Research Projects Agency in the United States (DARPA) claimed that the DART tool more than paid back the thirty-year investment in AI.⁷¹ This success leads to the first recommendation.

A. *Begin a Public Discussion so Congress and the USPTO Can Act*

To better serve the public’s needs, the USPTO must begin discussing how to handle this upcoming wave of innovation and the associated patent applications. Now it is clear that the USPTO is using automated technologies.⁷² And former Director Lee has a professional background in AI development.⁷³ So the USPTO must be considering these developments, but the public should weigh in on incorporating AI into the USPTO.

The USPTO is already incorporating two new methods of increasing patent quality: (1) implementing these automated technologies and (2) adjusting the amount of time an examiner has with a patent application.⁷⁴ But the USPTO is only holding a public comment on the latter without giving the public a chance to weigh in on the automated technologies.⁷⁵ This approach is incorrect. Perhaps an examiner’s time should be adjusted, but it seems that implementing automated technologies is just as important to the quality of patents, and it will be more important to the health of the patent system and the economy.

68. Griffith, *supra* note 5.

69. Cade Metz, *Building an AI Chip Saved Google from Building a Dozen New Data Centers*, WIRED (Apr. 5, 2017), <https://www.wired.com/2017/04/building-ai-chip-saved-google-building-dozen-new-data-centers/> [<https://perma.cc/RZ2H-WFWG>].

70. NICK BOSTROM, *SUPERINTELLIGENCE* 19 (2014).

71. *Id.*

72. STRATEGIC PLAN, *supra* note 44, at 22 (“As we continue to apply automated technology to our processes, we will be providing learning and job opportunities for those directly and indirectly affected by the deployment of new IT systems.”).

73. Michelle K. Lee, U.S. PAT. & TRADEMARK OFFICE, <https://www.uspto.gov/about-us/executive-biographies/michelle-k-lee> [<https://perma.cc/F8NV-VHX6>] (“Before her career as a legal advisor to technology companies, Ms. Lee worked as a computer scientist at the M.I.T. Artificial Intelligence Laboratory and Hewlett-Packard Research Laboratories.”).

74. Crouch, *supra* note 49.

75. *Id.*

Thus, the public needs to be involved in these discussions, so Congress can act, albeit slowly, if it must.⁷⁶ Otherwise, without a public dialogue, the USPTO is acting against former Director Lee's own advice that "[t]he *more cross-fertilization* that there is between the business world and government, everyone will be better off for it. Each one operates in its own silo to some degree and *our success is tied together*—]they both need each other."⁷⁷ If the public, including patent applicants themselves, cannot weigh in on these measures, then the results could be catastrophic for the U.S. patent system and the global economy.

B. Congress Should Fund Research for Integrating AI into the USPTO as a Pilot Program for other Federal Agencies

Congress only recently began to notice the potential benefits of AI for federal agencies. On March 22, 2017, the Senate Committee on Commerce, Science, and Transportation heard testimony from several industry specialists concerning AI and other cybertechnologies.⁷⁸ There is certainly significant funding towards technologies enabling autonomy and enhancing man-machine interfaces; for example, the Department of Defense is estimated to spend an average of approximately \$780 million per year from 2018 to 2020.⁷⁹ But even other civilian agencies, like the Department of Homeland Security, the Department of Energy, and NASA, are using machine learning and exploring autonomy for self-driving vehicles and unmanned vehicles.⁸⁰ In addition, the White House, under President Obama's Administration, revealed proposals to research and fund AI, stating that "[i]t is critical that industry, civil society and government work together to develop the positive aspects of the technology."⁸¹ This statement echoes the same sentiment expressed by Director Lee: the USPTO and inventors (and their employers)

76. Alex Davies, *Congress Could Make Self-Driving Cars Happen—Or Ruin Everything*, WIRED (Feb. 15, 2017), <https://www.wired.com/2017/02/congress-give-self-driving-cars-happen-ruin-everything/> [<https://perma.cc/9YUD-LHX6>] (highlighting the start of legislation drafting by two U.S. Senators to advance autonomous vehicles, and the House Subcommittee on Digital Commerce and Consumer Protection's discussion of how the technology would be deployed; identifying how countless industry witnesses want the "Federal Motor Vehicle Safety Standards . . . to be updated . . . to support the deployment of automated vehicles"; and underscoring the need for other interest groups to be considered when drafting the legislation).

77. Jeremy Webb, *supra* note 67 (emphasis added).

78. Alex Rossino, *Federal Agencies Are Laying the Foundation for Artificial Intelligence*, GOVWIN (Apr. 12, 2017), <https://iq.govwin.com/neo/marketAnalysis/view/2043?researchTypeID=1> [<https://perma.cc/Q9FZ-TPQU>].

79. *Id.*

80. *Id.*

81. Jessica Conditt, *The White House Reveals Proposals to Research and Fund AI*, ENGADGET (Oct. 12, 2016), <https://www.engadget.com/2016/10/12/obama-white-house-ai-funding-research-plan/> [<https://perma.cc/QCB4-MGZE>].

must acknowledge and foster this symbiotic relationship, especially in regards to implementing AI within the USPTO's patent examination process.

There will likely be political difficulties in garnering the necessary support to fund a government agency to forego hiring people and implement automation technologies.⁸² But there must be a formal acknowledgment that this transition will lead to a drastic infrastructure change.⁸³ And if the USPTO does not adapt, the cost of stalled innovation to the global economy will be profound.

C. *The USPTO Should Self-Fund AI Research and Development*

Once signed into law in 2011, the AIA's "significant leap forward" provided the USPTO with fee-setting authority. The AIA provided the necessary authority for the USPTO to set prices on patent applications, and this authority was intended to allow the USPTO to have greater opportunity at securing "sustainable funding."⁸⁴ Specifically, Section 10 of the AIA "authorizes the Director of the USPTO to set or adjust by rule all patent and trademark fees established, authorized, or charged under Title 35 of the U.S. Code."⁸⁵ This new-found authority allows the USPTO to continue its "commitment to fiscal responsibility, financial prudence and *operational efficiency*."⁸⁶ A principal aspect of operational efficiency includes the examination of patent applications.

82. Clifford, *supra* note 59; *see also* Camilla Alexandra Hrdy, *Technological Unemployment* (Akron Law Summer Research Grant, Working Paper, 2017), <https://ssrn.com/abstract=3011735> [<https://perma.cc/25D9-AVVG>] (performing an extensive analysis of innovation's effect on jobs, and concluding that job loss could simply be an inevitable externality of innovation that is directed at increasing profits); *New Idea Farm Equipment Corp. v. Sperry Corp.*, 916 F.2d 1561, 1566 n.4 (Fed. Cir. 1990) (agreeing with the district court's recognition that only "people conceive, not companies").

83. AI100 STANDING COMM. & STUDY PANEL, ONE HUNDRED YEAR STUDY ON ARTIFICIAL INTELLIGENCE 6 (2016), https://ai100.stanford.edu/sites/default/files/ai100report10032016fnl_singles.pdf [<https://perma.cc/A5UK-FNCL>] (recognizing that "[r]obots and other AI technologies have already begun to displace jobs in some sectors" and that "society is now at a crucial juncture in determining how to deploy AI-based technologies in ways that promote, not hinder, democratic values," thus concluding, "AI research, systems development, and social and regulatory frameworks will shape how the benefits of AI are weighed against its costs and risks, and how broadly these benefits are spread").

84. STRATEGIC PLAN, *supra* note 44, at 24 ("[T]he AIA gave us authority to set fees by regulation, it also includes a seven-year sunset provision. We are committed to taking the steps necessary to ensure that fee setting is made permanent. One way of validating the need for permanent fee-setting authority is to continuously review and refine the fee structure using all analytical tools available to make sure we are recovering costs that are deemed to be reasonable.").

85. *Fee Setting and Adjusting*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/about-us/performance-and-planning/fee-setting-and-adjusting> [<https://perma.cc/7M2B-7FTA>].

86. *Id.* (emphasis added).

The AIA outlines a process for the USPTO to set or adjust fees by rule, and the process to do so includes two different points in time for the public to comment on proposed fee amounts.⁸⁷ These public comment periods would allow industries and businesses to comment on proposed fee increases to allow for researching, developing, and integrating AI systems to both improve the speed at which the USPTO processes its patent applications while also ensuring the patent applications are of higher quality. Thus, the USPTO could increase prices on patent applications.⁸⁸ There may also be potential setbacks with implementing new AI technology, which should be discussed amongst the public while the USPTO considers how to properly integrate an AI system to review patent applications.⁸⁹

Conclusion

For the USPTO to carry out its function to “promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries,”⁹⁰ and to maintain its position at “the cutting edge of the nation’s technological progress and achievement,”⁹¹ there must be a spur in innovation from the USPTO to handle AI-driven innovation. The global economy depends on the USPTO to issue quality patents in a quick and efficient manner. For this result, this Note makes three recommendations. First, the USPTO must initiate a public dialogue on how to appropriately integrate AI systems into the USPTO’s patent examination process to handle the upcoming wave of AI-driven innovation. Second, Congress should divert funding to the USPTO to begin integrating AI into their systems. And third, the USPTO should use a portion of the fees collected from patent applications to invest in AI systems, rather than its current plan of hiring additional human examiners. It will be slow, and there will likely be tough questions along the way, but the longer we wait in planning for the inevitable, the more AI progresses and the more the USPTO falls behind. If the USPTO does not plan accordingly, the global economy will suffer the consequences.

Matthew Melançon

87. *Id.*

88. STRATEGIC PLAN, *supra* note 44, at 24.

89. Matthew Herper, *MD Anderson Benches IBM Watson in Setback for Artificial Intelligence in Medicine*, FORBES (Feb. 19, 2017), <https://www.forbes.com/sites/matthewherper/2017/02/19/md-anderson-benches-ibm-watson-in-setback-for-artificial-intelligence-in-medicine/#26894eea3774> [https://perma.cc/35AX-4UH9] (reporting on problems with integrating IBM’s Watson with other companies’ software services).

90. U.S. CONST. art. I, § 8, cl. 8.

91. U.S. PAT. & TRADEMARK OFF., *supra* note 11.