

**AT THE CORE OF AMERICA’S COMPETITIVE EDGE: WHY SOFTWARE-
IMPLEMENTED INVENTIONS ARE—AND MUST REMAIN—PATENT
ELIGIBLE**

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Executive Summary

Developments in software are reshaping our lives and our economy. Software innovations are being used by, and benefiting, virtually all industry sectors today. The explosion of new capabilities made possible by software—in manufacturing, safety functionality, and consumer devices, among many others—is no accident: companies invest heavily in software research and development in the United States because new inventions, implemented through software, can be protected by patents.

Too often, as an industry sector booms thanks to the investment companies and individuals make in research and development, some will criticize the intellectual property protection for that sector’s technology. The critics conveniently forget what incentivized the research and development in the first place. Today critics are targeting the success of software innovation; tomorrow it will be the next sector that is driving the U.S. economy.

Concerns about patent quality and the need for claims that provide clear notice of the metes and bounds of the property right are reasonable, but they apply equally to inventions in all areas of technology. And Congress has created new and important tools to improve patent quality.

Ultimately, the arguments given by critics of “software patents” (an inartful term, since patents are not issued for software code, but rather for the invention implemented by software) are simply unpersuasive. Software-related patents have led to tremendous growth in the software industry, they are fostering open innovation and interoperability, and they are incentivizing inventive solutions to unique problems.

In short: patents on software-implemented inventions are accomplishing the constitutional imperative to promote progress in the useful arts.

Software Drives Economic Growth

Software-implemented innovations are a critical driver of economic growth, exports, and job creation in the United States.¹ Software-implemented innovations also

¹ *The Software and Information Technology Services Industry in the United States*, SelectUSA, <http://selectusa.commerce.gov/industry-snapshots/software-and-information-technology-services-industry-united-states>; see also *IP Creates Jobs for America*, GIPC (May 25, 2012), <http://www.theglobalipcenter.com/ip-creates-jobs-america/>.

play a more general role in sustaining America's prominence in the global innovation economy.²

If we look at just a few of the incredible innovations this nation's inventors have produced in recent years in which patented software played a central role, it is clear that inventive software-implemented solutions are at the core of human progress. The breathtaking solutions that enable blind people to see, automobiles to detect and avoid oncoming danger, doctors to perform major surgical procedures on an out-patient basis, tests that detect likely cancer conditions in advance of any symptoms, prediction of weather events to save lives are all based on significant innovations implemented in software. And these are just a few of the innovations American inventors have produced in recent years in which patented software played a key role.

Take, for example, two members of the Partnership for American Innovation (PAI)—Second Sight Medical Products, Inc. and ManyWorlds, Inc. Second Sight Medical Products, which manufactures and markets implantable visual prosthetics to enable blind individuals to achieve greater independence, depends on the protections afforded by patents. ManyWorlds, maker of leading edge software that learns from the people who use it to help those people make better, more personalized decisions, also depends upon the patent system to protect its algorithmic solutions that analyze vast amounts of data. IBM has more than 500 patented software inventions that help IBM Watson Health aid the fight against cancer. The list goes on.

Without clear protection for the software-implemented algorithms powering these innovative and diverse solutions—strong and defensible protection in the form of patents—there would be little incentive for investors, be they small or large, to put resources into these companies or innumerable others like them. Simply put, patents enable the return on investment demanded by venture capitalists, early stage investors and billion-dollar corporate R&D budgets.

The Patenting of Software Innovations

Patents are not issued for lines of code, computer programs, or apps. Patents are issued for new and inventive processes expressed as algorithms implemented on hardware, such as a computer, that performs a function. They are not issued for abstract ideas.³ Even before computers and software existed, such processes were patentable—patents were issued for algorithms to control the operation of devices such as programmable looms and engines. As surely as computers and software carry and execute today's algorithms,

² In fact, according to a 2012 study by the U.S. Government, IP-intensive industries, all of which depend heavily on software-implemented innovation, support 40 million jobs, contribute more than \$5 trillion to our economy, and account for 34.8 percent of America's gross domestic product. *Intellectual Property and the U.S. Economy: Industries in Focus*, Economics and Statistics Administration and United States Patent and Trademark Office (March 2012), http://www.uspto.gov/sites/default/files/news/publications/IP_Report_March_2012.pdf.

³ See *Alice Corp. v. CLS Int'l Bank*, 134 S. Ct. 2347, 2357 (2014) (“A claim that recites an abstract idea must include ‘additional features’ to ensure ‘that the [claim] is more than a drafting effort designed to monopolize the [abstract idea].’”).

punched paper rolls and cams carried and executed the programs of the day and all were patentable.

The beauty of the patent system is that it sees through and beyond the medium of implementation, to the new invention. The patent system views software as a medium of expression, just like a language. It sees no more sense in discriminating against inventions implemented in software than our society sees in discriminating against ideas described in Spanish versus French versus German versus English. Moreover, one cannot obtain a patent on software (i.e., source code) because that is solely a linguistic expression. But one can obtain—and should be able to obtain—a patent on a process that is implemented on an actual machine via software. Software in its binary form and implemented on a computer literally changes the physical configuration of the processor—the software is effectively the gear that makes the widget work.

Patent protection is needed for software to encourage innovation and collaboration, promote economic growth, and preserve our ability to compete in international markets.⁴ There are three technological areas where the U.S. has a significant edge over other countries—software, pharmaceuticals and biotechnology.⁵ These technologies currently are eligible to receive patent protection in the U.S., but do not receive equal patent protection in other nations.⁶ The U.S. is the global leader in these three fields *because we allow patent protection* for the results of R&D in all areas of technology. The U.S. patent system does not have the government pick winners and losers among forms of technology—instead, the market decides. Other countries are giving less protection in

⁴ The same is true of the patent system's effect on other areas of technology. *See e.g.*, David Kline, *Do Patents Truly Promote Innovation?*, IPWATCHDOG (APRIL 15, 2014), <http://www.ipwatchdog.com/2014/04/15/do-patents-truly-promote-innovation/id=48768/> (“[O]n balance and over the long term, [the patent system] is **strongly correlated** with increased technology innovation, knowledge diffusion, and economic growth”).

⁵ The U.S. is also the world's largest market for pharmaceuticals and the world leader in biopharmaceutical research. According to the Pharmaceutical Research and Manufacturers Association (PhRMA), U.S. firms conduct the majority of the world's research and development in pharmaceuticals and hold the intellectual property rights on most new medicines. The biopharmaceutical pipeline also has over 5,000 new medicines currently in development around the world with approximately 3,400 compounds currently being studied in the United States - more than in any other region around the world. This industry relies on patents and other forms of intellectual property rights to justify the investment required to bring a product to market. *See, e.g.*, *The Pharmaceutical and Biotech Industries in the United States*, SelectUSA, <http://selectusa.commerce.gov/industry-snapshots/pharmaceutical-and-biotech-industries-united-states.html>.

⁶ *See, e.g.*, http://www.wipo.int/sme/en/documents/software_patents_fulltext.html, "Software Patent and Copyright Laws in India." 123HelpMe.com. 18 Aug 2015, BIOTECHNOLOGY INDUSTRY ORGANIZATION 2015 SPECIAL 301 SUBMISSION *available at* http://keionline.org/sites/default/files/2015_BIO_Submission.pdf; "Software patents: US vs. Europe" December 1, 2014 Ontañón, Ricardo *available at* http://www.clarkemodet.com/blog/2014/12/software-patents-US-vs.-Europe.html#_VdNLI53D-Uk; "Statement of the U.S. Chamber's Global Intellectual Property Center" Feb. 24, 2015, *available at* <http://www.theglobalipcenter.com/wp-content/uploads/2013/01/Special-301-Testimony-GIPC-FINAL.pdf>.

these three areas precisely because they are behind—they view weaker protection as a way to obtain and use U.S. technology without having to compensate U.S. inventors.

The U.S. is the most advanced country for software development, with 80% of the world's software produced here.⁷ Much like the semiconductor area, which consolidated previously distinct analog, RF, memory and processor IC's into one system on a single chip, today, just about all things related to consumer electronics are being designed into a single mobile device.⁸ Most of the advancements in the consolidation of technologies within mobile devices—for example, camera, GPS, video, alarm clock, and soon-to-be medical device—are driven by software.⁹ Software is also used to control numerous features of mobile telephones and tablets, such as temperature, graphics, image capture and compression just to name a few.¹⁰ As the Internet of Things develops, requiring more sensors to communicate with one another to complete an action (e.g., closing a garage door, turning on lights, automatically ordering more fabric softener), software is creating new services for existing industries and creating new markets.

Software development is also a critical component of each step of the manufacturing process—product design, production planning, engineering, execution, and service.¹¹ The vast majority of software-related patents today go not to traditional software companies, but to manufacturing companies that integrate software into their products and services.¹² For example, software enables advanced manufacturing, which can be used to create components of complex products more efficiently and at lower cost. Manufacturers no longer need to design customized devices for different uses. Instead, software applications tailored to different specialties—like virtual personal assistants on smartphones and virtual reality headsets—transform the way we interact with our technology.

Patents on software-related inventions provide small businesses and startups with a tangible asset to attract funds while working on product development. They also provide big companies with protection for their large investments and R&D budgets, which allows them to bring new breakthrough products to market and accelerate the pace of innovation. For example, IBM spent more than \$5.5 billion in 2014 on its R&D budget and has been the leading recipient of U.S. patents for twenty-two consecutive years. It announced

⁷ Making in America: U.S. Manufacturing Entrepreneurship and Innovation – Office of US Pres. 2014 - citing business.com/media/file/00240_Americas_Real_Manufacturing_Advantage.pdf.

⁸ Van Thompson, *What is a Software Patent?*, IPO.ORG (March 27, 2015), available at <http://www.ipso.org/wp-content/uploads/2015/03/What-is-a-software-patent.pdf>.

⁹ *Id.*

¹⁰ *Id.*

¹¹ *Id.*

¹² James E. Bessen & Robert M. Hunt, *An Empirical Look at Software Patents*, 16 J. Econ. & Mgmt. Strategy 157, 171 (2007).

recently that it received a record 7,534 U.S. patents in 2014.¹³ Indeed, the GAO recently found that half of all patents granted in recent years were software-related.¹⁴

So the issue is not “software patents,” but bright new algorithms that save and change lives and happen to be implemented using computer software. Because many breathtaking software-implemented innovations enable and power our modern world, at levels of efficiency and performance unthinkable even just a few years ago, patent protection is every bit as important as an incentive “for software-implemented innovation as for the innovations that enabled man to fly, and before that for the innovations that enabled man to light the dark with electricity, and before that for the innovations that enabled the industrial revolution.”¹⁵ Software-related inventions are transformative, but we will remain the global leader only as long as we continue to provide the incentives of technology-neutral patent laws.

Software Patents – A Rational Path Forward

Despite this wealth of evidence, some call for the abolishment of patents related to software and would have the government discriminate among different forms of technology. This argument is often put forward regarding cutting-edge technology, even though that is precisely the opposite of what led to the success of the technological field.

It is important that “patent protection be properly tailored in scope, so that programmers can write code and engineers can design devices without fear of unfounded accusations of infringement.”¹⁶ And we know that inconsistency in software patent issuance causes uncertainty in the marketplace and can cause excessive threats of litigation.¹⁷ However, the appropriate response to these issues is not to eliminate patents for software-implemented inventions in their entirety, but rather to ensure the applicable patents are “properly tailored in scope.”¹⁸ Those inventing in the software space dislike poorly-drafted claims as much as anyone, because invalid patents that cover software devalue high-quality patents by harming the reputation of patents in that field.

The view that software should not be patentable necessarily implies that the software industry itself is not capable of innovation worthy of patent protection. Yet, in a country where patent rights are authorized by the Constitution, “should not all fields of

¹³ *IBM Breaks U.S. Patent Record in 2014*, IBM.COM (Jan. 12, 2015), <https://www-03.ibm.com/press/us/en/pressrelease/45793.wss>.

¹⁴ U.S. Gov. Accountability Office, GAO-13-465, *Assessing Factors That Affect Patent Infringement Litigation Could Help Improve Patent Quality* 11-12 (2013). Software-related deals also account for over a third of all technology deals. PriceWaterhouseCoopers, *Analysis and trends in US technology M&A activity 2013* 12 (2013).

¹⁵ David Kappos, *An Examination of Software Patents Keynote Address*, November 2012, *transcript available at* <http://www.uspto.gov/about-us/news-updates/examination-software-patents>.

¹⁶ *Id.*

¹⁷ *Id.*

¹⁸ *Id.*

innovation be treated equally under the law?”¹⁹ Should we not avoid becoming a country where one field of endeavor (*e.g.*, pharmaceuticals or electronics) is deemed more “patent worthy” than other fields (*e.g.*, computer science and information technology)?²⁰

The right course of action is rather to focus on the facts and data, and move away from rhetoric and emotion. The anti-software-patent advocates, whose views are based on anecdotes, rhetoric and hyperbole, simply do not have the facts and data on their side. There is no software patent crisis that needs to be corrected. The IP system has taken major strides forward in dealing effectively with problematic patents—both software and non-software related. Of course, the system can be further improved, but addressing today’s issues—which are real but not dire—through abrupt measures based on rhetoric and anecdotes is like addressing a hangnail with an amputation: the immediate problem will be obviated, but a slew of graver, irreversible problems will arise in the solution’s wake.²¹

Improving the Quality of Software-Related Patents

The concern most frequently raised about software-related patents is that they tend to be of low quality—often with overly-broad or ambiguous claims or based on an invention that was obvious in light of the prior art. We should all be concerned with patents in any field of technology that have those characteristics. The Leahy-Smith America Invents Act (the “AIA”) was drafted with the primary goal of improving the quality of patents issued by the USPTO. The patent examination system is *ex parte*—that is, the applicant interacts directly with the USPTO examiner without third parties involved. Congress recognized that process may lead to patents with overly-broad or invalid claims and added two measures in the AIA to increase quality.

The first allows third parties to submit prior art during the application process and explain why that prior art is relevant to the application. This will provide an important resource to examiners and assist them in determining the appropriate scope before issuing claims. The second provision allows a limited, nine-month window after a patent is granted in which third parties can challenge claims of the patent on any ground that would be available as a defense in court. In this Post-Grant Review (“PGR”) proceeding, third parties can challenge abstract claims as not patent-eligible and provide evidence that a claim had already been in public use when the application was filed. These two

¹⁹ Raymond Millien & Christopher George, *The Patentability of Software: Myths, Facts and a Proposed Test*, IPWATCHDOG (May 28, 2014), <http://www.ipwatchdog.com/2014/05/28/the-patentability-of-software-myths-facts-and-a-proposed-test/id=49792/>.

²⁰ *Id.*

²¹ In 2013, some decried the unprecedented levels of patent litigation, built a narrative around “out of control” patent litigation, and laid the blame on software patents. In 2014, we know there was a decline in patent litigation, which has been followed by a partial rebound in the first half of 2015. But all of these numbers miss the big picture: the number of infringement claims filed each quarter, or each year, is affected by a number of variables including uncertainty created by new post-issuance proceedings; new joinder provisions; and the increased difficulty in enforcing patents rights, which affects the willingness to enter into license agreements. See David Kappos, *The Great Patent Debate: Changing Horizons*, March 13, 2015, available at <http://www.iam-media.com/files/Kappos%20speech.pdf>.

proceedings will be important tools to separate the wheat from the chaff and prevent overly-broad claims on software-related patents from infecting the system.

Software-Related Patents Issued by the USPTO Stand Up in Court

The USPTO undertook its own study of the U.S. patents involved in some of the highest profile litigation among major firms in the smart phone industry. The Office conducted an empirical analysis of “software patents” and smart phone litigations, the results of which were subsequently published by Stuart Graham and Saurabh Vishnubhakat.²² The USPTO found that in the vast majority of these cases, over 80 percent, the courts have found the software patents at issue to be valid – a far cry from the dire declarations and a rate of validity findings that compares favorably with other technology areas. So the U.S. federal district courts, which are the principal reviewers of USPTO decision-making, are finding in a clear majority of cases that USPTO examination and grant of software patents involved in the smart phone litigation were proper.²³

An ongoing look at statistics in the USPTO bears out a similar conclusion—rejections in software patent applications taken to its appeals board are upheld at a slightly higher rate than for the USPTO as a whole, and those few decisions appealed to the Federal Circuit are affirmed 95 percent of the time. So, to those commenting on the smart-phone patent wars with categorical statements that blame the “broken” system on bad software patents: get the facts. They don’t support the position.²⁴

A recent comprehensive study of data related to more than one thousand patent outcomes in more than two thousand cases further contradicts critics’ claims that software patents are more likely to be held invalid when litigated.²⁵ The study found that patent litigation is a complex system made up of many layers, for example inventors and their assignees, patent plaintiffs, and technology. When these layers are taken into consideration, software patents are no more likely to be found invalid than any other kind of patents.²⁶

²² Stuart Graham & Saurabh Vishnubhakat, *Of Smart Phone Wars and Software Patents*, 27 J. Econ. Persp. 67 (2013), available at <http://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.27.1.67>.

²³ Kappos, David J., *Investing in America’s Future Through Innovation: How the Debate Over the Smart Phone Patent Wars (Re)Raises Issue at the Foundation of Long-term Incentive Systems*, 16 STAN. TECH. L. REV. 485, 488 (2013).

²⁴ David Kappos, *An Examination of Software Patents Keynote Address*, November 2012, transcript available at <http://www.uspto.gov/about-us/news-updates/examination-software-patents>.

²⁵ Michael Risch, *The Layered Patent System*, Villanova Law/Public Policy Research Paper No. 2015-1002 (February 19, 2015), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2567415.

²⁶ *Id.* (“Further, what appear to be technology differences may instead also be patentee and plaintiff differences. These revelations change how we look at the patent system, because most proposals focus on only one layer at a time. It makes no sense to target software patents, for example, when only one type of software application performs worse than the others. The results here again run counter to conventional wisdom: they imply that hardware specific patents perform worse than general software patents when challenged.”)

The study also found that general software patents appear to perform better than hardware-specific software patents.²⁷ According to the study:

These findings are inconsistent with a narrative that software patents are somehow second class citizens that are inferior to other patents. However, the results *are* consistent with a layered approach to the patent system. It is not enough to simply compare software patents to non-software patents; examination by technology group and even patentee and plaintiff type are also necessary. For example, the data imply that highly litigious NPEs may be better at selecting software patents to assert than they are at selecting non-software patents. The invalidity outcomes also show why patentable subject matter rulings are so important to defendants – general software patents were harder to invalidate when tested on other patentability criteria.²⁸

Critics point to a study claiming that software patent owners win only 3% of their cases that go to trial.²⁹ But this study is a textbook example of the selective, anecdotal evidence some use to support their arguments. The study focused entirely on litigation of patents covering Internet business processes (“Internet patents”), issued during the first few years in which such patents were granted.³⁰ That is, its selection set was patents related to methods of doing business on the Internet, and had little to do with actual software technology. Also, this study looked only at patents issued through 1999 and lawsuits filed through 2009.³¹ So the study pre-selected the very subset of software patents that would be expected to be the most vulnerable both in scope and time. Yet the statistics stemming from this study are unclear as to what trends they identify, and what conclusions can be drawn – the study finds that patent owners win on only 3% of those Internet patents that go to trial, and the accused infringer wins on 7%. Who wins the other 90%? An additional, obvious but unaddressed question is engendered by the statement that when failing to settle, the owners of non-Internet patents (“NIPs”)³² won on the merits at a significantly higher rate than did owners of Internet patents but that this finding did not hold up in regression analysis.³³ Further, the study admits that when the effects of other variables were taken into account in a logistic regression analysis, there was no significant difference in the win rate for accused infringers between Internet patents and NIPs. So on close inspection,

²⁷ *Id.* at 30 (“In fact, among non-NPEs, a large portion of the challenged general software patents were found valid. More surprising, non-software patents fared worse than software patents, at least among the NPEs. Though non-software patents were challenged less often, the challenges were successful about two-thirds of the time, as compared to a 50% success rate for each category of software. Even in the non-NPE group, a greater percentage of software patents were found valid than non-software patents.”).

²⁸ *Id.*

²⁹ John Allison, *Patent Litigation and the Internet*, 2012 *Stan. Tech. L. Re.* 3, 27, available at <https://journals.law.stanford.edu/sites/default/files/stanford-technology-law-review-stlr/online/allison-patent-litigation.pdf>.

³⁰ *Id.* at 2-3 and 6-7.

³¹ *Id.*

³² Which the study admits go to trial at the same rate as internet patents.

³³ *Id.*

despite the agenda evident in the set of patents selected for this headline-grabbing study, the only clear observation that can be made about it is that it shows nothing.³⁴

Responding to Criticism

Critics of patenting software-enabled inventions attempt an array of misguided arguments.

1. Patents stifle innovation and foster monopolization in the software industry.

One of the oldest and oft-repeated criticisms of software patents is, at heart, a concern for the viability of the industry: since the early 1990s, critics have voiced fears that the software industry is somehow uniquely susceptible to the accumulation and concentration of power.³⁵ According to these critics, software patent rights impose insurmountable barriers to market entry by enabling large companies to prosper at the expense of smaller, and perhaps more innovative, competitors. The result is, allegedly, stagnation in both innovation and industry development.³⁶

History and experience provide the most obvious repudiation of these concerns, but the empirical data presents a compelling synopsis. The software industry continues to exhibit tremendous growth,³⁷ and startups remain significant sources of innovation and product development.³⁸ Companies like Facebook, Twitter, Snapchat, and Venmo have experienced astronomical success, and once-dominant industry players regularly face significant disruptive competition from startups.

2. Software-related patents prevent knowledge transfer.

³⁴ Indeed, this study actually buttresses the argument that software-related patents should not be discriminated against: the data set for this study could not distinguish between methods of doing business on the Internet and software-enabled inventions.

³⁵ See Robert P. Merges, *Software and Patent Scope: A Report from the Middle Innings*, 85 Tex. L. Rev. 1627, 1631-36 (2007), for an insightful history of this particular criticism of software patents. Merges provides one anecdote that has been rendered particularly amusing in hindsight: a 1994 publication by the League for Programming Freedom argued, “A vision of patents entrenched in the software industry is a vision of stagnation. A vision of IBM once again calling the shots. A vision of companies like Xerox and AT&T who have proven incapable of bringing innovative products to market stealing profits from those companies [that] can” (*citing* Gordon Irlam & Ross Williams, *Software Patents: An Industry at Risk* § 4.3 (Jan. 25, 1994), <http://lpf.ai.mit.edu/Patents/industry-at-risk.html>).

³⁶ *Id.* at 1633; see also David Kline & Bernard Cassidy, *Are Software Patents Stifling Innovation?*, IPWATCHDOG, <http://www.ipwatchdog.com/2014/04/11/are-software-patents-stifling-innovation/id=48998/>.

³⁷ Raymond Millien & Christopher George, *The Patentability of Software: Myths, Facts and a Proposed Test*, IPWATCHDOG (May 28, 2014), <http://www.ipwatchdog.com/2014/05/28/the-patentability-of-software-myths-facts-and-a-proposed-test/id=49792/> (“According to the U.S. Dept. of Commerce, the U.S. software and IT services industry had revenue totaling \$606B in 2011, with overall research and development spending of \$126.3B, and a U.S. workforce of nearly two million people”).

³⁸ Ronald J. Mann, *Do Patents Facilitate Financing in the Software Industry?*, 83 Texas L. Rev. 961, 965-966 (2005), available at <http://www.intertic.org/Policy%20Papers/Mann.pdf>.

In the same vein, critics argue that, by enabling patent-holders to exclude infringers and imitators, patents allow knowledge to be retained by individuals and entities who do not then implement their innovations.³⁹ These critics view research and development as distinct; they imagine that patent owners obtain patents merely to prevent others from monetizing their original ideas, or perhaps to exact prohibitive and unreasonable licensing fees.⁴⁰ Ultimately, the argument proceeds, licensing revenues turn out to be elusive, and the transfer of ideas into industry is prevented wholesale.⁴¹

What this argument ignores is that patent exclusivity rights come at the cost of full disclosure. In order to obtain a patent, an inventor must reveal both how the technology was created and how it works.⁴² Software patent applications, for example, must describe the invention with sufficient technical detail that a computer programmer could code the software by looking at the patent's claims.⁴³ This level of disclosure is just one reason that many inventors themselves say patents are not an efficient means of protecting inventions.⁴⁴ Nonetheless, patent applications have grown year-over-year, leading researchers to argue that inventors instead value patents because they provide incentives to innovate further and mitigate knowledge coordination problems, ultimately contributing to a system of open innovation.⁴⁵

The argument that patents support knowledge transfer is backed by empirical data. A recent study by the International Chamber of Commerce concluded that patents are essential to the open innovation model, by which firms are able to integrate external knowledge into their own research and development processes, ultimately enhancing efficiency and encouraging collaborative efforts.⁴⁶ Patents give owners of technological and other information the opportunity to disclose and trade that information without losing control over it,⁴⁷ while an open innovation system provides the channels of communication that allow patented ideas to be developed and taken to market (through licensing

³⁹ Mike Masnick, *Patenting University Research Has Been a Dismal Failure, Enabling Patent Trolling. It's Time to Stop*, TECHDIRT (Dec. 2, 2013, 1:30pm), <https://www.techdirt.com/articles/20131122/01322825335/patenting-university-research-has-been-dismal-failure-enabling-patent-trolling-its-time-to-stop.shtml>.

⁴⁰ *Id.*

⁴¹ National Research Council, *Managing University Intellectual Property in the Public Interest* (2010).

⁴² 35 U.S.C. § 112(a).

⁴³ Gene Quinn, *Software Patent Basics: What Level of Description is Required?*, IPWATCHDOG (Jan. 25, 2014), <http://www.ipwatchdog.com/2014/01/25/software-patent-basics-what-level-of-description-is-required/id=47663/>.

⁴⁴ Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When is it the Best Incentive Mechanism?*, INNOVATION POLICY AND THE ECONOMY 51, 70-72 (Adam B. Jaffe, Josh Lerner, & Scott Stern eds., 2002); see also James Bessen & Michael J. Meurer, *Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovators at Risk* (2008).

⁴⁵ Patrick Cohendet & Julien Pénin, *Patents to Exclude vs. Include: Rethinking the Management of Intellectual Property Rights in a Knowledge-Based Economy*, TECHNOLOGY INNOVATION MANAGEMENT REVIEW (December 2011), <http://timreview.ca/article/502>.

⁴⁶ Jennifer Brant & Sebastian Lohse, *The Open Innovation Model*, INTERNATIONAL CHAMBER OF COMMERCE (2014), available at https://www.google.com/url?q=http://www.iccwbo.org/Data/Documents/Intellectual-property/THE-OPEN-INNOVATION-MODEL/&sa=U&ved=0CAQQFjAAahUKEwj87NO_g-_GAhUJMz4KHSWjDfM&client=internal-uds-cse&usg=AFQjCNHbXbRt2yo_kvYfx0UyQBuiiWmiuQ.

⁴⁷ *Id.*

agreements, joint R&D agreements, corporate venture capital, joint ventures, and even acquisitions). The symbiosis of this system depends on clear, predictable IP arrangements. Allowing inventors to obtain patents for their software innovations provides them with continued incentives to innovate further, a means to coordinate with those able to take their ideas to market, and a platform from which to develop new ideas.⁴⁸

3. Software is not patentable subject matter.

Changing tactics, critics often insist that software, being a series of mathematical algorithms, falls into those categories of “laws of nature, natural phenomena, and abstract ideas” which the Supreme Court has made clear are not patentable.⁴⁹

Nonetheless, in order to advance their argument, critics must overlook the fact that software patents are not just mathematical functions, but mathematical functions as applied to resolve real-world problems.⁵⁰ The innovative element of the software-related patent is not the mathematical algorithm itself, but the use of that algorithm to create a function, or series of steps, that is new, useful, and non-obvious.⁵¹

Inventions in information technology (including hardware as well as software) are readily distinguished from those in more physical fields, including mechanical, chemical, and articles of manufacture. This is because mechanical, chemical, and article of manufacture areas can be described using well-known physical descriptors (e.g., “gears,” “sprockets,” “wheels”) and chemical names.⁵² Patents on information technology inventions, on the other hand, do not identify or claim specific objects, but rather use conceptual terms to describe an invention by its function, or series of steps.⁵³ Because these patents describe a fundamentally different technology than that of more physical inventions, it must be expected that information technology patents, including software patents, will use different (and less immediately familiar) terms.⁵⁴

The use of new and more abstract terms in software-related patents is a reflection of a broader shift in the economy. Before computers and the software used to operate them became commonplace, a large percentage of a company’s market value was derived from

⁴⁸ *Id.* at 18 (“By enabling firms to diminish the risk of free-riding or misappropriation by partners, IPRs facilitate and encourage sharing, stimulating flows of information and knowledge. . . [T]he concept of open innovation relies in large part upon markets for intellectual capital, underpinned by effective IP protection systems that enable companies to protect and enforce IPRs. . . Interviews with companies confirm that IPRs are central to the protection of their innovative capabilities when engaging in collaborative R&D”).

⁴⁹ *Diamond v. Diehr*, 450 U.S. 175, 185 (1981).

⁵⁰ Note, *Everlasting Software*, 125 Harv. L. Rev. 1454, 1460 (2012), available at http://cdn.harvardlawreview.org/wp-content/uploads/pdfs/vol125_everlasting_software.pdf.

⁵¹ *Id.*

⁵² *Id.* at 1457.

⁵³ *Id.* at 1460; see also U.S. Patent and Trademark Office, Manual of Patent Examining Procedure § 2181, at 2100-234 to -237 (9th ed., March 2014).

⁵⁴ *Id.* at 1465; see also Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific*, 17 Berkeley Tech. L. J. 1155, 1162-64 (2002).

that company's physical assets, including factories, equipment, and raw materials.⁵⁵ As the United States has changed to a knowledge economy, intangible assets, including intellectual property, know-how, and business methods, constitute up to 80% of the market value of public companies.⁵⁶ As society's means of valuing companies shifts from focusing on physical assets to more abstract intellectual property, it becomes increasingly desirable and necessary that patent rights be available to protect these valuable, intangible assets.

4. Patent rights should be reserved for inventions that, unlike software developments, are truly revolutionary.

Finally, critics argue that software is fundamentally distinct from other areas of innovation in that software developments are made incrementally, by building on the advances of previous researchers and coders. Software developments allegedly contrast with other inventions in that they are quick and inexpensive to produce, and can be brought to market in relatively little time, without stringent safety testing or agency oversight.⁵⁷ As a result, these critics argue that patent protection should be reserved for truly innovative developments.⁵⁸

This argument is rebuffed by the same straightforward logic used to counter allegations that software is not patentable: patents are not issued for the lines of code or mathematical algorithms themselves, but for new and inventive solutions to unique problems. These solutions are no more incremental or cumulative than those made in any other industry, including the semiconductor, chemical, and medical device industries.⁵⁹

Moreover, critics who denounce the innovative potential of incremental software developments have lost sight of one of the most fundamental purposes of the American patent system: to promote further breakthroughs by facilitating the broad dissemination of information and technology.⁶⁰ To accomplish this goal, the Constitutional Framers deliberately constructed a patent system that would encourage universal participation by rewarding modest advances in design and function.⁶¹ Unlike the European patent systems of the time, which restricted patent rights to the wealthy and elite through prohibitive costs

⁵⁵ David Kline, *Do Patents Truly Promote Innovation?*, IPWATCHDOG (APRIL 15, 2014), <http://www.ipwatchdog.com/2014/04/15/do-patents-truly-promote-innovation/id=48768/>.

⁵⁶ *Id.*

⁵⁷ Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 Va. L. Rev. 1575, 1687-88 (2003).

⁵⁸ *Id.* at 1688.

⁵⁹ David Kline, *Do Patents Truly Promote Innovation?*, IPWATCHDOG (APRIL 15, 2014), <http://www.ipwatchdog.com/2014/04/15/do-patents-truly-promote-innovation/id=48768/>.

⁶⁰ B. Zorina Kahn, THE DEMOCRATIZATION OF INVENTION: PATENTS AND COPYRIGHTS IN AMERICAN ECONOMIC DEVELOPMENT, 1790-1920, 29-30 (2005); see also B. Zorina Khan, *Premium Inventions: Patents and Prizes as Incentive Mechanisms in Britain and the United States, 1750-1930*, in UNDERSTANDING THE SOURCES OF LONG RUN ECONOMIC GROWTH 205-234 (Dora L. Costa & Naomi Lamoreaux eds., 2010), available at <http://www.nber.org/chapters/c12000.pdf>.

⁶¹ B. Zorina Kahn, THE DEMOCRATIZATION OF INVENTION: PATENTS AND COPYRIGHTS IN AMERICAN ECONOMIC DEVELOPMENT, 1790-1920, 53-54 (2005)

and burdensome administrative measures,⁶² the American patent system was designed to both reward and encourage invention, however gradual, by protecting the property rights of inventors without regard to their social class or educational level.

Congress has taken care to protect the integrative and inclusive nature of the American patent system by acting to reject heightened standards of patentability. The Patent Act of 1952, for example, was intended to abolish the requirement, imposed by the Supreme Court in 1941, that patentable inventions be dramatic, breakthrough inventions reflecting a “flash of genius” by the inventor.⁶³ Instead, Congress codified a regime in which all inventions that are useful, novel, and non-obvious may be patented,⁶⁴ regardless of whether the invention results from the inventor’s long toil and experimentation or from a sudden flash of creative genius.⁶⁵

When scrutinized closely, the litany of objections to software patents is threadbare and unsupported by empirical data. For years, critics have worried that software patents will undermine industry growth, contribute to the deleterious concentration of knowledge, impose barriers to market entry, and prevent new innovations from being brought to market. These dire prognostications have gone unrealized. Instead, the patent system’s provision of strong incentives and ownership rights for software innovators has spurred tremendous industry growth and attracted inventors from all over the world. These inventors and their demonstrated preference for obtaining patent protections in the U.S. provide the strongest evidence that the U.S. patent system functions, if not optimally, significantly better than any competing system in the world. Their choices reveal their objectives: to gain access to a system that incentivizes invention and dissemination of knowledge while protecting ownership rights. We respect their creativity and their hard work by maintaining a strong, fair patent system that champions respect for individual rights. Ultimately, the U.S. patent protections given to software innovators—without discrimination—signals that smart, driven risk-takers can best capitalize on their great ideas and hard work here in the U.S.

Conclusion

Make no mistake: if America denies robust protection to software-implemented inventions, decreased investment will inevitably follow—eroding a competitive advantage in a sector that has proven vital to the United States economy. This would benefit overseas competitors who would like nothing better than an open ticket to copy U.S. software innovation. Why in the world would we want to invite such a result?

⁶² *Id.* at 31-32; *see also* Christine MacLeod, *INVENTING THE INDUSTRIAL REVOLUTION* (1988).

⁶³ *Cuno Engineering Corp. v. Automatic Devices Corp.*, 314 U.S. 84, 91 (1941); *see also* *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 15 (1966) (explaining Congress’s intent to abolish the “flash of genius” test).

⁶⁴ 35 U.S.C. §101-103 (2014).

⁶⁵ *See* Reviser’s Note accompanying 35 U.S.C. §103; *see also* Jacob S. Sherkow, *Negating Invention*, 2011 B.Y.U. L. Rev. 1091, 1092 (2011), *available at* <http://digitalcommons.law.byu.edu/cgi/viewcontent.cgi?article=2615&context=lawreview>.

Patent protection is critical for software-implemented innovation, to encourage investment and collaboration not just for the sake of software, but for every technical area dependent on software—meaning every technical area, period. Discrimination against any form of innovation that has become critical to technological advancement, indeed that in many areas dominates technological advancement, makes no sense. Let's celebrate America's big competitive advantage: our broad, diverse, world-leading ability to solve the world's toughest problems using software technology. And let's especially celebrate those software-implemented ideas that break substantial new ground, by continuing to support their patentability. Let's optimally incentivize innovation through the promise of patentability for all areas of technology.